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Impact of Environmental Regulations on Financial and Operational Performance: Evidence from Indian Industries

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Abstract: Environmental regulations have become an inseparable aspect of industrialization to maintain a balance between pollution control and promote sustainable industrial development. In India, these regulations were introduced in the late twentieth century, and now the Ministry of Environment, Forest, and Climate Change is the main authority responsible for environmental policy and regulation in India. For shorter periods, these regulations increase compliance costs because firms must invest in pollution control equipment, waste management systems, and cleaner technology, which hinder their profitability and financial performance. But, over time, environmental regulations encourage firms to improve resource efficiency, adopt modern technology, and reduce waste, resulting in improved operational efficiency and long term performance. However, this study finds that this impact does not follow every industry in India and depends on their size, resources, pollution level, and others. From the findings, this paper concludes that environmental regulations create short-term financial pressure but improve firm performance, efficiency, and firm value in the long run.

Index Terms: Environmental regulations, Firm performance, Financial performance, Operational efficiency, Environmental compliance, Sustainable development, Indian industries, Corporate sustainability, Pollution control, ESG practices

Chapter 1: Introduction

1.1 Overview of Environmental Regulations

Addressing global pollution and sustainability issues, governments from different countries have enacted different laws and policies to control pollution, mitigate climate change, and protect natural resources, which otherwise lead to severe damage to both mankind and nature. These regulations aim to reduce environmental damage caused by industrial and business activities. These environmental regulations are increasingly being designed to align with the Sustainable Development Goals (SDGs) to bridge the gap between legal compliance and sustainability targets mandated by international agreements (Sagar & Chandrappa, 2023). These regulations include rules related to air pollution, water pollution, waste management, carbon emissions, and the use of natural resources, and are strictly required to be followed by every business and industry during production and business operations.

Environmental regulations exist for the previous records of extensive damage and environmental degradation caused by industrial growth since the mid-twentieth century. As Figure 1 suggests, the relationship between economic growth and environmental degradation can be defined with an environmental Kuznets curve, which hypothesizes an inverted-U-shaped relationship between the factors. As seen here, the rate of environmental degradation increases along with natural resource-dependent growth, which has been accelerated due to the effect of industrialization (Madani, 2020). Factories release harmful gases, discharge waste into water bodies, and generate solid waste. Without regulation, these activities continue to damage public health and the natural environment, for which governments are responsible to set strict standards and guidelines for the firms to follow.

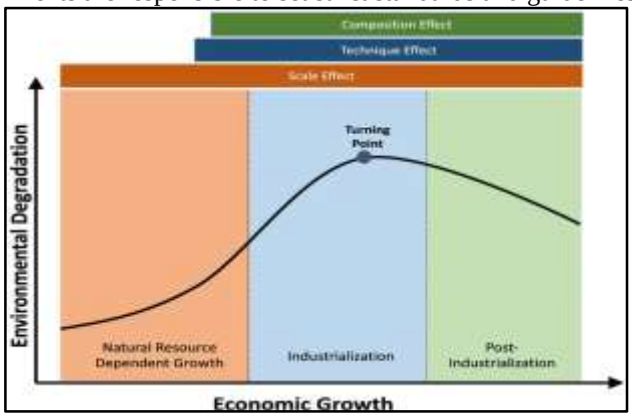

Figure 1: Relationship Between Environmental Degradation and Economic Growth
Source: (Madani, 2020)

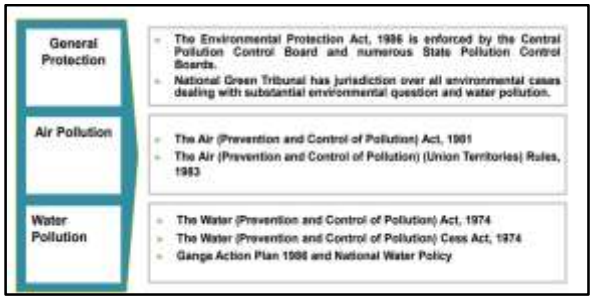

Figure 2: Indian Environmental Laws
Source: (Indian Institute of Corporate Affairs, 2019)

Especially in India, environmental regulations have become necessary to mitigate the hazardous pollution levels, protect biodiversity, and ensure sustainable development, which have been threatened due to rapid industrialization. Addressing the requirement, the Indian government has introduced pollution control laws, environmental protection acts, and sustainability guidelines for industries, and has been updating them over the years (Figure 2). During 2016, the concept of identifying companies through colors, including red, orange, green, and white, that would define their contribution to pollution and natural hazards, and for which they have to follow certain "environmental permits" according to their group of colors (Indian Institute of Corporate Affairs, 2019). However, the basis of the permits is almost equal to every category, where firms must install pollution control equipment, treat waste, and follow emission standards. Following these regulations affects how firms operate, how much they spend, and how they plan their business strategies to retain for a long term. Hence, environmental regulations are now an important factor in business management and financial performance

1.2 Environmental Issues and Industrial Growth in India

India was introduced to global industries during British colonization, and from them, industrialization has occurred through different phases in the country. While the phases have been observed to fluctuate very often, industrial growth is certainly determined within India (Figures 3 and 4) (Civils Daily, 2017). Along with the handicraft and agricultural products, industries such as manufacturing, energy, chemicals, textiles, and mining have expanded significantly. This growth has increased production, employment, and exports, which have also, at the same time, increased environmental problems.

Figure 3: Industrial Growth Rate During Plans 6 and 7
Source: (Civils Daily, 2017)

Figure 4: Industrial Growth Rate During Plans 10 and 11
Source: (Civils Daily, 2017)

Some of the major environmental issues in India include air pollution, water pollution, land degradation, and industrial waste. Starting from releasing untreated waste into rivers, emission of industrial and vehicle smoke, to hazardous waste from factories, creates serious issues, including health and environmental risks. Even the industrial areas are often reported to face water contamination and soil pollution.

These environmental problems created pressure on the government to take action. As a result, environmental regulations were introduced to control pollution and protect natural resources (Figure 2). Addressing those regulations and maintaining them are strictly required for every industry to reduce emissions, manage waste, and adopt cleaner technologies, highlighting how industrial growth and environmental protection are closely connected. These regulations are also required to maintain a balance between economic growth and environmental sustainability.

1.3 Environmental Regulations and Corporate Responsibility

In recent years, corporate social responsibility (CSR) has shifted towards ESG protection, referring to environmental, social, and governance factors. The main reason behind the shift is the change in brand views. For instance, firms are no longer judged only based on profit, but are judged on their environmental and social performance (Gholami et al., 2022). Businesses are expected to reduce pollution, use resources efficiently, and follow environmental standards to continue their operations for a long time, while also maintaining a brand reputation for following all the necessary sustainable guidelines.

CSR activities in recent years include environmental protection as a major component. Many firms now publish sustainability reports and environmental performance reports to maintain transparency and to highlight how much they invest in cleaner technology, energy-efficient machines, and waste management systems. These actions improve the public image of the firm and build trust among customers and investors (Caputo et al., 2021). Investors now prefer firms that follow environmental standards and sustainable practices, making environmental regulations more than legal requirements and addressing as necessary businesses strategy. Firms that ignore environmental responsibility may face penalties, legal action, and damage to their reputation, ultimately removing their presence from the industry.

1.4 Link Between Environmental Regulations and Firm Performance

Environmental regulations have a direct impact on firm performance, including profit, productivity, efficiency, and market value. For example, firms have to invest in pollution control equipment, waste treatment, cleaner technology, and compliance procedures, which ultimately increase their operational costs and reduce short-term profits (Zhu & Zhao, 2022). While larger firms can adjust to the short-term loss and sudden investment, medium to small-sized firms often find it difficult to bear these changes.

From the viewpoint of positive growth, environmental regulations improve firm performance in the long run. Regulations force firms to reduce waste, improve efficiency, and adopt new technology, which ultimately leads to innovation and better use of resources (Nazir et al., 2024). Additionally, efficient use of energy or the use of green energy and raw materials reduces production costs over time. From this, firms gain a better reputation and customer trust. This idea can also be proven through Porter Hypothesis. According to this theory, strict environmental regulations encourage innovation and improve the competitiveness of firms (Ambec et al., 2013). From this view, it is evident that environmental regulations do not always reduce profits, but help firms to improve overall performance in the long run.

1.5 Research Aim and Objectives

The study aims to examine the impact of environmental regulations on firm performance in Indian industries. The aim would be followed by several objectives to understand whether environmental regulations act as a burden on firms or whether they improve firm performance over time. The objectives are presented below.

- To examine the impact of environmental regulations on the financial performance of firms.
- To analyze the impact of environmental regulations on productivity and operational efficiency.
- To study the impact of environmental regulations on firm value and competitiveness.
- To examine the impact of environmental regulations across different industries in India.

Chapter 2: Literature Review

2.1 Environmental Regulations and Economic Performance

Environmental regulations have become one of the most pivotal aspects discussed both in economic and business research. In earlier times, researchers like Haveman & Christensen (1981) and Jorgenson & Wilcoxen (1990) argued that environmental regulations increase production costs and reduce economic performance. They vouch for their statement, suggesting that firms have to spend on pollution control equipment, cleaner technology, and compliance systems, which increase investment costs and ultimately reduce profitability. As a result, the companies' industrial growth slows down in the short run.

Researchers, including Dechezleprêtre & Sato (2014) and Tengfei & Ullah (2024), presented different views that strict environmental policies reduce competitiveness, especially in developing countries where firms operate with limited resources. They mentioned that when a firm spends more on compliance, its production costs increase, which puts the company in a tough situation compared to its competitors. Fabrizi et al. (2024) further pointed out that when firms' production costs increase, their market price becomes less competitive compared to firms in countries with weaker environmental laws.

However, contrary to their views, many researchers, including Ahmed et al. (2022) and Dzwigol et al. (2023), support their point by suggesting that environmental regulations do not disrupt but improve economic performance in the long run. With proper rules and regulations, firms are encouraged to reduce waste, use resources efficiently, and adopt modern technology, thereby improving productivity and reducing long-term costs. These differences in views highlight that the relationship between environmental regulations and economic performance is not simple, as it requires including both cost and efficiency effects.

2.2 Environmental Regulations and Financial Performance of Firms

Financial performance undoubtedly contributes to examining and measuring firms' performance. Indicators such as return on assets, return on equity, profit margin, and sales growth are the most common measuring options, as mentioned by TUDOSE et al. (2022). However, researchers have different views and opinions regarding whether environmental regulations reduce or improve financial performance. For instance, Liu et al. (2022) found that environmental compliance increases operating costs and reduces short-term profitability. Firms are bound to follow environmental regulations and those of the local governments with which they are doing business. To ensure compliance with the policies, heavy and excessive investment is required, especially in pollution reduction technology and waste and environmental management systems. These additional expenses reduce net profit, especially in pollution-intensive industries such as chemicals, energy, cement, and manufacturing.

However, other researchers, including Waris et al. (2024) and Fosu et al. (2024), found a positive relationship between environmental performance and financial performance, suggesting that firms that follow environmental standards successfully attract investors, improve their corporate image, and gain customer trust. Additionally, environmentally responsible firms also face fewer legal risks and penalties due to their proper compliance with the rules. It can improve the firms' financial stability and improve the quality of the products or services, ultimately achieving long-term profitability.

2.3 Environmental Regulations and Firm Productivity

Firms' productivity generally refers to how firms use their resources, such as labor, capital, and raw materials. Environmental regulations often force firms to improve their production processes and reduce waste, which can lead to better resource management and higher productivity, as stated by Ingaldi & Ulewicz (2024). In this matter, Shaheen et al. (2022) suggested that firms adopt cleaner and more efficient technology in countries with stricter environmental regulations. While it requires initial investment and a change of infrastructure, the new technology would significantly reduce waste and improve production efficiency by using less energy and fewer raw materials.

However, some studies oppose this view. For instance, Zhong et al. (2025) mentioned that while larger companies successfully obtain the changes, small firms face difficulty in improving productivity because they do not have enough financial resources to invest in new technology. The contradictory view highlights how the impact of environmental regulations on productivity depends on firm size, technology level, and industry type and cannot be generalized.

2.4 Environmental Compliance Cost and Profitability

Environmental compliance is necessary to avoid penalties and backlash from the industry. However, the compliance cost becomes a serious factor affecting firms' performance by controlling their profitability. As opined by Mokhtar et al. (2024), compliance costs include investments in pollution control equipment, monitoring systems, waste treatment, environmental audits, and reporting systems, which, overall, increase total operating costs. In the short run, this increase in cost leads to a reduction in profitability. As mentioned by Chen et al. (2022), firms often experience lower profit margins because of increased environmental spending, which is especially common in industries that produce high levels of pollution.

However, researchers, including Aiguobarueghian et al. (2024), focus on the long run, claiming that firms that invest in environmental compliance often benefit from cost savings through energy efficiency, waste reduction, and better resource management. It highlights that while environmental compliance indeed reduces profit in the short term, in reality, it would improve profitability in the long-run, solidifying the companies' position in the market.

2.5 Environmental Performance and Competitive Advantage

Environmental performance generally measures how effectively organizations manage their ecological impact, policies, sustainability targets, and compliance with environmental regulations. As Nazir et al. (2024) mentioned, firms that significantly reduce pollution, manage waste properly, and use sustainable resources are considered environmentally responsible firms. The researchers found that good environmental performance improves competitive advantage. Firms that maintain strong environmental practices significantly build positive corporate image, attracting both customers and investors. Addressing the seriousness of sustainability, customers started shifting their preferences towards environmentally responsible companies, as stated by Reddy et al. (2023). Similarly, investors are also more willing to invest in firms with good environmental performance.

Apart from stakeholder attraction, environmental performance also leads to innovation. As assessed by Odeyemi et al. (2024), firms develop new production methods, energy-efficient technology, and sustainable products to be compliant with environmental regulations. This helps firms differentiate their products in the market and improve their competitive position for a long period.

2.6 Research Gap

This chapter summarizes the opinions of different international researchers who portrayed their views regarding the relationship between environmental regulations and firms' performances. However, their views are generalized and do not focus on any country or industry-specific discussion. The definition and explanation of industrial structure, regulatory environment, and level of technology found in the previous research are mostly limited to developed countries and are very different from those in India. Additionally, some studies focused only on pollution control or environmental compliance, while others focused only on financial performance. Hence, there is a requirement to connect environmental regulations with financial performance, productivity, and firm value, especially in the context of India, which this paper aims to fill.

Chapter 3: Environmental Regulations in India

3.1 Major Environmental Laws in India

India has introduced several environmental laws to control pollution and protect natural resources since the late twentieth century. Among them, one of the most important laws is the "Environment Protection Act of 1986", allowing the government authority to set environmental standards for each industry and regulate industrial pollution (India Code, 1986). This law aims to control air, water, and land from pollution by giving the authoritative power to the government to take necessary action against firms that violate environmental rules.

"The Water Prevention and Control of Pollution Act of 1974" is another important law that focuses on controlling water pollution caused by different industries (India Code, 1974). With the integration of the law, industries must treat wastewater before releasing it into rivers or lakes. Similarly, "the Air Prevention and Control of Pollution Act of 1981" aims to control air pollution from factories and industrial plants (India Code, 1981). Through this, industries must follow the emission standards and install pollution control equipment.

Additionally, the "Hazardous Waste Management Rules 2016" and "the Solid Waste Management Rules 2016" also play an important role (MoEFCC, 2016a; MoEFCC, 2016b). These regulations set instructions on how industries handle, store, and dispose of hazardous waste. Altogether, these laws from the legal framework for environmental regulations in India directly affect industrial performance by influencing operational management and costs.

3.2 Pollution Control Policies for Industries

Industrialization leads to significant damage to the environment and directly or indirectly impacts the biodiversity of the country. Addressing this, pollution control policies are designed to reduce such environmental damage caused by these industrial activities. The Indian government has introduced emission standards, waste management rules, and environmental clearance policies for industries (Soren & Singh, 2025). Industries have to obtain environmental clearance and set some ESG goals to comply with pollution control policies before starting a new project. This ensures that the environmental impact of the project is examined legally before production begins.

The government has also been promoting cleaner production methods and pollution control technology, especially by focusing on the circular economy (Kumar, 2019). Industries are encouraged to reduce waste, recycle materials, and use energy-efficient technology. Also, in some cases, the policies promote the use of renewable energy and cleaner fuels to reduce pollution. In this way, these pollution control policies force industries to change their production process and invest more in pollution control systems (Awewomom et al., 2024). While these activities certainly increase compliance costs for the companies, they also help in reducing environmental damage and resource efficiency, and help the companies to obtain a successful position for a longer period.

3.3 Role of Government and Regulatory Bodies

The government plays a major role in implementing environmental regulations, adhering to the global SDG goals. The Ministry of Environment, Forest, and Climate Change is the main authority responsible for environmental policy and regulation in India (MoEFCC, 2020). This ministry constantly upgrades and updates the environmental standards and develops different policies according to the requirements.

The Central Pollution Control Board and State Pollution Control Boards monitor industrial pollution and ensure that industries follow environmental standards set by the ministry. These boards measure air and water pollution levels and conduct inspections in industrial areas to examine the conditions. They also issue pollution control certificates and can take legal action like heavy financial penalties, closure of operations, and direct criminal prosecution against firms that violate environmental rules (Diligence Certifications, 2026). These regulatory bodies directly affect industrial operations, compliance costs, and business decisions by ensuring that environmental laws are properly enforced by the companies.

3.4 Compliance Requirements for Firms

Firms in India must follow several environmental compliance requirements to avoid legal actions. Firstly, according to "The Environment Impact Assessment Notification 2006", the industries must obtain environmental clearance and consent to operate from the Pollution Control Boards of India before starting operations (Trilegal, 2024). Secondly, to comply with the rules, firms are required to install pollution control equipment and regularly monitor pollution levels. They are bound to maintain transparency with the stakeholders and must submit environmental audit reports and compliance reports to regulatory authorities (Kharola et al., 2025). Maintaining a record of the waste management, emissions, and resource use are must, without which the result can lead to fines, penalties, and even closure of the production house or factories. In addition to the increased operating costs, these compliance requirements increase administrative and operational responsibilities for firms, which affect their profitability and financial performance.

3.5 Challenges Faced by Indian Industries

While this set of rules and regulations is essential to ensure environmental benefits and mitigate pollution, Indian industries struggle to comply with the environmental regulations. One major challenge is high compliance costs. To achieve cleaner and greener technologies, pollution control equipment and waste treatment systems are required, for which firms need to make a large investment, which becomes a burden for SMEs and MSMEs (Ecoholics, 2025). Another major challenge is the lack of specialized personnel with technical knowledge who can implement and monitor the environmental standards effectively. For this, some firms still use old production methods, which create more pollution and reduce efficiency, and lead to non-compliance with environmental policies.

Additionally, as reported, in India, environmental regulations are often enforced weakly, with inconsistent applications across different states (Morsel India, 2025). This increases the complication for the state observation boards and reduces the compliance effectiveness. There are also challenges related to regulatory procedures and delays in environmental clearance. Despite these challenges, environmental regulations are still necessary to control pollution, restore diversity, improve environmental conditions, while also promoting sustainable industrial development in India.

Chapter 4: Firm Performance and Environmental Regulations

4.1 Impact on Financial Performance

Firms' performance and their operations in the long run strongly depend on their financial performance. As TUDOSE et al. (2022) mentioned, financial performance is usually measured through profit, return on assets, return on equity, and sales growth. To be compliant with environmental laws, firms have to heavily invest in pollution control equipment, waste treatment systems, environmental audits, and other compliance procedures, such as permission granting managing legal issues. Environmental regulation ended up increasing firms' cost of production, which ultimately increased the total operating expenses and reduced short-term profitability (Chen et al., 2022).

Many firms in India, especially those that work within pollution-intensive industries such as cement, chemicals, energy, and manufacturing, face high environmental compliance costs. For example, the cement sector of India has to heavily invest in cleaner technology, including "Waste Heat Recovery Systems", alternative fuels, and carbon reduction procedures to meet net-zero goals by 2070 (Global Institute, 2024). Reportedly, leading firms, such as Ambuja, Dalmia, and JSW, have been starting to adopt these measurements to reduce cleaner ratios, utilize renewable energy, and lower their emission rate (Sharma, 2021). While these bigger firms are capable of adjusting to the short-term profit loss, small firms are getting affected due to their limited financial resources, resulting in affecting their performance.

However, if judged from the long run, environmental regulations can improve financial performance in the long run. Firms that adopt energy-efficient technology and waste reduction methods enable to reduce production costs over time. Additionally, by using raw materials and energy efficiently, firms can significantly reduce wastage and improve overall cost management (Li et al., 2023). Also, these firms can successfully avoid any legal penalties and fines, and attract both environmentally conscious investors and customers. Hence, it can be suggested that, despite the different views, environmental regulations can improve long-term financial performance.

4.2 Impact on Operational Efficiency

Environmental regulations directly impact the operational efficiency of the firms. They force firms to reduce waste, control emissions, and improve production processes, which leads to better resource management of labor, energy, and raw materials. Adhering to the environmental policies, major corporations like Tata Power, ITC Ltd, and others adopt cleaner production technology, such as rooftop solar panels, AI-driven energy management, and wastewater treatment to meet environmental standards (ITC Ltd, 2025; Tata Power, 2025). This cleaner technology uses less energy and fewer raw materials, resulting in water reduction and improved production efficiency. Different sectors have also improved their production planning and monitoring systems to comply with the environmental standards, which directly and indirectly improve operational excellence.

However, due to a lack of initial capital investment, some firms face difficulty in improving operational efficiency as they continue to use old machinery and outdated technology (Mbonyane et al., 2023). Therefore, it should be assessed that the impact of environmental regulations on operational efficiency depends on the level of technology, size of the firm, and type of industry.

4.3 Impact on Firm Value

Firm value refers to the value of the company in the market and investors' perception of its future performance. Environmental regulations directly influence firm value by attracting modern investors who are more aware of environmental risk and sustainability practices (Alsayegh et al., 2022). On the other hand, firms that do not comply with the Benevolent regulatory guidelines face legal risk, penalties, and reputational damage, reducing investors' confidence in them.

Firms that follow environmental regulations and adopt additional sustainable practices often have a better reputation in the market. These firms are also the most attractive to both investors and customers, resulting in improving their market value (Zhang & Berhe, 2022). Stakeholders, in recent times, prefer to continue business with environmentally conscious companies. Even inventors prefer firms that follow environmental, social, and governance practices. From this viewpoint, it is certain that environmental regulations can negatively affect firm value in the short run due to increased costs, but in the long run, environmentally responsible firms are bound to increase firm value.

4.4 Industry-Wise Impact: Manufacturing, Energy, Textile, Chemical

While the studies generalize the implications and impacts of environmental regulations on firms' performance, in reality, they do not work the same for all industries. In India, pollution-intensive industries such as cement, steel, chemicals, textiles, and energy are more affected by environmental regulations. As seen in Figure 5, the b part highlights that in India, 34% of the total emissions are produced by cement, iron, and steel industries, and Figure 6 highlights the potential resources of pollutants from the cement industries themselves. Hence, these industries are required to spend more on pollution control and compliance, since the regulations are stricter for them compared to other industries.

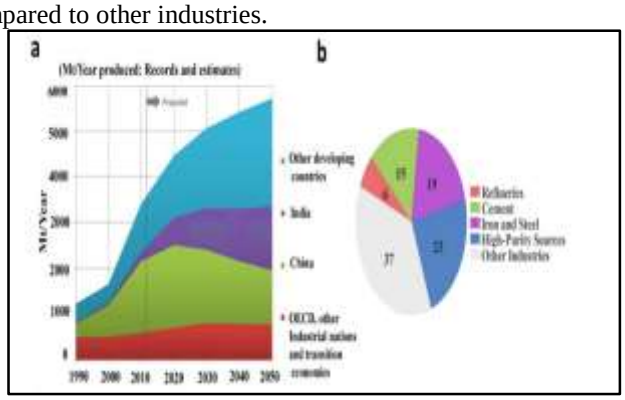

Figure 5: Production of Cement and CO2 Emission in India
Source: (Zhu et al., 2022)

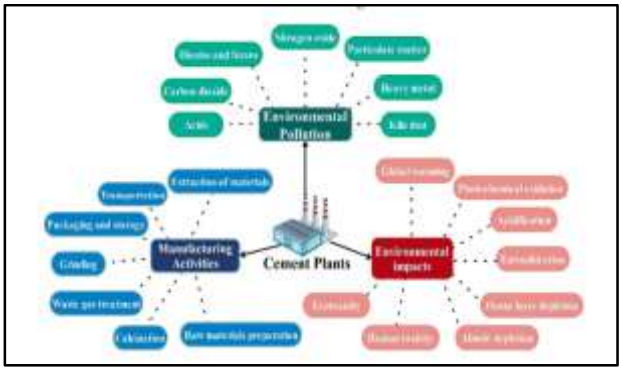

Figure 6: Potential Pollution Resources from the Cement Industry
Source: (Zhu et al., 2022)

Low pollution industries, such as information technology, services, and finance, are less affected by environmental regulations because their environmental impact is lower (Zhu & Zhao, 2022). Even while they have to invest in technologies for agility, security, and customer service, their compliance costs are comparatively low. Additionally, in manufacturing industries, environmental regulations often lead to technology improvement and process innovation, while in the energy sector, environmental regulations encourage the use of renewable energy and cleaner fuels. For textile and chemical industries, waste treatment and water management are the highest priority (Uddin et al. 2023). It highlights that the impact of environmental regulations varies across industries depending on their potential pollution level, the requirement of technology, and regulatory pressure.

Chapter 5: Findings and Implications

The key findings from the research are that the environmental regulations have both positive and negative impacts on firms' performances in India. For the negative effects, the short-term financial loss and increasing compliance costs are the major problems, which often hinder the company's firm value. Firms are required to invest in pollution control equipment, waste management systems, and cleaner technology, which require initial capital investment, which increases operating costs and reduces profitability in times of economic recession, especially in pollution-intensive industries such as cement, chemicals, textiles, and energy.

The positive impacts of these regulations are improved firms' performance. With the adoption of energy-efficient technology and effective resource management procedures, firms can reduce waste and improve overall operations. It also reduces production costs in the long run. Furthermore, environmental compliance also improves corporate image, investor confidence, and market value of firms, allowing them to retain their position for a long time.

The most important finding of the research is the different impact of environmental regulations on different industries. To be exact, firms' size, capital resources, industry, level of pollution, and regulatory pressures differentiate each firm from the other. While pollution-intensive industries are more affected, service sector firms are less affected.

Chapter 6: Conclusion and Future Research

This study analyses the impact of environmental regulations on firm performance in Indian industries from previous research papers and industrial reports. With special attention to the Indian industries, this paper shows that environmental regulations increase compliance costs and reduce short term profitability of firms. This creates financial pressure and short-term firm value reduction, especially for small and medium firms and pollution-intensive industries. However, over time, compliance with these regulations leads to improved efficiency, resource management, and corporate environmental responsibility. Firms with cleaner technology and efficient production not only improve operational performance but also improve corporate image and investor confidence, resulting in improved firm value in the long run. However, since these impacts vary for different industries, future studies can focus on specific industries and use firm-level financial data to measure the impact of environmental regulations more accurately.

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