

Gohila Vani – 5 February 2026

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# Carbon Emissions, Industrial Responsibility and the Need for Carbon Credit Platforms

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# Introduction: Climate Change as an Industrial Systems Problem

Climate change is no longer only an environmental issue; it has become one of the most critical industrial, technological, and economic challenges of the modern era. From a research and development perspective, the climate crisis must be understood through the lens of industrial systems and global production patterns. In 2024, global energy-related carbon dioxide emissions reached approximately **37.8 gigatonnes**, marking the highest level ever recorded. At the same time, atmospheric CO<sub>2</sub> concentration exceeded **422 parts per million**, representing a 50% increase compared to pre-industrial levels. These figures clearly indicate that current industrial and economic activities continue to operate on carbon-intensive foundations. The global economy still relies heavily on fossil fuels, which provide more than **80% of total energy demand**. This dependence makes immediate elimination of emissions unrealistic, thereby highlighting the urgent need for transitional mechanisms such as carbon markets and carbon credit platforms to accelerate decarbonization without halting economic development.

## The Global Carbon Budget and the Narrow Window for Action

Climate science provides a clear framework known as the global carbon budget, which represents the total amount of carbon dioxide humanity can emit while still limiting global warming to 1.5°C above pre-industrial levels. According to the Intergovernmental Panel on Climate Change (IPCC), the remaining carbon budget is approximately **250 gigatonnes of CO<sub>2</sub>**. With annual emissions currently close to 38 gigatonnes, this budget could be exhausted in **less than seven years** if emissions continue at the present rate.

This timeline emphasizes the urgency of immediate and large-scale action. Without rapid emission reductions, achieving the Paris Agreement targets will become increasingly unlikely within the next decade.

## Energy Production: The Largest Source of Global Emissions

The energy sector remains the dominant contributor to global greenhouse gas emissions, responsible for nearly **73% of total emissions worldwide**. Electricity

generation, heating, and fuel combustion form the backbone of modern industrial economies, yet they rely predominantly on fossil fuels.

Coal-fired power plants alone contribute around **40% of global electricity emissions**, followed by natural gas at approximately 22%. Oil contributes a smaller but still significant share. Despite rapid growth in renewable energy, fossil fuels continue to dominate the global electricity mix, making the energy sector the primary target for decarbonization strategies.

The significance of this sector lies in its interdependence with all other industries. Every manufacturing process, transportation system, and digital infrastructure ultimately depends on electricity and fuel, meaning energy decarbonization has a cascading impact across the entire economy.

## Industrial Manufacturing: The Hidden Giant of Emissions

The industrial sector contributes approximately **9 gigatonnes of CO<sub>2</sub> annually**, representing around **one-quarter of global energy-related emissions**. When construction lifecycle emissions are included, the combined contribution of manufacturing and construction may exceed **50% of global emissions**.

Industrial emissions are particularly difficult to reduce due to the need for high-temperature heat, fossil fuel-based raw materials, and chemical processes that inherently release carbon dioxide. Key subsectors include cement, steel, chemicals, and large-scale manufacturing, all of which are essential for infrastructure development and economic growth.

## Cement Industry: The Fourth-Largest Emitter if It Were a Country

Cement production alone contributes approximately **6–8% of global CO<sub>2</sub> emissions**, generating about **2.2 gigatonnes of CO<sub>2</sub> each year**. The carbon intensity of cement production arises from two major sources. First, the chemical process known as calcination releases CO<sub>2</sub> when limestone is heated to produce clinker. Second, the kilns used in cement production require temperatures above 1400°C, typically achieved using fossil fuels.

Due to the combination of chemical and energy-related emissions, the cement sector remains one of the most challenging industries to decarbonize. If cement production were considered a country, it would rank among the **top four global emitters**.

## Steel Industry: Infrastructure's Carbon Backbone

Steel production contributes roughly **7% of global carbon emissions**, producing around **3.4 gigatonnes of CO<sub>2</sub> annually**. Global steel production currently exceeds **1.9 billion tonnes per year**, with each tonne of steel generating approximately **1.8 tonnes of CO<sub>2</sub>**.

The primary driver of emissions in steel manufacturing is the blast furnace process, which relies heavily on coal to convert iron ore into steel. As global urbanization and infrastructure demand continue to grow, steel production is expected to increase, making decarbonization in this sector essential for achieving climate targets.

## Transportation: A Growing Source of Emissions

Transportation contributes approximately **15% of global emissions**, with road transport accounting for the majority. Aviation contributes around **2.6% of global CO<sub>2</sub> emissions**, while shipping adds roughly **3%**. Unlike some industrial sectors, transportation emissions continue to rise in many regions due to increasing mobility demand and global trade.

The transition to electric vehicles, sustainable aviation fuels, and green shipping technologies is critical to reducing emissions in this sector.

## Corporate Responsibility: The Carbon Majors

One of the most significant findings in climate research is the concentration of emissions among a relatively small number of corporations. Studies indicate that **32 fossil fuel companies are responsible for approximately half of global carbon emissions**, while **36 companies emitted more than 20 gigatonnes of CO<sub>2</sub> in 2023 alone**.

Major contributors include Saudi Aramco, ExxonMobil, Shell, Chevron, BP, Gazprom, and Coal India. This concentration suggests that targeted corporate decarbonization policies could have a disproportionately large impact on global emission reduction.

## Emerging High-Emission Consumer Industries

Beyond traditional heavy industries, new sectors are rapidly emerging as major emitters. The fashion industry now contributes approximately **8-10% of global emissions**, driven by fast production cycles, synthetic textiles, and global logistics networks. For example, the fast-fashion company Shein reported emissions of **16.7 million tonnes of CO<sub>2</sub> equivalent in 2023**, illustrating how consumer industries are becoming increasingly carbon-intensive.

## Economic Consequences of Climate Change

Climate change is not only an environmental challenge but also a major economic risk. Research estimates that the world's largest fossil fuel companies have contributed to approximately **\$28 trillion in climate-related damages**. These impacts include extreme weather events, agricultural losses, infrastructure damage, and public health costs. The economic implications further strengthen the case for rapid decarbonization.

## Carbon Credit Platforms: A Market-Based Solution

Carbon credit platforms provide a mechanism for measuring, reducing, and offsetting emissions. A carbon credit represents **one tonne of CO<sub>2</sub> reduced or removed**. These platforms allow companies to compensate for unavoidable emissions by investing in climate mitigation projects such as reforestation, renewable energy, methane capture, and sustainable agriculture.

By introducing a price on carbon, carbon markets transform environmental responsibility into measurable economic action.

## The Role of Carbon Markets in Industrial Decarbonization

Carbon markets play a critical role in enabling industries to transition toward sustainability while maintaining economic growth. They fund climate projects, encourage technological innovation, and provide financial incentives for emission reduction. For hard-to-abate sectors such as cement, steel, and aviation, carbon credits serve as an essential bridge toward long-term decarbonization.

## Conclusion: A Critical Decade Ahead

The research clearly demonstrates that global emissions are dominated by energy production, heavy industry, transportation, and a small group of major corporations. Achieving climate targets will require coordinated action across technology, policy, and market systems.

Carbon credit platforms represent a crucial component of this transition, offering a scalable mechanism to align economic growth with environmental responsibility. The next decade will determine whether the global community can implement these solutions quickly enough to meet climate goals.