Success rate of Indian construction industry in reaching global Climate Change targets set in CoP26 (2021)-A critical analysis

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Abstract

Climate change is a phenomenon that has taken over the very existence of all life forms worst hit is human life in all aspects. This paper gives a brief introduction and overview of the grave situation that needs global attention and collaborative effort. India being a fast advancing country holding a pivotal spot in Asia's economy and universal goodwill, with its rich knowledge capital, culture and philosophy of a religion that emphasizes a strong responsibility towards eco system is a key stakeholder in global effort to control Climate change for good. This paper presents a critical analysis of the alignment and preparedness of Indian Construction industry, which is a major contributor to country's GDP in response to UN mission expressed as Paris agreement of 2015. The paper presents the statisticsofenergy consumption and CO_2 emissions contributed by construction industry towards Climate change, further projects the change in statistics with the adoption of alternate actions and prove that reduction of both aspects are achieved to the limits proposed by policy put forward in CoP26 by India.

Keywords

Climate Change, Conference of Parties (CoP), Context, Greenhouse Gas Emission (GGE), Policy

1.0 Introduction

Climate is described as the composite or mainly predominant weather conditions of a region or physical context throughout the year, averaged over a series of years, it includes temperature, air pressure, humidity, precipitation, sunlight, cloudiness, and winds**(1)**. Every life form in the region is dependent on the context and influenced by its climate for their survival and sustenance. With humans holding a greater share of dependency, growing complexity of civilization and its actions have resulted in exploitation of the resources beyond limits breaking the delicate balance between the context and its climate.The complexities of industrialization Anthropogenic activities were always the principal cause of

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climate change since the 1800s, mostly attributable to the combustion of fossil fuels such as coal, oil, and gas has lead to emission of carbon monoxide and methane, the so-called Greenhouse Gas Emissions (GHGE) function as a blanket around the Planet, trapping sun's heat and elevating temperatures. The Earth is presently around 1.1°C warmer than it was in late 1800s, with greenhouse gas concentrations at their highest in 2 million years. Intense droughts, water scarcity, devastating fires, rising sea levels, flooding, melting polar ice, catastrophic storms, and dwindling biodiversity are now among the repercussions of climate change. (2)

Climate change has affected people in a variety of ways. Climate change may have an impact on people's health, food security, housing, safety, and livelihood. Some of us, including those who live in small island nations and other impoverished countries, are already more susceptible to climate change. Sea-level rise and saltwater intrusion have compelled entire communities to relocate, and prolonged droughts are placing people at risk of starvation. The number of "climate refugees" is predicted to surge in the future. (2)

Many experts and government auditors agreed that restricting global temperature rise to no more than 1.5 degrees Celsius will help us evade the worst climate impacts and maintain a sustainable environment. Global warming will surpass 2.7°C by the end of the century, according to current federal climate plans. (3)

Climate change-causing emissions come from all over the world and harm everyone, although some countries emit more more than others. The 100 countries with the lowest emissions account for 3% of all emissions. The top ten emitters account for 68 %. Everyone must embrace climate action, but those who cause significant damage have a larger need to act first. (3)

We are faced with a significant dilemma, while there are numerous remedies available. Many climate change solutions have the ability to strengthen our lives even while saving the environment. We also have worldwide accords to steer our progress, such as the United Nations Framework Convention on Climate Change and the Paris Agreement of 2015. Reducing emissions, responding to climate impacts, and financing essential modifications are three main types of action. (2)

While a significant number of countries are vowing to achieve net zero emissions by 2050, around half of all emission reductions must be accomplished by 2030 to keep global warming below 1.5°C. Between 2020 and 2030, fossil fuel production must fall by about 6% annually. (3)

Climate action implies substantial financial commitments on the part of governments and businesses, while climate stagnation is even more costly. One key aspect is for affluent countries to follow through on their pledge to pay $100 billion per year to developing economies so that they may adapt and migrate to greener economies. (2)

The UN for climate change (UNCC) has been conducting Conference of Parties (CoP) to assess the steps taken towards Climate change objectives by all its member nations and its effectiveness. The CoP26 held in Glasgow, UK in 2021 has seen some significant commitments by member nations towards achieving the objectives globally in a collaborative manner. The CoP26 has been

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historical wherein India has committed to achieve greater milestones in climate change actions.

2.0 Overview

India's economy is getting more integrated with the global economy as its size and importance expand. The liberalization and economic reforms that dates back to the early 1990s seem to be irreversible and are set to accelerate. Transaction costs in India have declined in recent decades, notably as the country liberalises its corporate climate. As a result, Indian businesses are becoming more focused, efficient, and typically larger firms, in contrast to being broadly diversified and vertically integrated company groups. In addition to the corporate restructuring and increasing domestic M&A that has resulted, many Indian companies are now investing overseas and forming budding multinationals. As a result of this shift, the Indian economy's global integration will continue to grow. (4)

Since the mid - twentieth century, when it broke away from its intrusive visitors and its fraction of global GDP had fallen to between 1%to 2%, India has been on a mission to boost its part of the global economy. (2)

Indian real GDP per capita is now increasing at a pace of 7.5% / year on average, more so than doubling in a decade. This statistic stands in contrast with the past annual GDP per capita growth rate of just 1.25 % between 1950 - 1980. With faster development, India overtook Japan to be the world's third-largest economy in 2006, responsible for about 7% of global GDP (after the United States and China). (5)

India is a huge and strategically significant democratic nation with a booming service sector and key industrial capabilities (including nuclear and aerospace). India has the world's second-largest population and is a key military and economic power in Asia, with a population of over a billion people. Except for China, India's genuine rate of economic growth has surpassed most other economies in the recent decade. (2)

The present state of economic growth of India indicates its influence and significance in the Asian continent, so also proves the extent of contribution to climate change making India responsible to be the key stakeholder in bringing about climate change.

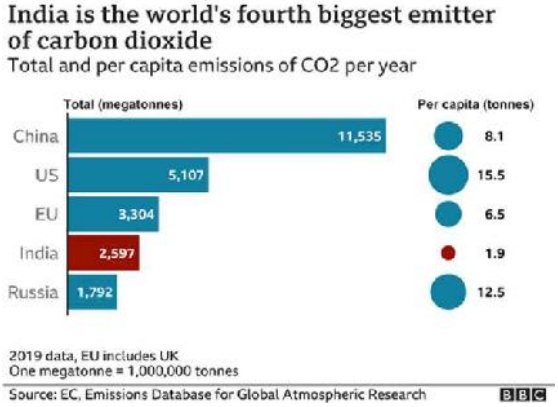

Fig 2.1 India's contribution to global climate change (Source: Emissions Database for global atmospheric research, BBC)

3.0 Background

Advances and development in various sectors have been constantly growing, though there was a fall due to the pandemic, India has contributed to the world economy, the GDP has recovered quickly due to supportive policies by the government and financial relief.

The economy's foundations remain resilient, owing to the incremental relaxation of lockdowns and the intelligent intervention of the Atmanirbhar Bharat Mission, which has put the economy firmly on the road to recovery. This route would need a 2.4 % increase in real GDP over 2019-20's

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absolute level, implying that the gdp would take two years to reach and surpass its pre-pandemic level. These expectations are in line with the IMF's forecasts of 11.5 % real GDP growth in 2021-22 and 6.8 % in 2022-23 for India. According to the IMF, India will become the world's fastest emerging economy within next two years. (6)

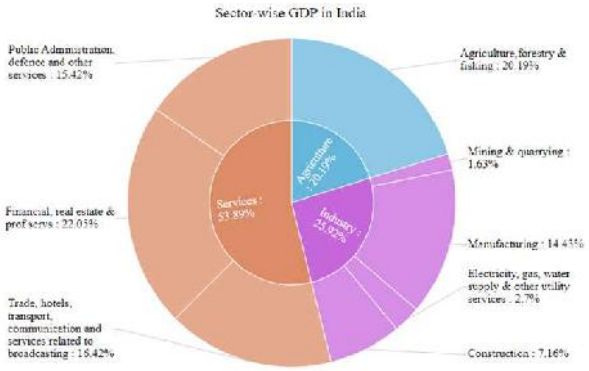

Fig 3.1(source: Ministry of Statistics & Programme Implementation)(7)

Fig 3.1 gives a comprehensive vision of the contributors to GDP; the focus should be on industries, which are active contributors to Greenhouse gasses, a prime element leading to Climate change. The manufacturing sector comprises of units of varied type and scale, electricity and mining are small contributors, the entire focus goes to Construction sector which is single largest activity currently contributing to 27.6% of the Industry sector, amounting to a Gross Value Added (GVA) 12,82,048.00 Cr INR. **(7)**

4.0 Climate Change and Construction sector

The development of any nation is visible through its constructions, more the development more is the infrastructure and amenities necessary from social to economic infrastructure. This proves that Construction industry is a key activity that defines development implying that it has a greater share in the greenhouse emissions leading to climate change.

The building materials and construction business has two critical issues, both of which expose sector players along the construction value chain to global climate risks in different ways. On the one side, the industry impacts the environment through GGE and is subject to carbon credits in the production of construction materials, as well as in the power and heat supply cycles of building operation. **(8)**

4.1 Indian Construction Industry and its share in Climate change

The building sector in India accounts for nearly 22% of the country's total annual CO2 emissions. The products/industrial practices of three energy-intensive building materials constitute for 80% of the emissions released by the construction sector: **(9)**

- Steel
- Cement
- Brick

The statistics of energy consumption and emissions during the manufacture of these three materials are tabulated in Table 4.1 for past three decades to understand the growth trend. Table 4.2 projects the future changes for the next 10 years.

Table 4.1 implies an upward trend with an annual increase of 51.77PJ in energy consumption and 6.3mt in CO2 emissions.

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Manufacture of Cement, Steel & Brick	1990	2020	Increase in 30 years	Annual Increase
Total energy consumed PJ (Peta Joules)	721.00	2274.00	1553.00	51.77
Total CO2 emission(mT)	76.30	267.00	190.70	6.36

Table 4.1 Total Energy & Emission in 1990&2020(9)

Manufacture of Cement, Steel & Brick	2020	2030	% Increase
Total energy consumed PJ (Peta Joules)	2274.00	2792.29	22.79%
Total CO2 emission(mT)	267.00	290.61	8.84%

Table 4.2 Projection of Future increase in Emissions & Energy consumption upto 2030(9)

Table 4.2 projects a phenomenal increase in energy consumption by 22.79% and 8.84% in emissions with conventional methodin a decade in the manufacture of 3 extensively used building materials.

5.0 Climate change goals set by India in CoP26 -2021(10)

- India's non-fossil energy capacity will attain 500 gigawatts (GW) by 2030.
- By 2030, India's economy will have a carbon intensity of 45 percent..
- By 2030, India will have met 50% of its energy demand (measured in power generation capacity) with renewable energy.
- By 2030, India will have lowered its entire anticipated carbon emissions by one billion tons.
- India’s target of net-zero emissions are to be fulfilledby 2070.

5.1 Challenges to India construction Industry

India’s stand on CoP26 implies that the energy consumption must switch from fossil fuels to renewable sources to reduce the carbon emissions and construction industry must adapt to these changes to sustain its production of basic construction materials and cater to the growing demands. This drastic transition needs a lot of effort to transform the way the construction industry produces basic construction material. It also signifies the human capital engaged and finance invested to reach the set goals.

The Construction industry needs to engage all aspects from Design, Engineering, Construction and Management streams holistically to successfully bring the emission levels down to the set limits.

6.0 Strategies and actions of construction industry supporting climate change policies

6.1 Technological strategies

A change in the levels of technology would bring about a noticeable reduction in the green gas emissions. Refer **Table 6.1** in Section 9Annexure-1 for a comparative study showing the emission by different technology levels adopted in manufacturing the same material Source:**(9)**

Conventional method as per Table 6.1.1 Annexure-1	Steel production in million Ton	Cement production in million Ton	Brick production in billion
Total production for next 10 years	**33.9**	**224.5**	**93.6**
Total energy Consumption (PJ/t) for next 10 years	1071.24	1299.85	421.10
Total CO2 emission reduced (mT) for next 10 years	81.36	206.54	2.71

Table 6.2 Energy consumption & CO_2 Emissions upto 2030(Conventional method)

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Alternate method as per Table 6.1.1 Annexure-1	Steel production in million Ton	Cement production in million Ton	Brick production in billion
Total production for next 10 years	**33.9**	**224.5**	**93.6**
Total energy Consumption (PJ/t) for next 10 years	735.60	1010.25	243.36
Total CO2 emission reduced (mT) for next 10 years	40.68	187.45	1.68

Table 6.3 Energy consumption & CO_2 Emissions upto 2030(Alternate method)

The Tables 6.2 and 6.3 shows the energy consumption and emissions levels during the manufacture of the three materials under consideration by conventional and alternate method as specified in Section 9 Annexure-1 Table 6.1

Manufacture of Cement, Steel & Brick	Conventional method	Alternate method	% Decrease
Total energy consumed PJ (Peta Joules)	2792.29	1989.24	28.76%
Total CO2 emission(mT)	267.00	229.81	13.92%

Table 6.4Reduction in Energy consumption &CO2 Emissions upto 2030 with change in manufacturing methods as specified in Table 6.1

The Table 6.4 shows a declineof 28.76% intotal energy utilization and 13.92% in total CO_2 emissions for target year 2030 from now. In comparison to the increase projected in Table 4.2 with a projected increase inenergy consumption of 22.79% and 8.84% in emissions, the reduction statistics as illustrated in Fig 6.1.1 clearly neutralizes beyond the increase statistics, which indicates a brighter side of the possibility to reach the targets listed in Section 5. The contribution to decrease in the manufacture of the three basic building materials is just 20% of the total materials manufactured to support the construction activity. If another 40% of the industries supporting construction adopts this change there is no doubt in neutralizing the rising contribution in next 10 years.

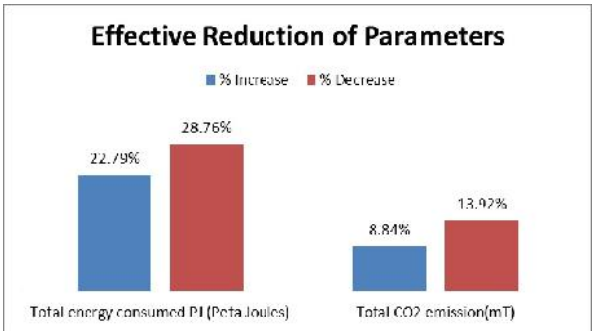

Fig6.1.1Comparison of Effective reduction of Parameters

6.2 Design strategies focused on reducing Energy Consumption & CO_2 Emissions

The Government of India (GoI) acknowledged Green Rating for Integrated Habitat Assessment (GRIHA) as a national instrument to measure GHG reduction from habitats, in its INDC in accordance to Conference of the Parties (COP) decisions 1/CP.19 and 1/CP.20. The GoI tool, created by The Energy and Resources Institute (TERI) and incorporated by the Ministry of New and Renewable Energy (MNRE), assesses the environmental performance of all building typologies holistically over their entire life cycle, providing a definitive standard for green buildings and sustainable ecosystems.

In a business-as-usual scenario4, the predicted emissions from the commercial sector in 2030 would be around 1370Mt CO2e, whereas if this footprint complies with GRIHA criteria emissions would be lowered by 38 %. As a signatory to the United Nations Framework Convention on Climate Change (UNFCCC),India is taking steps to adapt buildings to climate change in a global framework, with potential for country-to-country technology sharing agreements and international capacity development assistance. **(10)**

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The construction industry is ready to take on the challenge of reducing its share of the emissions to 45% of the present value in a decade.

7.0 Conclusion

It is a known fact that India has always acted responsibly in crucial situations, the promises made by the Govt. of India in CoP 26 is not just a statement but an assurance to the world that we are committed to it. Being a country in Asia holding a pivotal role in the economy knows its responsibility and efforts taken towards a grave situation. The construction industry being a single entity contributing a major part to the country's GDP also is aware of the impacts it has created in the climate change scenario. India being an emerging nation has reformed many policies for the betterment and has enabled new ideas to curb the effects of climate change, which has given the stakeholders a freedom to explore for the better of the humanity. India also being self-reliant in technology and think tanks has all the capability and agility to handle the great challenge of reducing the emissions levels set in CoP26. The construction industry is well equipped with technology, human resources and governmental support to handle its share of reductions. The trends imply that the far end vision of zero emission at 2070 will be fulfilled without ambiguity.

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9 ANNEXURE-1

	Technology as usual	Best Practice	New Technology
	Steel Production		
Description	Mini : Scrap based	Mini: Mixed feed 75% scrap, 30% sponge, non-cooking coal based	Mini: Mixed feed, 70% scrap, 30% sponge iron, natural gas based
	ISP : Open Hearth, LD Concast	ISP : thin slab continuous casting, coal injection	ISP : Corex process, utilising non-coking coal
Energy*	**31.6 GJ/t**	**24.75 GJ/t**	**21.7 GJ/t**
Emissions	**2.4 t CO_2/t**	**1.82 t CO_2/t**	**1.2 t CO_2/t**
**** Energy figure is based on possible mix of technologies for different scales of production.***			
	Cement Production		
Description	Dry process = 75% Semi dry = retrofitting wet Wet process being phased out	Gujarat Ambuja; Dry process with 5 stage pre-heater	Improved dry process at Japanese levels of technology
Energy*	**5.79 GJ/t**	**5.34 GJ/t**	**4.5 GJ/t**
Emissions	**0.92 t CO_2/t**	**0.894 t CO_2/t**	**0.835 t CO_2/t**
**** Energy figure is based on possible mix of technologies for different scales of production.***			
	Brick Production		
Description	Bull's Trench Kiln with Movable Chimney : 90% Fixed Chimney: 10%	Bull's Trench Kiln with Fixed Chimney	High Drought Kiln and Vertical Shaft Brik Kiln
Energy *	**4.2 GJ/'000 bricks**	**3.2 GJ/'000 bricks**	**2.6 GJ/'000 bricks**
Emissions	**0.29 t CO_2/'000 bricks**	**0.23 t CO_2/'000 bricks**	**0.18 t CO_2/'000 bricks**
**** Energy figure is based on possible mix of technologies for different scales of production.***			

Table 6.1 Comparative table showing the emission from different technology levels of manufacturing the same material Source:(9)

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