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IMPACT OF COVID-19 ON CONSTRUCTION INDUSTRY

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"Don't be embarrassed with your failures. Learn from them and start all over again"
- Richard Branson

Abstract— *COVID 19 which is the abbreviation for corona virus disease originated in the month of November 2019 in Wuhan city of China, had crossed the borders by March 2020 and triggered the economic slowdown and recession all across the world. This deadly infectious virus had compelled most of the countries to declare emergency lockdowns to control the infection. Talking about India, life just stopped due to "JANTA CURFEW" declaration on 22nd March 2020 and Lockdown 1 (25th March 2020 to 14th April 2020) of three weeks, followed by lockdown 2 (15th April 2020 to 3rd May 2020) and Lockdown 3 (4th May 2020 to 17th May 2020). The mantra of the period was "Social distancing" and "Stay Home stay Safe". Not very well prepared for such a rude shock due to lock down all the economic activities such as factories, business houses, offices, restaurants, salons, buses, trains, flights, autos, cabs, private cars, 2 wheelers are shut down. This pandemic significantly disrupted many sectors like Industrial sector, Agricultural sector, Health sector, Education sector, Entrepreneurship etc. Government also is not untouched from it; they are being tested and stretched every now and then.*

Keywords— COVID-19, Construction Industry, Civil, Global Pandemic, Lock down, Recession

1. INTRODUCTION

In India construction industry is the 2nd largest after agriculture sectors, and it is therefore critical to the country's economic and GDP growth. Industry size of INR 10.5 trillion, it contributes around 8 per cent of the nation's GDP and employs to 57.5 million people. Also, being a core sector, there are so many industries that are dependent on the construction activity in the country. For example, the construction plant and machinery manufacturing industry comprise around 500 companies and is estimated to be sized at INR 375 billion.

In India, the construction sector was the 2d largest recipient of Foreign Direct Investment in year 2017 despites being quite fragmented. In 2008-19 India has spent close to 82.5 trillion Indian rupees. A further investment of 337.5 trillion Indian rupees is needed for sustain the current level economic growth. This can be expected to make further employment of 2.142 billion person years up to 2030 because the sector features a high employment multiplier constant factor.

The construction sector is expected to face a simultaneous reduction in both supply and demand on account of this pandemic. As the sector is driven by infrastructure projects to a large extent, it is expected to be hit severely by the current levels of uncertainty, dismal business and consumer sentiments, loss of income as well as the diversion of government funds towards COVID-19 management.

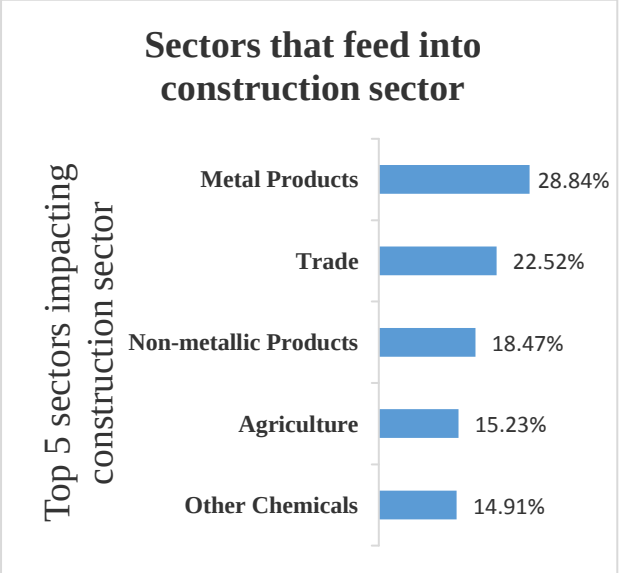

Figure 1 Sectors that feeds into construction sector

The graph mentioned in the Fig.1 are show the backward linkage of the construction sector with other sectors.

These 5 sectors that are used as inputs in the construction industry are metal products, trade, non-metallic products, agriculture and other chemicals. These sectors are dependent on the construction sector and demand from these is affected when the construction industry experiences a demand shock in the form of loss in investments.

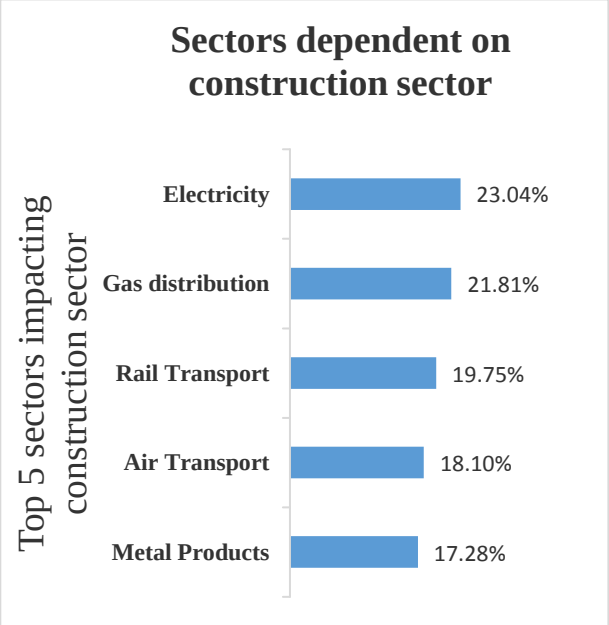

Figure 2 Sectors dependent on construction sector

The graph mentioned in Fig.2 are show the forward linkage of the construction sector with other sectors.

These sectors are received inputs from construction sector like electricity, gas distribution, rail transport, air transport and metal products. The activity like repair and maintenance services, and when these sectors affect with a shock, the demand for the construction sector output is affected.

In short, low economic activity in different sectors would impact construction industry through forward linkages. A loss in output of construction would also have a multiplier effect through backward linkage causing further loss of the overall economic activity. For economic sustainability in pandemic situation, the construction industry will need to quickly find the ways to keep the masses employed, enhance quality of living, and more importantly, meet project timelines and budgets.

2. IMPACT ON INFRASTRUCTURE

Construction contributes around 60% of the total investments among all sectors that take place in India. An investment of 100,000 INR in the construction sector contributes, 150,000 INR for the Gross domestic product (GDP), generates 320,000 INR total revenues, and creates large scope for employment.

95% of the investment took place in six sectors alone namely Power, Roads and Bridges, Urban, Telecommunication, Railways, and Irrigation.

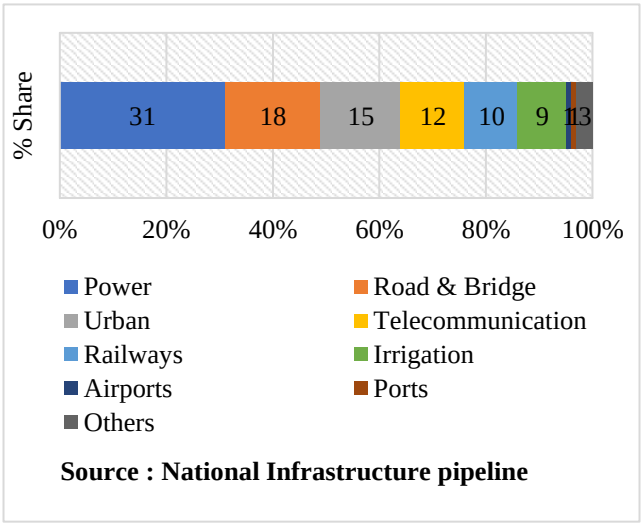

Figure 3 Sector wise share of Infrastructure investments of INR 80 Lakh Crore during FY 08 to FY19

To improve quality in infrastructure, there has been a focus on various schemes such as:

- Nal Se Jal
- National logistics policy to improve the efficiency of transport services
- Integrated Power Development Scheme (IPDS)
- Deen Dayal Upadhyay Gram Jyothi Yojana (DDUGJY) for improving the water and electricity utility infrastructure respectively
- Bharatmala
- Pradhan Mantri Gram Sadak Yojana (PMGSY) adopting standards in the quality of road infrastructure
- Atal Mission for Rejuvenation and Urban Transformation (AMRUT) scheme to enhance the quality of urban infrastructure
- Railway station redevelopment program
- Sagarmala for improving the port-based development
- Smart City Mission4 and others.

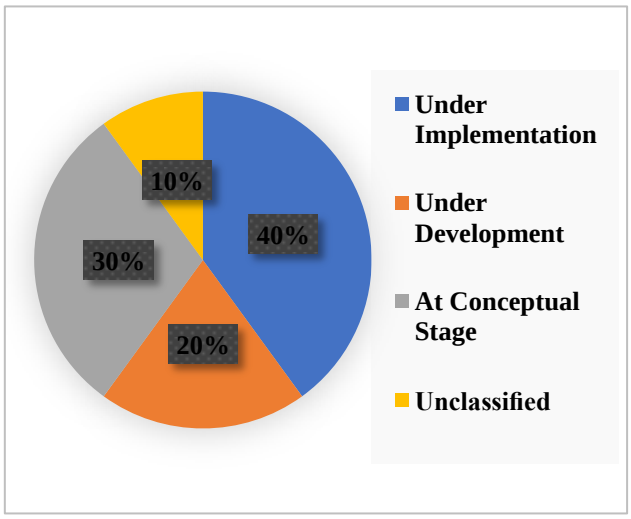

Figure 4 Status of projects as specified in NIP

On December'19 report printed by the Ministry of Statistics and Program Implementation (MoSPI) on the update of the 1701 central sector infrastructure project, in these report 355 projects are uptodate with schedule, 583 were delayed, 401 facing cost overrun, and 205 facing both costs overrun as well as time overrun. The additive time and price overruns of those comes area unit mentioned below:

There are 1701 trillion INR more project cost when the estimated cost, project cost is 20.65 trillion INR while completion cost is 24.71 trillion INR cost. Due to no movement of any project more than 3 months cause the project delays. Total 583 projects were delayed in these 31.39 percent (183) projects delay 1-12 months, 22.13 percent (129) projects delay 13-24 months, 25.04 percent (146) projects delay 25-60 months and 21.95 percent projects delay with more than 61 months.

In NIP (National Infrastructure Pipeline) there are nearly 111 trillion INR worth of projects, it includes project like roads, gas, rural housing, renewable energy, etc. Around 2/5 part of these projects are in unclassified and conceptual stages, some part of this projects are likely to be reprioritised towards developing the social infrastructure like primary, secondary healthcare facilities, improving air transportation, medical institutions, and public parks in the country.

3. IMPACT ON LABOUR

The COVID-19 crisis is expected to hit labour-intensive sectors particularly hard. In the construction industry alone, migrant workers comprise a large part of the workforce and typically stay in labour colonies at construction sites. As per CREDAI, prior to the lockdown, there were around 20,000 ongoing projects across the country. The work was being undertaken in as many as 18,000 sites and more than 30 per cent of workers were staying away from sites due to the fear of coronavirus infection. Together these projects involved a workforce of 8.5 million.

The 40-day lockdown in effect since 25 March 2020, which was further extended up to 03 May 2020 and subsequently to 17 May 2020, led to reverse migration with workers leaving cities and going back to their villages. It is estimated that around 6 lakh workers walked on foot to villages, and around 10 lakh workers are in relief camps, who are employed across multiple sectors as per the Centre's submission to petitions in the Supreme Court.

4. IMPACT ASSESSMENT FRAMEWORK

Table 1 Sectoral impact on the 3-M i.e., manpower, materials and machinery due to the COVID-19 pandemic

Sector	Man Power	Plant & Machinery	Raw Material
Power Sector			
Generation	▲	N	▼
Transmission	▲	▲	▼
Distribution	▲	N	▼
Water (supply, sanitation and treatment) & Irrigation	▲	N	▼
Transport			
Railways & Metro	▲	▲	▼
Ports	▲	N	▼
Roads	▲	▲	▼
Airport	▲	N	▼
Real Estate	▲	N	▼
Urban Development	▲	N	▼
Oil&Gas	▲	N	▼
Metals & Mining	▲	N	▼
Manufacturing	▲	N	▼
Legends	▲ Increase in cost	N Neutral/ No change in cost	▼ Decrease in cost

5. IMPACT ON PROJECTS ACROSS THE LIFE CYCLE

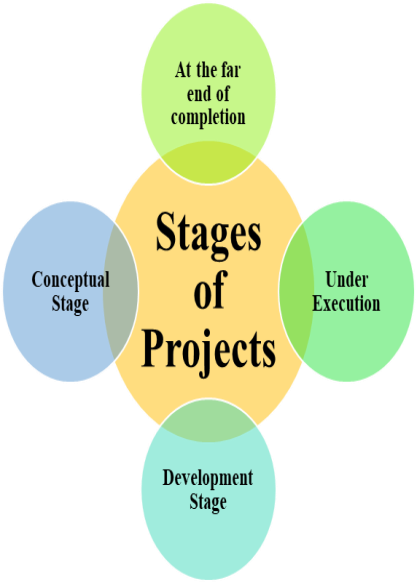

Figure 5 Project Life cycle

1. At the far end of completion:

The construction work is mostly completed for such category of projects and commissioning spares are available in the promised place of delivery. Hence, the supply chain shocks would be minimal. The kind of work needed to be done would also not be restricted to confined places. As a result, there would be minimal resistance offered by the workers and little changes would be needed in the execution methodology.

In case of non-liner projects, the challenges during the monsoon would be limited and could be mitigated by a proper monsoon preparedness plan. For linear projects like pipelines, canals, bridges and underground drainage (UGD) works, it is imperative to commission the projects before the onset of the upcoming monsoon, failing which the projects are likely to get extended up to the end of the year. For irrigation projects, the benefit would be lost for the entire Kharif and Rabi season in the catchment area and could impact the supply of water for the drinking water schemes.

Supply Chain	Raw Materials	Hiring charges for P&M	Labour Costs
N	▼	N	▼

2. Projects under Execution:

Under this category of projects, construction would be in full swing with mobilised manpower, plant and machinery. Due to the lockdown, there has been considerable reverse migration to rural areas while many are also stuck in relief camps and labour colonies in the cities. Contractors or developers would have to create an incentive for labour now in the villages (in line with the notifications by Government of India) to move beyond their comfort zones and come to the project locations to work. While the skilled people like carpenters, welders, fitters, plumbers, electricians and riggers may demand higher wages to the tune of 20 per cent - 25 per cent, general unskilled and semi-skilled labour could demand a 10 per cent - 15 per cent increase. However, mining projects which are largely located in eastern India may not face labour shortage or an increase in the labour costs.

The hiring charges for the plant and machinery already deployed within the site may not vary but for the new equipment, there is a possibility that their cost may increase marginally due to the shortage of skilled manpower for operating that equipment. Due to the revised SOPs to come into play, social distancing will have to become a norm, and this shall push up the cost for building the required hygiene infrastructure related to the building of additional labour colonies, Personal Protective Equipment (PPE), seating norms in the vehicles etc.

The outlook for commodities seems to be bearish and hence prices may remain steady for key construction commodities like cement, sand, steel (structural and reinforcement), aggregate, aluminium etc. However, the supply chain for the sectors like steel, power, telecom, oil and gas etc., where specialised materials (like alloy steels) and electronics are to be used, is likely to undergo some disruptions and the mitigations need to be identified quickly.

Supply Chain	Raw Materials	Hiring charges for P&M	Labour Costs
▼	▼	▼	▼

3. Projects in Development Stage:

Projects which have secured land, received all the requisite approvals from the concerned government, achieved financial closure and are about to commence execution would have to be re-estimated both from time and cost perspectives.

Prescribed labour density would pose constraints due to social distancing norms. A rework on effort estimation will be required to assess the time to complete, basis the labour productivity and availability, and the extent of the land/work-front available on a given project. The risks associated with supply chains would also need to be looked at and a proper crisis management plan/alternative will need to be factored in the project budget.

Supply Chain	Raw Materials	Hiring charges for P&M	Labour Costs
▼	▼	▼	▼

4. Projects in Conceptual Stage:

Governments should re-evaluate their portfolio of projects that are in the pipeline and may prioritise the social infrastructure projects, such as affordable housing, underground water drainage, water supply and healthcare projects. Hence, such projects need to be considered on priority. On the other hand, the private sector may consider reassessing the projects strategy to invest in lesser risky models like 'HAM, PPP etc. Few key factors to be considered for projects' prioritisation:

- Ability to immediately kick start
- Alignment with strategic intent and national cause
- Interlinkages with the success of other projects
- Ability to generate immediate and sustained employment
- Ability to generate immediate revenue
- Degree of supply chain disruptions
- Capital requirement in short, medium and long term
- Status of statutory approvals & other issues

Supply Chain	Raw Materials	Hiring charges for P&M	Labour Costs
▼	▼	▼	▼

Legends

Increase in cost	Neutral/ No change in cost	Decrease in cost
▲	N	▼

6. DATA COLLECTION AND ANALYSIS

In this Covid-19 pandemic situation we conduct survey using google online survey form. Total 71 response received for this survey. Participant who fill the form are Architects, Civil Engineers, Construction/Project Managers and Quantity Surveyors.

Table 2 Demographic information of the participants

	Description	Number	Percentage (%)
Respondents Academic Qualification	Diploma	6	8.4
	Bachelor Degree	21	29.6
	Master's Degree	44	62.0
Respondents' Profession	Architect	13	18.3
	Building Engineering	3	4.2
	Civil/Structural Engineering	14	19.7
	Electrical Engineering	1	1.4
	Mechanical Engineering	1	1.4
	Construction/Project Management	24	33.8
	Quantity Surveying	15	21.1
Company's specialization	Contractor/Construction	24	33.8
	Designer or Consultant	37	52.1
	Client	9	12.7
	Development Authority	1	1.4
Year of Experience	5-10years	20	28.2
	11-15years	11	15.5
	>15years	40	56.3

Table 3 Participants' responses

Questions	Options/ Descriptions	Frequencies	Percentage (%)
Did COVID-19 affect your project?	Yes	69	97.2
	No	2	2.8
Do you consider permanent changes to your working process?	Yes	42	59.2
	No	29	40.8
In the face of the Pandemic, did you obtain or anticipate getting any benefit from the government (e.g. tax or VAT waver, furlough)?	Yes	17	23.9
	No	54	76.1
In which way did COVID-19 affect your project(s)?	Full stoppage	29	40.8
	Partial stoppage	36	50.7
	Others	6	8.5
What is the current status of your project(s)?	Work returned with disruptions and progress affected	52	73.2
	Work has not returned	13	18.3
	Work returned without affecting our weekly progress	6	8.5
Reason(s) for suspension of	Government decision	40	56.3

work or why not resuming work?	Business decision	14	19.7
	Personal decision	7	9.9
	Other reasons	10	14.1
If COVID-19 affected your project, what is the level of its impact on your workflow?	Severe	11	15.5
	Major	23	32.4
	Moderate	27	38.0
	Minor	5	7.0
	Insignificant	5	7.0
Rate the impact of the lessons learnt on your projects / business	Very significant	0	0.0
	Significant	24	33.8
	Average	36	50.7
	Minor	6	8.5
	Minimal	5	7.0

7. RECOMMENDATIONS

The impact assessment conducted in the previous section for projects at different stages require specific actions to be undertaken by key stakeholders. While few actions are critical to quickly recover or curb losses, other actions will be imperative for longer-term resilience in coping with pandemics or black swan events in the future. With the substantial capital investment plans at stake, government departments including central, state, nodal ministries, and policy think tanks like NITI Aayog will play a critical role in implementing the suggested measures for the overall revival of construction sector so that India can achieve high trajectory growth in the near future.

1. Government

Short Term (1-2 Months)

- Release part retention amount, as applicable
- Automatic extension of time, as applicable
- Prioritize pending projects
- Provide tax benefits
- Minimum/waive Electricity charges

Medium Term (3-6 Months)

- Commission a construction task force for full scale resumption of work
- Amend model concession agreements/ contracts
- Infuse one-time national fund
- Implement single window clearance

Long Term (>6 Months)

- Strengthen early warning and response systems
- Setting up of Construction city
- Capacity building
- Standard protocols
- Housing and healthcare for workers

2. Owner/Developer

Short Term (1-2 Months)

- Implement MoHFW guidelines
- Implement risk management framework
- Periodic staff trainings to become anti-fragile
- Revisit project framework to remove inefficiencies

Medium Term (3-6 Months)

- Joint re-planning with contractors & vendors
- Relational contracts
- Digital road map (Building Interface Modelling, Drones etc.)
- Rapid Response Teams (RRT)
- Tag team approach

Long Term (>6 Months)

- Implement digital roadmap
- Guidelines on facilities for workers
- Structured risk management
- Business continuity
- Revisit project framework

3. EPC Contractor

Short Term (1-2 Months)

- Embrace pre-fabricated model
- Wide reaching feedback loops
- Robust communication

- Flexible working for employees

Medium Term (3-6 Months)

- Risk mapping of supply chains
- Estimate time and cost to complete
- Round the clock monitors
- Mechanised solutions
- Risk preparedness for such events in near future

Long Term (>6 Months)

- Adapt to anti-fragile and agile practices as new norm
- Encourage open communication
- Flexibility for employees
- Engage the employees
- Implement employee engagement measures

8. CONCLUSIONS

While it is elaborated that Covid-19 played havoc with economy, construction industry can't be left behind, being critical to country's economy. So many sectors are directly affected by any upward/downward swing in this industry.

Covid-19 impact on project at different stages of execution has been emphasized. A series of measures have been suggested for different stages of projects and form all the controlling authorities. If the measures are implemented properly and sincerely, day is not far when construction industry will bounce back to its previous glory, beating Covid-19 blues.

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