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The impact of COVID-19 in the construction sector and its remedial measures

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Abstract. Corona virus (COVID-19) outbreaks have severely disrupted the economy, with devastating effects on global trade and it has simultaneously affected households, businesses, financial institution, industrial establishments and infrastructure companies. The economic crisis caused by the virus has hit many more organizations around the world. Similarly, construction and engineering projects around the world have been jeopardized in various ways by the COVID-19 pandemic and many projects have closed. As a result, there has been a financial recession in the construction industry in almost all countries and has created unemployment. All in all, this situation has caused great concern, uncertainty and unrest in the construction industry. This paper observes in several countries and describes the global impact of the Corona virus on the construction industry. This paper also explains how it is possible to continue construction work in this situation. If construction work continues, the economic downturn will be reduced and unemployment will be reduced.

Keywords: COVID-19, Construction, Global impact, Economy, Supply chain

1. Introduction

There is no place in today's globalized world that has not been damaged by the Corona virus (COVID-19) pandemic. Almost all commercial, economic and social activities are suffering from the COVID-19 pandemic. Similarly, the construction and engineering industries are no different, they are also suffering from this crisis. Corona virus is an infectious disease therefore to stop the spread of this disease, the construction work has been temporarily stopped keeping in mind the concerns of the workers in the construction industry. As a result, construction industries are gaining nothing but losses, which have an impact on world economy. It has also disrupted the transportation system which has disrupted the supply of materials. Many construction companies are going through a financial recession so companies are laying off a lot of their workers. Overall, construction industry has taken a terrible turn. This paper has observed the impact of COVID-19 in the construction sector in eight countries i.e. INDIA, USA, CHINA, ITALY, UK, AUSTRALIA, RUSSIA and UAE. The impact of COVID-19 on the economy and construction industry in these countries has been observed and all that information is described on a table. According to data from all of these countries, the effects of COVID-19 on the global construction sector are well determined. In addition, the remedial measures that need to be taken to continue the construction work are described in this paper. If these measures

are taken, the construction industry will turn around again. All the above issues have been discussed in this paper with proper explanations.

2.Table 1 : The impact of COVID-19 on the GDP, construction sector and unemployment of the following countries

Country	Country's GDP shrink	Percentage of the total GDP came from construction	Construction company	Construction worker	Losses in construction	Country's overall unemployment
INDIA	GDP of India shrinks 23.9% in Q1FY21.	The construction sector accounts for 8% of India's GDP(at constant prices).	There are 200 firms in the construction industry in India. In addition to these, there are 120000 class A contractors in government construction industries.	There are a total 5.1crore construction workers in the country.	The impact of the Corona virus on India's construction industry is costing an estimated Rs 30,000crore every day. This pandemic will reduce investment in construction industry by 13 to 30 percent, which will probably affect gross value added and employment.	The number of unemployed in India has risen to 27.11% due to Corona virus(COVID-19) in the first week of may.
USA	Economy of U.S.A. diminished 4.8% in the 1st quarter of 2020 due to Corona Virus pandemic which has shut down the country.	In 2019, the value of the construction industry in the United States contributed 4.1% of GDP.	There are over 700000 construction company.	11.2 million people work in the construction sector.	45% of contractors are facing destruction related to the outbreaks.	Corona virus outbreak raises unemployment by 14.7% in April 2020 and job losses reach 20.5 million.
CHINA	The Chinese economy shrank 6.8% in the first	the construction industry accounted for 6.8% of china's	There are about 32900 construction firms.	In 2018, the number of workers in China's construction industry was	As a result of this lockdown, all construction work has stopped and	Unemployment rate in March 2020 was 5.9%.

	quarter of the year 2020.	GDP. The industry was valued at 894 billion USD with five percent annual growth		approximately 55.6 million.	the amount of capital investment has decreased. China losses RMB 10 million from construction.	
ITALY	Italy's GDP fell by 4.7% in 1st quarter from the foregoing three months to March 2020.	From the 1st quarter of 2020 to 2nd quarter of 2020 GDP from construction in Italy shrunk from 15803.80 EUR million to 12168.40 EUR million.	Around 20,000 construction companies.	In 2016, there are 210781 employer in building construction industry.	The growth forecast for the Italian construction industry has been revised and the construction industry is expected to contract 0.7% in 2020, 1.5% growth is lower than previously forecast because of the effect of the COVID-19 outbreak. Almost 44% construction companies claim that corona virus has damaged their work.	Italy's unemployment rate fell to 8.4% in March 2020.
UK	UK economy shrank by a record of 5.8% in March 2020.	Construction industry of UK contributes 6% of GDP.	There are 343,000 construction business in UK.	A total of 2.2 million people work directly or indirectly in the construction industry across the UK.	In this pandemic, the loss of U.K. construction industry is £301.5 million per day.	UK unemployment rate for three months to March 2020 was estimated at 3.9%.
AUSTRALIA	The Australian economy has shrunk by 10%.	The construction industry generates more than \$360 billion and 9% of	There are more than 360,000 building and construction	In 2019, more than 115 million people were employed in the construction	Australian construction losses about \$5 billion due to COVID-19 pandemic.	The unemployment rate rose to 6.8% in August 2020.

		the country's total GDP comes from here.	companies listed in Australia.	industry which was 9% of all Australian jobs.		
RUSSIA	Russia GDP will shrink 5% in 2020.	From the 1st quarter of 2020 to 2nd quarter of 2020 GDP from construction in Russia increased from 708.60 RUB Billion to 1045.60 RUB Billion.	235000	In 2005, there are 10.9% employer works at construction .	In this pandemic situation, Russia will face 10% of financial recession in construction sector.	Russia's unemployment rate jumps 30% in May 2020.
UAE	GDP shrinks 1% in March 2020.	The construction industry contributed approximately 6.4% to GDP in 2018.	In 2017, There was 11755 construction project in UAE.	10 million.	The construction industry is facing costly pressures and productivity has declined due to lack of labor.	Unemployment rate in UAE will reach 2.8% by the end of 2020.

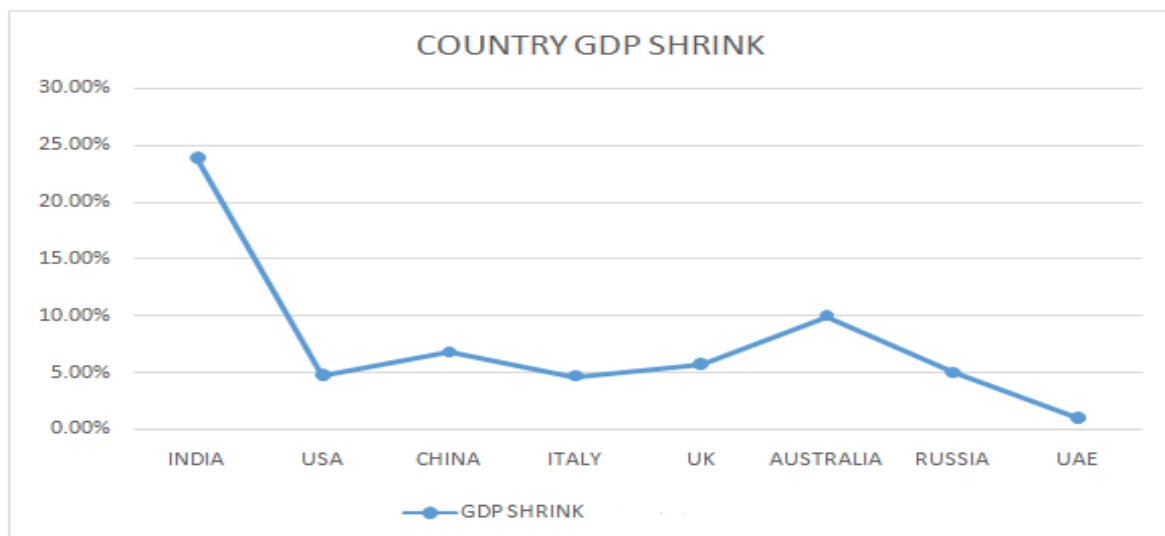


Figure 1. percentage of GDP shrinks

3.Impacts of COVID-19 on construction sector

The number of COVID-19 victims are increasing day by day, which is also having an impact on the construction industry. The supply chain is being disrupted due to government lockdowns, labor shortages are occurring, companies are facing economic recession and having trouble keeping various contracts.

3.1. Supply chain management

The supply chain has been disrupted in various ways in different parts of the world. Various construction materials are required but for lockdown these are not reaching the construction site from outside which is hampering the construction work. The various materials that come from different factories in the country or abroad through different vehicles for construction work, those things cannot come. All vehicles are not able to come to lockdown due to which the required materials are not arriving so the work is off. It has not only shut down the construction industry, it has also damaged the livelihoods of those who bring these things in vehicles and the factories that make all these materials are also losing a lot of money because these are not being sold.

3.2. Transportation problem

All transportations in the country have been disrupted due to lockdown in all parts of the country. That's why no materials are arriving in the construction sector and no workers are able to come to work from their home. That's why the work has stopped.

3.3. Labor shortage

First, workers are unable to reach their workplaces because the transportation system is completely closed. Second, the disease is caused by a viral infection, So workers are more likely to spread the disease when they come in contact with each other. Therefore, many workers are not willing to come to work. Moreover, it is not possible to make the workers work without any protection.

3.4. Financial problem

The companies are not making any kind of profit due to work stoppage in the companies and on the contrary more losses are being incurred and not only the company is losing money but also all the suppliers who are providing the required materials to different companies to be used in construction sector, all those suppliers are also incurring huge losses. Since the closure of the company, the supply chain has been shut down and the factories that produce goods have stopped production, resulting in many losses of them. Moreover, due to non-sale of factory-produced goods and closure of the construction sector, the government is unable to collect proper taxes from all these places which is having a direct impact on the country's GDP and when the country's GDP goes down, it affects the global economy.

3.5. Contractual implication problems

It is mainly based on a clause called 'Force majeure'. There are many rules mentioned in this clause, 'Large Scale Epidemic' is one of them. COVID-19 pandemic falls within this category. Different contractors put their different tools in different places for use in different machinery construction sector but as a result of this lockdown, all these equipments have been lying there for a long time. The companies have a contract with the contractors to work with all these equipments on the basis of some money and If the 'Force Majeure' Clause is mentioned in the contract then no compensation will be paid to the contractor by the agency due to delay. The result is a lot of financial loss when contractors stop working.

3.6 Unemployment

Companies are suffering huge economic losses due to this lockdown. That is why companies are not able to pay their employees properly and the company is laying off a lot of workers. Due to this, many people's jobs have been snatched away. Their families are also going through a lot of hardships as a result of losing their jobs. All in all, a worrying situation has arisen.

4. Remedial measures

Uncertainty has been created all over the world for Corona virus. Work in all construction sectors has come to a standstill and in almost all countries the economy is going downhill. In this situation, some remedial measures have to be taken to revive the construction sector against this disease. Some remedial measures are discussed below.

4.1. Comply with the guidelines of the WHO and the government

No vaccine for this disease has come on the market yet. So to avoid this infection, workers must follow all the guidelines of World Health Organization (WHO) and in addition, the rules issued by the government of each country must be obeyed. Companies also need to follow these guidelines.

4.2. Maintaining social distance

This disease is transmitted from person to person that's why it is not possible to gather many worker in one place. Therefore, according to the rules and regulations of the government, it is necessary to work within a sufficient distance between two people. In the office, the gap between the two seats should be increased.

4.3. Wearing safety equipments

When working in the construction sector, you need safety equipments such as helmets, safety shoes etc. but here the safety equipment is the equipment that is needed to protect against the transmission of the disease. So workers must wear mask to protect themselves. Workers must also wear gloves on their hands, personal protective equipments(PPE) on their bodies and worker must keep sanitizer. Sanitizer must be used from time to time to keep hands clean.

4.4. Workplace sanitization

Every place in the workplace should be well cleaned every day and the companies have to keep a bottle of sanitizer in the office. All new products or materials coming from outside should be sanitized.

4.5. Arrange to stay

After opening the company, Workers living far from the construction site will also come to work. Now they will not be able to travel from home every day because the vehicles are not running in that sense now. That's why companies should arrange accommodation for them when it comes to working with them. Those places have to be clean enough and have to be cleaned every day. Companies should also provide them with at least two meals a day. In addition, workers should maintain social distance in their place of residence.

4.6. Alternate duties

Now it would not be right to work with all the workers together. That's why companies need to share responsibilities with each employee and the assembly is less if each employee is brought in a few days a week instead of every days such rules must be introduced by the organization. In other words, if an employee comes to the office today to work, then that employee will come to the office again after one or two days to work and in the middle one or two days another employee will come to work and that employee will have another two days off.

4.7. Allowing goods transportation system

When the construction work starts, there will be a need for goods, so companies have to transport the goods from outside to get the supply. That's why government should be allowed to transport goods subject to certain condition. All heavy vehicles transporting goods will have to get a transport permit issued to the government in this lockdown. Only those drivers will be able to drive for transportation goods. Besides, the driver has to aware and do all the work according to the social distance.

4.8. Medical facilities

Every company has to make some medical arrangements in advance for each of their sites. When their workers enter the site to work, they will be allowed to enter only after daily thermal scanning test. In

addition to this, the level of oxygen in the body will be seen with the help of pulse oximeter. If an employee is infected Corona virus while working, some of the medical expenses will need help from the company. Such rules should be made by the companies. Companies also need to organize occasional general checkup camp for employees.

4.9. Modular construction

Companies can use modular construction in such situations. Modular construction will cost much less and it will complete the construction very quickly.

4.10. 3D printing

3D printing or additive manufacturing is the process by which each layer accumulates to form a physical objects. Everything can now be created with 3D printing according to the prototype. In Covid-19 pandemic situation, we can use this technology to create different types of home models, building models, bridge models etc.

4.11. Software

Some coding software can be used in this situation in the construction sector. Construction work can be made much easier in this situation by using artificial intelligence(AI) and machine learning(ML). Using those software, employee will do all the digital work instead of notebook pens, so the work will be faster and in less assembly. Also AutoCAD, Staad Pro, Etabs, Revit etc. are used for designing and with these software, employees can design at home.

4.12. Remote working

Many sector workers are working from home for the lockdown. It is quite difficult to work from home in the construction sector. However, the company should try to keep employees away from each other as much as possible, so it is safe to work from home. So workers should work from home as much as possible such as holding meetings, filling out Google forms to get some information from labor, signing contracts digitally, making conversation or sending mails etc. Designing, planning or estimation and costing can also be done with software at home.

4.13. Financial package

The government should provide some financial assistance or some financial loan to the companies that are going through a severe financial crisis. The government's main goal should be for companies to resume work.

5. Conclusion

The COVID-19 pandemic has done a lot of damage to society. It has affected the society as well as the economy of every country. The disease is spreading so fast that the government has been forced to lockdown. As a result of this lockdown, all transportation systems have been shut down, supply chains have been disrupted and workers are not able to come to the construction site even from home. That's why work in the construction fields has stopped and the construction workers have also faced extreme uncertainty. So construction companies are facing a financial recession. Companies need to start working again to end this financial crisis. That's why everyone should return to work in according to the guidelines given by WHO and the government. Construction companies need to take necessary remedial measures for their workers. Companies should keep an eye on whether it's easy to work with new technology or software and try to do most of the work from home. The government should ask the construction company to continue working consciously. So work should continue in this way until the situation becomes normal or the vaccine is released. Not only the construction sector but other organizations should be aware of this and continue to work so that the economy will improve and unemployment will be reduced.

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