



Title: A study of the impact of the Covid -19 Pandemic on Cement Production and the Performance of the Zambian Cement Industry.

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1.0 ABSTRACT

The construction sector in Zambia is a huge contributor in scale and share to gross domestic product (GDP) and economic development and it is a major employer of many engineering professionals globally (Agung & Wibowo, 2009). It provides the required materials to support construction of infrastructure which defines a nation's degree of development. The World Health Organization (WHO) has declared coronavirus disease of 2019 a pandemic and this has resulted in a public health crisis which has affected many sectors of the global economy across the globe (Yashavantha & Jayabaskaran, 2020). The rapid spread of the coronavirus poses a significant burden on both developed and developing nations globally and it has put unbearable pressure on humanity with very unpredictable economic consequences on many sectors including the construction industry (Hannes & Tisogondo, 2022). Cement producers in Zambia have been impacted and this makes it difficult for them to access key raw materials required to produce cement. In the construction industry, all the workers and technical engineers need to nearly be on site to perform activities and monitor the machine activity to ensure that production is done correctly and safely (CemNet, 2020). The cement industry is very different from other industries, and it requires on site presence of all project members. In view of the above, understanding how this industry addresses the impact of covid 19 on its operations is important in ensuring that appropriate interventions are put in place to ensure uninterrupted supply of the product to both the domestic and export markets.

Key words: Cement, Covid – 19, crisis, utilization rates, value chain, supply chain, risks.

2.0 STATEMENT OF THE PROBLEM

Zambia is currently facing a backlog in infrastructure development and efforts are being made to curtail this problem but there is still a lot of time before this strain is curtailed significantly. The cement industry is the key pillar of road and infrastructure development in Zambia, and it is currently facing challenges attributed to the spread of Covid 19 in the key districts where the manufacturing facilities are situated. This led to a lock-down, and it slowed down both domestic and international trade in all economies. The construction sector which relies heavily on the cement industry faced huge financial stress due to low business activity. This study investigated the impacts of covid 19 pandemic on cement production and the performance of the Zambian cement industry.

2.1 Objectives of the Study

The main objective of this study was to fully appreciate the extent to which the Covid 19 Pandemic has impacted cement production and the operations of cement producers in Zambia. The study sought to highlight the main challenges cement producers are facing to produce and supply the product in their quest to support governments efforts that are aimed at accelerating economic development through the construction of improved road networks, hospitals, schools, bridges, and housing units for civil servants. The study sought to find practical solutions that will help cement producers improve their supply chains, sustain production efficiencies and at the same time remain competitive and profitable during the covid 19 pandemic and in the foreseeable future.

2.2 Introduction

The World Health Organization (WHO) declared the coronavirus 2019 (COVID-19) pandemic on 11th March 2020 (World Health Organization, 2020). By the end of November 2020, there were around 50 million cases and 1.2 million deaths reported (WHO, 2020). The Coronavirus disease also known as Covid-19 is a serious infectious disease caused by the Corona virus and it attacks the respiratory system (Conti & Younes, 2020). The first outbreak of the disease was in Wuhan a city in China in December 2019, and it later spread to several other part of the world and it had very devastating impacts on the global economy (Bin et al., 2021). The Covid – 19 pandemic disrupted the financial markets and the economy worldwide. Its impacts on Zambia's financial markets and the economy were exacerbated by the fact that there was change of Government and the country has a huge sovereign debt which must be serviced.

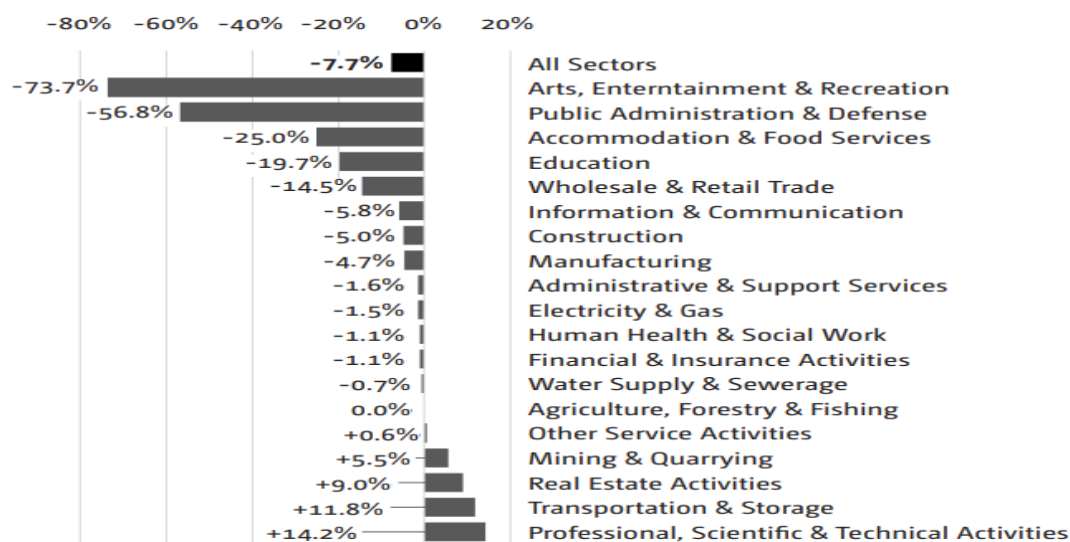
These unusual events prompted the Government to undertake large monetary and strong fiscal policy interventions. The pandemic has caused economic and social distress for the country, and it has slowed down economic development. Financial markets play a very crucial role in the economy and any unforeseen conditions such as the Covid – 19 outbreaks had a negative impact on the economy, and this also impacted the

profitability of the main players in these markets. The purpose of this study is to analyze the impact of the Covid – 19 Pandemic on the key aspects of the financial markets and bank operations.

2.3 Background – Macro-Economic Impact of Covid – 19 on Zambia.

Zambia’s macro- economic growth has been declining over the past decade and in 2020 the prospects of the economy rebounding were worsened by outbreak of the Covid 19 pandemic, coupled with rising sovereign debt, and the default on the Eurobond. As was the case with several other countries worldwide, the Zambian government took several measures which included, national lockdown, telecommuting and wearing of masks and these were aimed at halting the spread of the Covid - 19 virus. These measures coupled with the ripple effects attributed to the decline in international trade and tourism resulted in reduced economic activity and the Gross Domestic Product (GDP). Although there was a severe contraction of GDP by 7.7% in 2020, when the Pandemic heightened, this was not uniform across the major economic sectors (Zambia Statistics Agency,2020).

Figure 1: Estimated impact on GDP across the industries, Zambia,



Source: Zambia Statistics Agency (2021).

During the period of the pandemic, many sectors experienced declining growth rates with the arts and entertainment industries recording the worst shock (-74%). On the other hand, some sectors recorded increasing growth rates. These included, real estate activities (+9.0%), Transportation and storage (+11.8%), Professional and technical activities (+14.2%). The mining sector, on which the Zambian economy heavily relies, grew by +5.5% despite the crisis mainly due to copper price hikes especially in 2020 (Kalikeka, M. et al., 2021).

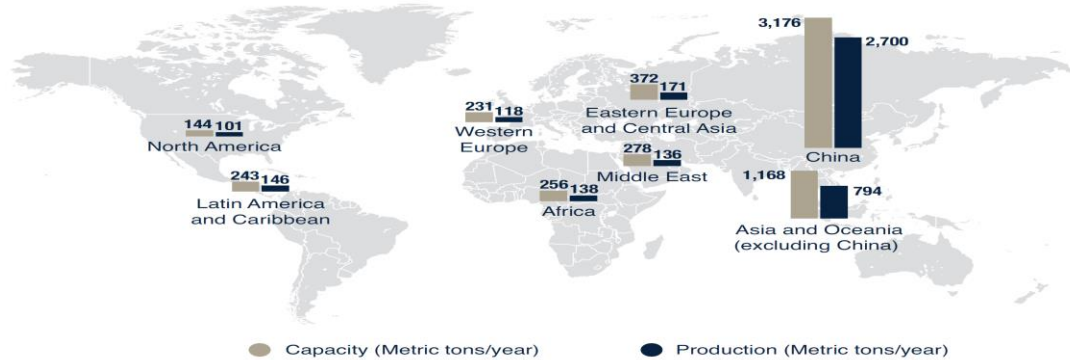
3.0 LITERATURE REVIEW

The COVID-19 crisis has had a very significant impact on the cement industry in Zambia which supplies the construction sector with cement and other aggregates used in infrastructure development projects. The

construction sector, which is a major consumer of cement, saw a huge decline in activity when the government implemented lockdown and social distancing measures to stop the spread of the virus. This led to a severe decline in demand for cement, which in turn resulted in decreased clinker and cement production, decrease in prices, and this created over-capacity challenges at all the production facilities in Zambia. In addition to the decline in demand, the pandemic also caused disruptions to the supply chain, as lockdowns and travel restrictions made it difficult for manufacturers to obtain raw materials and transport their finished products to their markets. This further impacted the production and distribution of clinker, cement and other aggregates that are used for construction purposes.

The Covid-19 crisis only became a typical issue recently and literature on this subject is still very limited especially one that focuses on its impact on the cement industry in low-income countries such as Zambia. The report published by the Department of Business, Projects, and Innovation of the Irish Government in August 2020 was one of the earliest reports that looked at how the cement and construction industries have been impacted by the pandemic. This report highlights that the extractive and construction industries were among the sectors mostly impacted by the Covid -19 pandemic and demand for cement decreased due to a decline in construction activity globally of about 50% and this led to overcapacity problems.

Figure 2: Global Cement Capacity and production, 2019



Source: CW Research (2020).

There is, however, need to disaggregate the contraction rates attributed to the Covid – 19 pandemic by region and country to enable stakeholders understand the scale and impact of the pandemic on national economies. To date, there has been no study which specifically focuses on its impact on the cement industry in Zambia which is a major employer and contributor to the Gross Domestic Product (GDP). The Covid – 19 Pandemic has significantly impacted international trade between Zambia and China which is a major partner in the implementation

of various infrastructure development projects. This has slowed down implementation of various projects that are an important component of the 8th National Development Plan (8th NDP).

China is the top-most commercial partner for Zambia and the two governments have signed bilateral agreements to foster economic development in infrastructure development. As a result, international trade between the two countries has increased tremendously. If the pandemic is not contained, Covid -19 could impact many African countries that have trade links with China due to the high volumes of travels (Gilbert et al., 2020). According to WHO, the countries that will be impacted the most because of the high risk of covid-19 include Algeria, Angola, Cote D'ivoire, the Democratic Republic of the Congo, Ethiopia, Ghana, Kenya, Mauritius, Nigeria, south Africa, Tanzania, Uganda, and Zambia (Velavan & Meyer, 2020). This is largely attributed to the high volumes of international trade and the development support the Chinese Government is offering to these countries. Through this study, the main aim will be to identify the impacts of Covid -19 and assess the level and severity on production efficiencies, supply chains and demand of cement in the context of the Zambian market. The study will also consider the impacts of covid – 19 on cement exports to the neighboring countries like the Democratic Republic of Congo (DRC) and Burundi that are undergoing massive reconstruction following prolonged periods of civil wars.

According to the European Central Bank's economic forecasts, the construction sector will suffer a loss of about 40% due to the impact of covid - 19 (Husien & Naji,2021). Borkova et al. (2020), in a study on the digital transformation of the construction industry in the context of the macroeconomic shock attributed the COVID-19 pandemic, pointed out that during the peak of the quarantine period many construction companies were closed, and they concluded that digitization would reduce the adverse effects of the pandemic in many sectors of the economy. This report does not, however, highlight the organizational wide digital transformation that cement producers must invest in to transform, the internal value chains for both the inbound and outbound logistics to ensure consistent production and supply of clinker and cement.

Cement producers must re-engineer their processes and adopt to working differently. The virtual environment will be very much integrated into all construction activities, and this will involve more flexibility of working because of the inevitable adaptation of new technological tools. Gashahun (2020) hinted in his study on assessing the impact of Covid-19 on the construction industry in Ethiopia that if the epidemic continues, there would be about 1.76 million jobs at risk. Companies will cut down on labour as a way of reducing costs while at the same time consider adopting digital technologies across the value chain. Gumble's (2020) argues that there are many office-based construction roles that can be done at home, and in this period of the pandemic flexibility in the working arrangements is viable and it should be more widely accepted to save many potential job losses. Cement producers have the capacity to adopt innovative production technologies to move the industry forward. Most

cement production sites are safe, and the workers are more efficient in plants where digital technologies have been adopted. Technology has also improved productivity when dealing with complex projects by using artificial intelligence.

With COVID-19, the global greenhouse gas (GHG) emissions will decline compared to previous records and this could potentially mark a “turning point” in the improvement of climate change (Hepburn et al.,2020).In another study conducted by the National University of the Maldives (August 2020) about the impact of Covid 19 on the construction industry, the team noted that the effects of COVID-19 in the Maldives are similar to its effects on the construction industry around the world and the impacts included disruptions to construction projects, liquidity problems, disruption to supply chains, increased production costs, and legal problems related to contract terms. Ogunnusi et al. (2020) in their study of the Coronavirus pandemic, implications and expectations noted that most construction companies may resort to borrowing due to reduced uptake of income from sales and for fear of being declared bankrupt and it will become necessary for construction companies to embrace digital technologies to reduce the impact on their long-term business prospects. The study reveals that some construction companies might resort to borrowing from commercial banks for fear of becoming bankrupt due to the effects of COVID-19 on their cashflows. In Zambia, cement producers have challenges raising finance from the banks and through the stock markets and it is, therefore, important to consider the Central Banks interventions that are aimed at cautioning the impact of covid-19 on access to credit from the commercial banks operating in the Zambian financial market. Ogunnusi et al. (2020) concluded that construction experts may rely more on modern technologies for the purpose of increasing production and optimizing average capacity utilization rates. Despite all the efforts and intensive research that has been done lately on this subject, there is still no vaccine against the corona virus, and this makes it a very serious global threat (El Zowalaty & Järhult, 2020).

Bailey et al. (2020) highlighted the legal implications of the COVID-19 pandemic on construction related standard form contracts and how this is being managed. The pandemic has significantly slowed down the pace at which construction projects are being implemented and this is largely attributed to the high health and safety risks as most construction workers are expected to work in closed environments. COVID- 19 being an unforeseeable circumstance can be considered a force majeure occurrence under any standard form of contract and it will usually afford contract extension for the delay during the pandemic with no compensation for any additional costs (Bailey et al.,2020). This study will also consider some actions that cement producers will have to take to streamline their debt portfolio and explore other means of funding to avoid becoming bankrupt due to reduced business fortunes.

The impacts of the Covid – 19 pandemic will be key considerations for the cement industry in Zambia as most producers have long term supply contracts with various construction companies that are undertaking various infrastructure projects that are supposed to be delivered on time. This study will explore the effects on the cement

industry in Zambia and outline the actions that cement producers must take to ensure consistent supply of both clinker and cement to support the construction industry.

4.0 METHODOLOGY

The research aims to explore the negative impacts of the Covid – 19 pandemic on the production of cement and the various factors affecting the performance of Zambian cement industry. This will be achieved by a desk review of the limited literature that is available on the subject matter and a field study that will include focus group interviews with cement industry experts. The study also involved a gathering information from professionals working on projects that are funded by international donor agencies to understand the positive and negative experiences in the implementation of the time sensitive projects that they are managing in the context of the covid – 19 pandemic. This will serve as an important pedestal for future research. The study further examined the array of opportunities that digital technologies present to firms operating in the cement industry.

4.1 Study Design

The approach that was taken in this study was a cross sectional investigation which utilized self-administered questionnaires and online questionnaires using Microsoft forms. The study was extended and included virtual focus group interviews with key cement Industry experts and included plant managers, process development engineers, analytical chemists, maintenance managers, Quarry Managers, Kiln Burners, and Safety officers of the major cement producers in Zambia. Additional data about the industry was collected from other sources and it included detailed reviews of literature of previous studies done on the industry when there was a public health crisis that adversely impacted the cement industry, government publications and journals written by scholars who have a keen interest in the cement and construction industries.

4.2 Questionnaire Design and Data Collection.

In this study the questionnaires were designed using a monkey survey and the main reason for this was to ensure that data is collected through a consistent and well-structured process. The questionnaires were shared with cement industry experts, selected suppliers of raw materials and selected customers. The idea was to ensure that data was collected from various stakeholders about activities that cover inbound logistics, the internal value chain, and all outbound logistics. With this data, it was feasible to evaluate and assess the impact of the pandemic on the supply chain, cement production and the other factors that affect production efficiencies.

4.3 Research Questions

As part of the data collection process, the study aimed at providing answers to some of the following

question to fully appreciate the impact of the Pandemic on the Cement industry.

1. What is the overall impact of the Covid – 19 pandemic on the production of cement and the performance of the cement industry in Zambia?
2. How was the performance of the cement industry before and during the pandemic?
3. What was the impact of Covid 19 on the supply chains?
4. How can cement producers ensure efficient supply chains for inbound and outbound logistics?
5. What action must cement producers take to ensure improved capacity utilization for them to remain competitive and ensure long-term sustainability?

5.0 ANALYSIS OF RESULTS

As the Covid – 19 pandemic continues to evolve, many events such as disruptions to the global supply chains and the volatility in the financial markets have brought about a new set of challenges which must be dealt with urgently. In Zambia and the rest of the world, policy makers still have a window of time to execute a coordinated response to the crisis to limit its adverse impact on the global economies. The turbulence faced in the cement and construction sectors in Zambia at the onset of the Covid – 19 pandemic can be attributed to the outbreak coronavirus disease. There was a sharp contraction in the performance of the sector and both cement demand and production declined sharply reflecting high uncertainty about how the performance of the economy and many investors in the construction sector became risk averse due to the increased volatility in the financial markets as this exceeded those levels seen during the global financial crisis. Some of the notable impacts on the cement production and the performance of the cement industry are outlined below:

5.1 Performance of the Cement Sector before the onset of Covid – 19

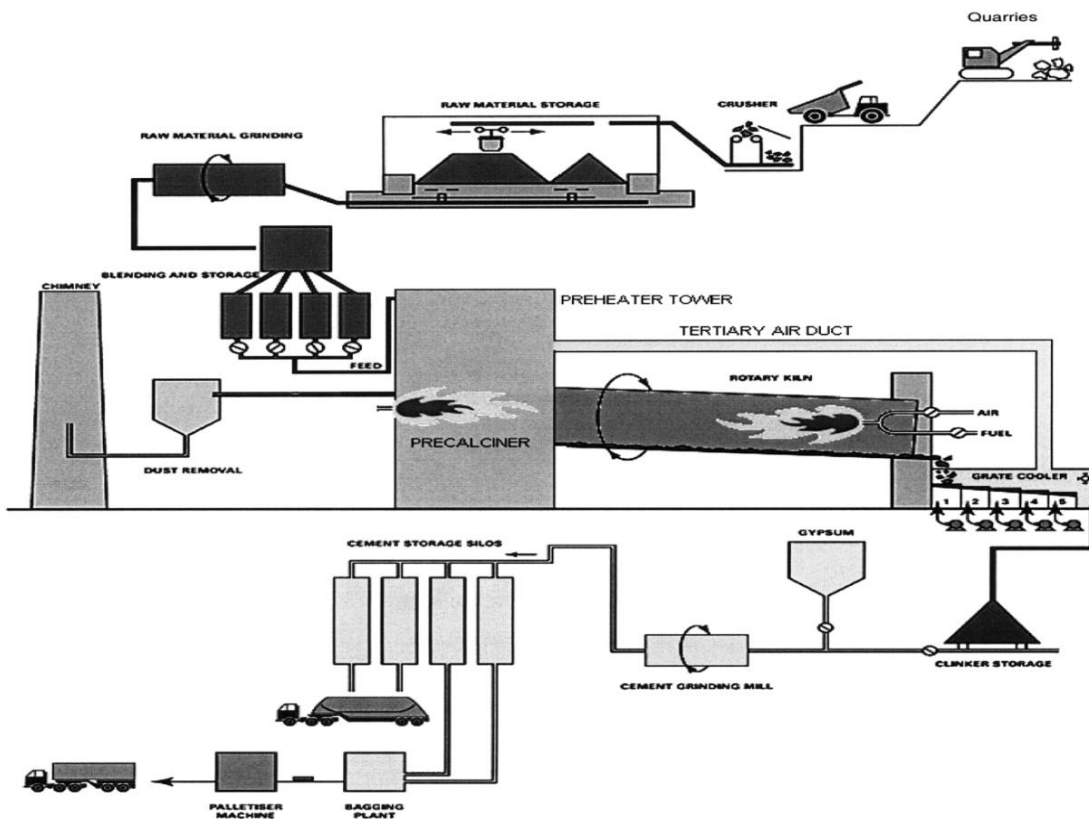
Prior to the outbreak of the Covid – 19 Pandemic, capacity utilisation in the cement plants was high and this led to the market being over supplied and it became competitive. The consumption of cement in Zambia per annum averages around 2.3 million metric tonnes compared to a production of about 5.5 million metric tonnes from the combined production facilities of the main producers in this industry (Lusaka Times, 2019). Before the onset of the Covid -19 pandemic, there was high competition in the cement sector with the two leading producers, Lafarge, and Dangote cement companies, controlling about 55% of the total market share (Lusaka Times, 2019). The Zambia's Competition and Consumer Protection Commission maintains that there is need to enhance the existing level of competition in the cement industry so that it will lead to more consumer choice even after the Covid 19 Pandemic is over (Lusaka Times, 2019).

5.2 The Cement Production Process - Overview.

All the cement plants in Zambia are located near the quarries which are the main source of limestone

which is the primary raw material required for cement production. The main reason for their location is that about 1.6 metric tons of limestone are required to produce 1.0 metric tons of cement and because of this, it is economical to have plants set up near the sources of limestone. There are two main steps in cement production. The first step is the production of clinker from raw materials and the second step is the production of cement from clinker (Portland Cement Association, 2008). The first step requires transportation of raw materials to the primary crushing plant where the limestone is crushed, and it is then homogenized at a temperature of about 1,500 degrees in a big rotating pipe called a rotary kiln. The kiln is then heated to high temperatures, and subsequently inclined, to allow the raw materials to flow to the other end, where it is quickly cooled. The result is a solid grain like substance called clinker. The second step is the transformation of clinker into cement in a grinding mill process where elements like gypsum and other minerals are aggregated to produce a fine powder called cement (Portland Cement Association, 2008). Finally, the bulk cement is moved to cement silos for storage until a customer places an order. Cement is then sold either in bulk or in 50 kg bags depending on the customer requirements.

Figure 3: Upstream Cement Supply Chain.



Source: Cemex (2008)

5.3 The Impact of Covid – 19 on the Cement Sector

5.31 Effect on Demand. Before the outbreak of the Covid – 19 Pandemic, the cement industry in Zambia was over supplied and the market was very competitive. The consumption of cement in Zambia averages around 2.7 million metric tonnes compared to a production of about 4.63 million metric tonnes from the combined production facilities of the main players in this industry (Dangote, 2009). Competition in this sector is very high with Lafarge and Dangote cement companies controlling about 55% of the market share.

Figure 4: Cement industry Statistics.

Key statistics	
Demographics	
Population	18.9m
Urbanisation	44.6%
2020 GDP growth	-3.5%
Market	
Total capacity	4.63Mta
Cement consumption	143kg/person
Total market	2.7Mt

Source Dangote Cement Plc Annual Report (2020)

During the period of the pandemic, there was a sharp decline in the demand for both bulk and bagged cement due to the slow pace of implementation. The export market was more impacted by the pandemic mainly due to the closure of the borders and this resulted in cement producers having challenges. In some markets domestic demand increased as it seemed a lot of people resorted to be doing home improvements since they were not allowed to be in public. As a result of this aggregate contraction most of the cement producers had overcapacity and this triggered a downward pressure on the price of the product resulting in high competition. Cement producers were mainly expected to survive the covid – 19 crisis and they had to strengthen their sustainability and competitiveness in all their markets. In the next five years, the demand for cement is expected to decline by at least 5 percent year on year and this means that there will be a corresponding increase in idle capacity, and this will adversely impact the Return on Investment (ROI). Cement producers in Zambia will record lower profits progressively as most construction projects will be impacted by the pandemic.

5.32 Effect on Productive Capacity Utilization Rates.

A very noticeable impact of the COVID-19 pandemic on the plant utilization rates in Zambia is the adverse effect it had on the rate of production capacity utilization of the manufacturing firms. Prior

to the onset of the covid 19 pandemic, most firms in Zambia were already operating their plants below their full capacity, due to the high costs of essential raw materials and the loadshedding when the country experienced. These challenges have now been compounded by the covid – 19 pandemic and this has impacted capacity utilization in a very significant way as evidenced by the much lower plant capacity utilization rates across industries when compared to the period before the COVID-19 pandemic. In Zambia, the capacity utilization in manufacturing firms was 69 percent in 2013 and 70 percent in 2019, it fell drastically to 51 percent in 2020 (UNCTAD Research paper No 63,2021). The table below shows that the production capacity utilization rates in 2020 varied significantly across the categories of firms. The pandemic did impact capacity utilization through reduced labour supply in most firms as some workers were required to stay at home to limit the infection rates among staff especially those that work in teams.

Table 1: Impact on firm employment, liquidity, and capacity utilisation in Zambia

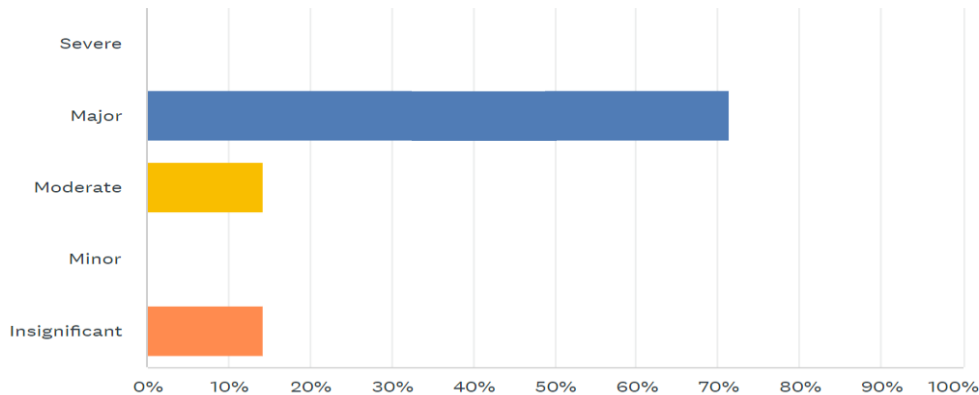
	% of firms confirmed permanently closed since COVID-19 pandemic declared	% of firms that have ever temporarily closed during the COVID-19 outbreak	Capacity utilization in 2020 (%)	% of firms that decreased total number of permanent workers since Dec 2019	% of firms that ever decreased total number of temporary workers since COVID-19 began	% of firms that ever experienced decreased liquidity or cash flow availability since COVID-19 began
All	3.36	39.80	51.05	25.65	43.82	90.78
Small (5-19)	4.59	38.08	48.69	20.13	39.50	92.59
Medium (20-99)	3.38	44.10	54.06	35.08	47.90	90.55
Large (100+)	0.34	34.39	48.64	17.79	44.65	86.97
Manufacturing	2.86	30.15	51.05	32.89	46.84	89.32
Services	3.47	42.21		23.91	43.06	91.15
Direct exports are 10% or more of sales	0.78	23.04	39.72	47.48	52.97	85.26
Non-exporter	3.54	41.08	52.27	24.44	43.50	91.07
Top manager is female	11.98	24.68	36.27	17.47	54.02	81.63
Top manager is male	2.09	41.62	51.87	26.66	42.67	91.92
10% or more foreign ownership	6.24	42.42	51.02	36.78	49.32	90.46
Domestic	2.39	38.96	51.06	21.45	41.97	90.86

Source: World Bank Enterprise Survey database.

There are many channels through which the covid – 19 pandemic had a negative impact on capacity utilization in Zambia. The Government imposed a national lockdown, social distancing and people that were infected with the virus had to be quarantined to halt the further spread of the virus. This resulted in partial and, in some instances full closure of the cement. About 70% of the firms surveyed in the industry indicated that they had to slow down

production because covid-19 had a major impact on the infrastructure development projects that they were supplying cement for construction.

Figure 5: Impact of Covid 19 on construction projects



Source: Research Survey Results.

Covid 19 also caused supply chain disruptions and because of this firms were not able to receive the essential raw material in good time. These disruptions further constrained capacity utilization. Cement producers faced many challenges when procuring raw materials and other spares parts required to run the capital-intensive cement plants in the cement plants.

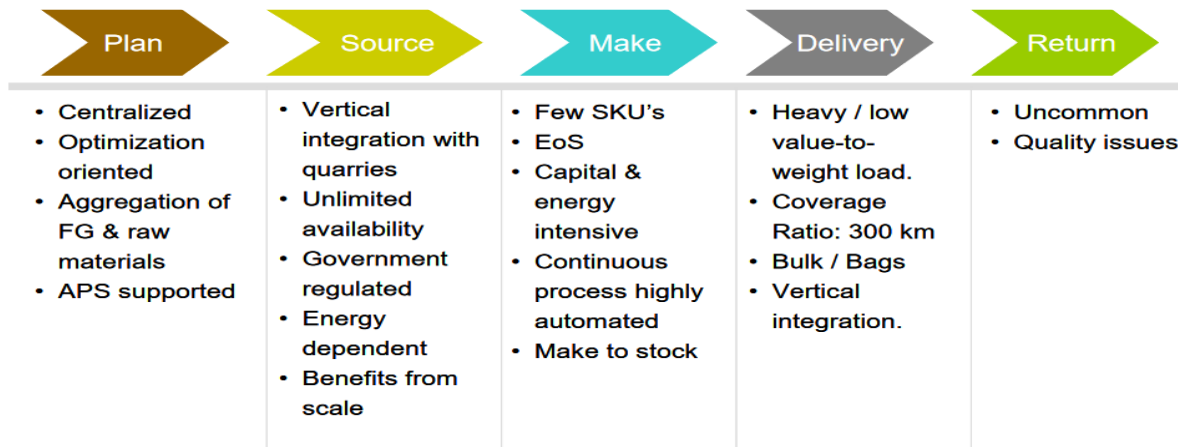
5.33 Effect on Supply Chains.

The spread of the Covid 19 virus has impacted supply chains adversely and we continue seeing a huge decline in demand of many products and increasing uncertainty of availability of raw materials and spares used in the production processes of cement. The manufacturing of cement requires the use of different types of raw materials that include, limestone, gypsum, and sand. In addition, cement producers also procure large quantities of coal, grinding media, polythene bags and various spares required for routine maintenance of the primary and secondary crushers, the kilns, the cement mills, and the packing plant. Most of these must be sourced from other countries. During the period when the lockdown measures were put in place, cement producers are faced many challenges with sourcing of raw materials and other supplies. Many suppliers of raw materials had reduced production, and this has impacted cement producers as they were unable to stock the right quantities of raw materials required for them to produce cement.

The diagram below is a presentation of the supply chain model of a cement operation based on the Supply Chain Council's (SCOR) model processes. Most of traditional Cement Supply Chains are divided into five major

Sections: (1) Quarry works and Crushers, (2) Clinker production, (3) Cement grinding, (4) Delivery processes, through (Bulk/ Bags distribution networks) (Noche Bernd and Tarek Elhasia,2013).

Figure 6: Supply Chain Characteristic



Source: Agudelo (2009)

Cement Plants use bulk raw materials and timely delivery of these to the manufacturing site was a big challenge due to restrictions in production and movements of goods. Additionally, most borders were closed, and this exacerbated the problems faced by cement producers attributed to disruptions in the supply chain. Zambia being a land locked country had no access to foreign supply sources and haulage of raw materials by road and rail became expensive due to increased tariffs as most transporters wanted to cover their fixed costs.

5.34 Impact on the Workforce.

The coronavirus 2019 (COVID-19) has drastically impacted workers and workplaces across the globe and it has totally changed the workplace environment, increased workers' concerns about economic insecurity, caused mental health and physical well-being, isolation, challenges of working remotely, and returning to the workplace safely (Pamidimukkala et al.,2021). The pandemic has continued to put pressure on the workforce in all sectors and studies show that its impact will have long-term effects. In Zambia, cement companies have been forced to remodel and the workforce has been reduced by over 20% of the head count. With this new arrangement of working productivity has slackened and cement producers are beginning to face challenges to supply cement consistently. As a result, productivity reduced sharply when the pandemic heightened as the workforce had to adapt to the new way of working. Employers had to deal with the emotional impact of staff members who got infected and affected by the loss of their beloved ones. In addition, some employed stress counsellors and facilitated vaccinations for their workforce. This research revealed that in addition to increased risk of contracting the virus, workforce in cement plants is facing heavier workloads because of the reduced

headcount and lack of artificial intelligence in production operations.

5.35 Impact on Private Consumers. The impact of the Covid -19 pandemic did not only impact corporations that are in construction business, but its effects were felt by private consumers whose demand accounts for about 20% of the domestic sales. These consumers buy the product to facilitate residential construction supported by financial institutions who offer loans and mortgages to individuals that are primarily aimed at addressing the challenges attributed to the current housing deficit.

The survey that was conducted revealed the following:

- I. Most individuals had to suspend their construction projects when the government imposed a national lock-down to limit physical contact and prevent the spread of the virus.
- II. The shelf life of ordinary Portland cement is three months. Since the period of the lock down was beyond three months, some consumers who had bought the product in bulk suffered financial loss as the product started deteriorating.
- III. The consumers in the target population indicated that in addition to the losses above, they did not obtain any value added tax and import duty waivers on construction materials from the government.
- IV. Individuals usually hire builders for a limited duration. Because of Covid – 19 these had to be laid off and the prospects of them returning were remote because some of them found alternative and secure employments elsewhere. This had the potential of impacting the quality of future construction works and their completion times as new workers were to be employed.

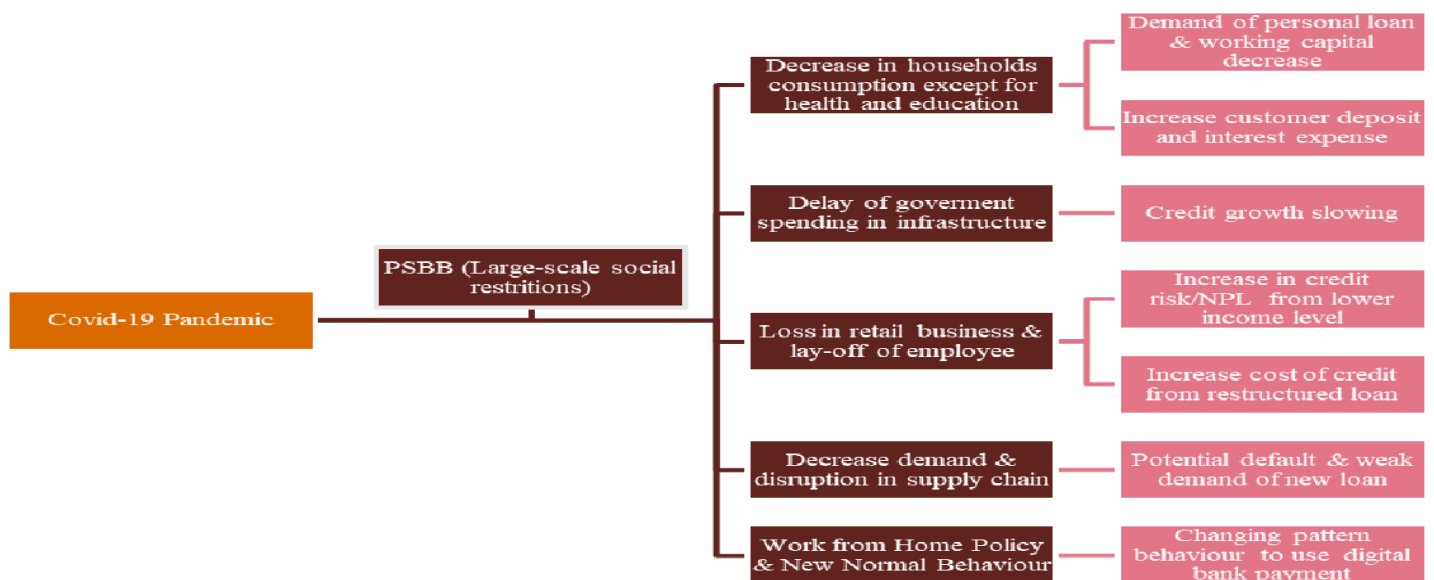
5.36 Impact Capital and Investment Requirements.

Cement plants are capital intensive, and most maintenance and expansion projects are a big concern for cement producers and potential investors in Zambia. Sisala (2008) observed that most projects in Zambia (i) have long gestation periods, (ii) are subjected to cumbersome pre-feasibility and feasibility studies plus Environmental Impact Assessments, (iii) have long implementation periods (usually 5 to 7 years), (iv) require huge capital outlay, (v) are characterized by long payback periods contrary to the private sector demands of short term returns, and (vii) compete for capital with more lucrative projects with short term returns. Most cement producers had to suspend their expansion and maintenance projects during the period of the pandemic because of the many uncertainties around their return on investments.

5.37 Impact on Financial Markets and the Risks faced by Cement Producers.

As the Covid – 19 outbreak evolves, there are many events such as the volatility in the global financial markets that have triggered new challenges that have impacted many companies and they must be dealt with very swiftly. Because of the capital-intensive nature of most cement operations, the companies operating in this sector rely on financial markets to access resources to finance their projects. The pressure and turbulence faced in the financial markets at the beginning of 2020 can to a large extent be largely attributed to the Covid – 19 pandemic. During the period of the pandemic, stock prices declined by bigger margins, and this reflected uncertainty about how the Zambian economy would perform and many potential investors who had interests in the cement sector became risk averse. This was largely due to the increased volatility in the financial markets which exceeded the levels seen during the period of the global financial crisis. The figure below summarises the impact of the covid – 19 pandemic on the banking industry.

Figure 7: Impact of COVID-19 to the Banking Industry



Source: International Journal of Business, Economics and Law, Vol. 24, Issue 3 (2021)

During the period of the pandemic, cement producers faced huge financial risk, and these were classified as market risk, credit risk and liquidity risk.

- i. **Market Risk** – Market risk is a systematic risk arises from volatility in uncontrollable external market forces such as interest rates, foreign currency exchange rates, equity prices, commodity prices and others (Madura, 2021). The volatility in the external market forces affects the value of financial instruments of the cement industry such as deposits, investments, deposits, foreign currency receivables, payables, and borrowings. Market risk shows either positive or negative impact on value of cash flows and future

earnings. Market risk is further fragmented into three categories such as foreign currency risk, interest rate risk and commodity price risk (Madura, 2021).

- a. **Foreign Currency Risks** – Cement producers faced unanticipated changes in the fair value of their foreign cash flows mainly due to rapid fluctuations in foreign currency conversion rates. This exposure was largely driven by uncertainties attributed to covid – 19 and the impending presidential general elections. This increased the cost of doing business due to the increased costs of imported raw material, cost of spares for plant maintenance and it affected inflows from investments denominated in foreign currencies.
- b. **Interest Rate Risk:** Most firms indicated that they faced unanticipated changes in the value and cash flows of their financial instruments mainly because of the sharp volatility in the market interest rates. Zambian cement producers were exposed to interest rate risks, and they had an extra burden of continuously tracking the changes in credit markets and restructure their financing strategies to ensure that they optimize their maturity profile and related financial cost.
- c. **Commodity Price Risk:** Although the bulk of coal used in the manufacture of cement is sourced from Maamba Colliers, there were times when this had to be imported because of some operational challenges faced by the suppliers. There was unanticipated fluctuation in the price of imported coal, pet coke and fuel which impacted the cost of production and the profit margins. Cement producers were forced to enter into long term agreements with major supplier of coal and fuels and lubricants.

ii. Credit Risk – Credit risk refers to a company is exposed to in an event when an individual or institution fails to meet their financial obligations towards company. In the cement industry trade receivables, loans, investments and bank balances, foreign exchange transactions, derivative financial instruments, and all financial guarantee activities (operating, financing and investment) are exposed to credit risk (Negero , M. T., & Bona, G. B. (2022). Financial analysts working in the cement sector had a task of using various credit rating tools to measure this risk. To manage credit risk cement companies are adopted Criteria based approval process such as monitoring credit limit, credit worthiness, credit rating and mutual fund investments (Negero, M. T., & Bona, G. B.,2022). Credit risk negatively impacted the revenue and operating profits because of the huge accounting provisions that were made in the financial statements. This ultimately impacted the company’s earnings per share and their stock market valuations.

ii. Liquidity Risk: This is the risk of default by a company in repayment of debt to trade creditors and financial suppliers (Panigrahi, C. M. A.,2013). Although the cement producers were able to hedge against this risk, some of the disruptions that were faced along the value chain can be attributed to the exposure that the firms that they deal with faced because of their inability to put in place mechanisms to manage their liquidity risk.

6.0 RESPONSE TO THE COVID 19 CRISIS.

The cement sector is a key contributor to the Zambia's GDP and cement producers took action to limit the impact of covid – 19 on the industry. All the firms continued to produce the product despite the challenges faced and they took radical steps in ensuring that appropriate measures were put in place to guarantee compliance with all the health and safety requirements. The World Health Organisation and the Ministry of Health have taken steps to help the cement and construction sectors to mitigate the adverse impacts of the Covid -19 pandemic on its employees and their operations.

6.1 Actions taken in the short term.

Cement companies are continuously taking many actions to mitigate financial exposure and regain the profitability and earnings per share trajectory despite the projected decreased cement demand. Analysis of results from the focus group interviews conducted with selected cement industrial experts revealed that the following actions have been taken by all companies in the sector to limit the impact of the pandemic on their operations:

- I. There is more attention on cost reduction along the cement production value chain. As a result, non-essential expenditures have been suspended and there has been a reduction in labour costs on segments that are not core to the business.
- II. Most producers have drastically reduced capital expenditure and some of the non-critical projects have been postponed. Furthermore, maintenance activities have only been restricted to very critical projects.
- III. Radically re-thinking working capital management practices and ensuring that adequate controls are in place to keep inventory levels to the minimum.
- IV. There has been a critical review of all the arrangements for cement distribution with a focus on stimulating demand. Most producers have opened depots in all the provincial centres to make the product accessible by commercial and retail customers.
- V. Cement producers are now ready to have a dedicated team secluded from the rest of the population to ensure uninterrupted plant operations in the event of any possible future outbreaks. Additionally, they have also embarked on an ambitious programme of training to ensure that the workforce is multi-skilled.
- VI. Significant allocations have been given to promoting employee wellness and they have also taken steps to incentivize good behaviours among the workforce as a way avoiding contracting the virus.

6.2 Actions taken in the long term.

6.21 Health and Safety. Cement producers have increased the budgetary allocations for all programmes aimed at promoting employee health and safety to supplement the efforts that the Ministry of Health has put in place to uplift the health and safety standards of the citizens. Production of cement at all plants

has continued and the environment is highly controlled to ensure staff safety when they on duty. The personnel density is now being to a minimum and wearing of masts and protective clothing and masks is mandatory.

6.22 Adoption of Digital Technologies. As a way of ensuring their competitiveness, cement producers have transformed the way they do business by embracing digital technologies in the execution of their production plans and implementation of their marketing strategies. In the face of the pandemic, this is seen as catalytic in profit maximisation as it is a way of boosting capacity utilization and increasing sales revenue from both domestic and export markets during the crisis. Furthermore, cement producers are placing greater emphasis on investments that are aimed a capacity among staff in the use of virtual capabilities with the organisation. This will ensure that staff become more resilient in the face of any crisis and increased competition in the sector. These efforts should not leave anyone behind because investments in digital technologies will set the seal on staff adaptability and result in a very resilient work force.

6.23 Supply Contracts. To lessen disruptions to clinker and cement production caused by lack of raw materials, the firms have considered framework contracts with suppliers of key raw materials. A framework is an agreement with suppliers to establish terms governing contracts that may be awarded during the life of the agreement and it sets out terms and conditions for making specific purchases (Call-offs) (Constructing Excellence.,2018). As part of their long-term strategy to minimise supply disruptions, the firms have started in sourcing of transportation services and in some cases consignment stocking has been enforced in some plants.

6.24 Government Involvement. The Zambian Government embarked on an ambitious agenda of stimulating cement demand through the promotion of various construction projects aimed at closing the housing deficit the country is currently experiencing. They are encouraging financial institutions to provide mortgages to companies and individuals through the Development Bank of Zambia and the Zambia National Building Society. Furthermore, they are providing support in the construction of housing for the Police Service, National Service and the Teaching Service Commission. In the 8th NDP, infrastructure development remains a priority and they are partnering with various Multilateral Institutions. All these initiative and partnerships are expected to stimulate demand for cement amidst the ongoing Covid 19 pandemic.

6.25 Policy Developments to Respond to the Crisis. The Central bank acted fast by enforcing policy tools to control the negative impact of the Covid - 19 pandemic on the economy. These measures targeted many business entities operating in Zambia and these included Multinational Corporations (MNCs), Small Medium Enterprises (SMEs), non-profit organisations and various households. Kalikeka,

M. et al. (2021) outlined the measures that were taken by the Central Bank to ease the liquidity pressure that impacted all the players in the Zambian financial markets, and these are outlined below:

- I. **Interest rate cuts** – The Bank of Zambia’s (BOZ) monetary policy committee lowered its policy rate by 125 basis points to 8% on August 18, 2020, responding to a growing Covid-19 crisis. They further provided clear guidance on the projected interest rate trends for the future to stabilize expectations (Bank of Zambia.,2020).
- II. **Quantitative easing** – The BOZ created additional bank reserves by purchasing Treasury and Mortgage – backed securities from the open market to lower interest rates and to increase the supply of money during the crisis.
- III. **Increased liquidity and credit support** – The Central Bank increased its lending to financial institutions, Multinational corporations, and other non-financial institutions. It also increased the purchase of corporate securities and there was more flexibility facilitating international settlements and other international swap lines (Bank of Zambia.,2020).
- IV. **Regulation easing** – To improve delivery and to reduce compliance costs for various players in the financial markets, BOZ reduced the minimum reserve requirements on lending and the standards for collateral were lowered and there was an expansion in the list of assets that qualified for collateral ((Bank of Zambia.,2020).
- V. **Timelines** – The timelines required for repayment of principal and interest payments were reviewed and extended. The reason for this was to allow borrowers to have sufficient cash to honour their obligations and reduce the default rates which attract penalties in many cases.

All the above actions were necessary and helped to ensure affordable borrowing, supported access to financial credit to business entities and households, thereby stimulating demand as they are now able to absorb economic shocks induced by the pandemic.

7.0 CONCLUSION

It is very clear from this study that the cement industry plays a very critical role in driving the economy and it provides many employment opportunities for nationals and international experts. As cement producers project declining business fortunes mainly because of declining lower sales demand, people that are employed in this sector are facing psychological problems as they foresee a financial crisis should the Covid 19 crisis persist. In Zambia, the cement industry has been impacted seriously by the closure policies that were enforced by the government and the companies must recover from the huge backlog that was created during the national lockdown. These measures that were enforced at the peak of the pandemic disrupted supply chains and this negated capacity utilization rates. Many suppliers were not able to deliver critical raw materials to facilitate production of cement to support many projects. Most of these projects were either suspended or delayed, and this exacerbated the existing financial and administrative challenges faced by cement producers especially the new entrants to the sector. Many suppliers and contractors are facing legal claims for failing to deliver on their contractual obligations that were made before the onset of the pandemic. Given that cement production is capital intensive, the outbreak of the pandemic resulted in capacity underutilization due to the low demand and as a result they were not able to cover the fixed costs required to run the cement plants. In view of this development, there is a risk that cement prices might increase in the short term as cement producers try to boost their revenues to remain profitable. Any potential increase in price might subdue demand further. The study reveals that the effects of the covid - 19 pandemic are very wide and varied. They range from supply chain disruptions, lower capacity utilization rates, unbundling of teams, lower throughput speeds, suppressed production and many legal disputes that have further put additional strain on the cashflows. Cement producers are now being encouraged to rethink their production strategies and radically re-engineer their business processes, production function and the supply chains. There is urgent need to abandon the traditional production and management policies and expedite adoption of modern technologies. They must also exploit the opportunities that come with the use of artificial intelligent and other computer applications. Adoption of new digital based manufacturing technologies will reduce the number of workers required in plants and this will reduce transmission rates of the coronavirus among the workforces. As a priority all cement producers in Zambia must identify their critical success factors and devise a very comprehensive framework for improving cement production and other necessary operational processes that are aimed at stimulating production efficiencies and market demand for cement and other concrete product in the context of covid – 19 crisis.

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