



### A STUDY OF THE COMPARISON BETWEEN THE COMPLIANCE AND VOLUNTARY CARBON MARKET MECHANISMS IN INDIA

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#### Abstract:

*The carbon market in India is evolving as an effective instrument for economic growth and reducing greenhouse gases. The carbon credit market plays a very important role in carbon credit trading. Carbon credit markets are divided into compliance (compulsory) and voluntary markets. The compliance market is regulated by the government, whereas the voluntary market is one in which companies buy credits to meet voluntary sustainability or net-zero goals. This paper discussed the recent scenario of the carbon credit market in India. Further, it highlights the comparison between the compliance market and the voluntary market mechanism in India.*

**Keywords:** *Carbon credit market, carbon credit, compliance market, voluntary market, greenhouse gases, carbon credit trading, etc.*

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#### Introduction:

India has been an important participant in global carbon markets, particularly under the Clean Development Mechanism (CDM) introduced under the Kyoto Protocol. India has also been establishing its own domestic carbon market framework in recent years in order to fulfil its climate obligations and promote sustainable industrial growth (Ministry of Power, Government of India, 2023).

The framework that enables the purchase, sale, and trading of carbon credits is known as the carbon credit market. Carbon markets are of two types such as compliance market and the voluntary market. National, regional, or international policies establish the compliance market. They are based on the "cap-and-

trade" model, which requires regulated organisations to buy allowances to offset their emissions. Whereas the voluntary carbon market allows private organisations and individuals to buy carbon credits to meet the voluntary climate goals.

Carbon credits are now a significant tool in the financial markets. Despite the regulation, participants, and goals of these mechanisms differ, they all work together to reduce emissions and promote sustainable development.

Carbon markets have developed into one of the most useful instruments for nations looking to achieve their decarbonisation targets. Economic incentives for reducing GHG emissions are made possible through the trading of carbon credits.



### Carbon Credit Trading:

Carbon credit trading is market-based approach aimed to lower greenhouse gas emission by giving monetary value to carbon emission. The primary goal of carbon credit trading is to reduce CO<sub>2</sub> and other greenhouse gases in the atmosphere. Carbon credits can be exchanged between companies or purchased and sold. Credits can be utilised to fund global and trade partner carbon reduction measures. Many companies offer carbon credits to consumers, both individual and business, who want to reduce the voluntary reduction of carbon emissions. Carbon credits are a significant component of national and international emissions trading schemes.

There are two types of carbon markets:

Compliance carbon market and Voluntary Carbon Market

Carbon credit trading systems around the world, including in India, are based on these two methods.

### Compliance Carbon Market Mechanism in India:

Compliance markets are established and governed by established regional, national, and global carbon reduction programs, such as the Kyoto Protocol (Gorain et.al., 2021). A carbon tax or a cap-and-trade system can be used to achieve this, changing economic incentives by increasing the cost of pollution. Industries must comply to legally applicable emission reduction targets set by the government under the regulated compliance carbon market. Businesses who don't reach these goals have to buy carbon credits from other organisations that have met their reduction goals. India introduced the Carbon Credit Trading Scheme (CCTS) under the Energy Conservation (Amendment) Act, 2022. The program establishes a framework for a domestic carbon market with the goal of lowering greenhouse gas emissions from several business categories.

In this carbon market:

- Government establishes emission intensity targets for certain industries.
- Carbon credit certificates are given to companies that reduce emissions above the target.
- In order to comply with regulations, companies that exceed their emission limits must buy credits.

Initially, the compliance mechanism is expected to involve a number of energy-intensive industries, including aluminium, cement, fertiliser, iron and steel, petrochemicals, petroleum refineries, textiles, and pulp and paper.

### Voluntary Carbon Market Mechanism in India:

Voluntary carbon markets operate outside of compliance markets, allowing companies and individuals to choose to buy carbon offsets (Gorain et.al., 2021, An Analysis of Carbon Market and Carbon Credits in India). Organisations, businesses, and individuals can choose to buy carbon credits to offset their greenhouse gas emissions through the voluntary carbon market (VCM). Participation in the voluntary market is not compulsory.

Carbon credits are generated in voluntary markets by projects such as:

- Sustainable energy
- Capturing industrial gas
- Efficiency in energy
- Initiatives for forestry (preventing deforestation)
- Potable water
- Regenerative farming
- Wind energy
- Biogas

India has been one of the most prominent contributors to voluntary carbon markets. Companies are often taking part in voluntary markets to meet net-zero goals, improve their brand image, and demonstrate to stakeholders that they care about the environment.

**Literature Review:**

| Year | Name of the Author       | Title  | Conclusion   |
|------|--------------------------|--|--|
| 2013 | Chotalia P.              | Carbon credit-currency of 21st century   | This study highlights that the for developing countries, particularly India, carbon credits will play a significant role in project finance.   |
| 2024 | Bholane K.               | Current scenario, opportunities and challenges of carbon credit trading in India | According to this study carbon credit trading is an important tool against the climate change.   |
| 2021 | Subrata G. et.al.        | An Analysis of Carbon Market and Carbon Credits in India                         | This study highlights that there is a need to promote global carbon market rather than searching financial interest by the investment firms.   |
| 2023 | Swinkels, L., & Yang, J. | Investing in Carbon Credits.   | This study describes that the returns from the global carbon market also offer investors in traditional investments like stocks, bonds, and commodities opportunities for diversification. |
| 2010 | Paul A.                  | Carbon credit and Carbon Trading in India: An Overview                           | According to this study proper policies are need to be formulated and implemented to hold GHG gases emission to save carbon credit for increasing the volume of carbon trading.            |
| 2018 | Varshney A. et.al.       | Carbon Credit Market in India: An Empirical Analysis                             | According to the paper, there has been lots of movement in the carbon market because of other economic factors like Greenex, Powerex, I.I.P., and the population of our nation.            |

**Research Gap:**

The literature review indicates that in recent years, there have been few studies on carbon market which emphasize on the carbon credit trading, opportunities and challenges in carbon credit trading. Hence, the present study analysed the difference between the Compliance and the Voluntary carbon market mechanisms of carbon credit trading in India.

**Objectives of the Study :**

The objective of the present study is to compare the compliance and voluntary carbon market mechanisms in India.



### Hypothesis :

**Null Hypothesis:** There is no significant difference between the compliance and voluntary carbon market mechanisms in India.

**Alternative Hypothesis:** There is a significant difference between the compliance and voluntary carbon market mechanisms in India.

### Data and Methodology:

For the purpose of the present study, a descriptive research method is used, which is based on secondary data. For the purpose of analysis, 10 companies from the Compliance Carbon market and 10 Companies from the Voluntary Carbon Market have been selected. The following table shows the selected companies from the compliance and voluntary carbon market.

### List of the Companies under the Compliance and Voluntary Carbon Market Mechanism

**Table 1**

| Sr. No. | Sector       | Compliance Carbon Market           | Voluntary Carbon Market                               |
|---------|--------------|------------------------------------|---|
| 1       | Iron & Steel | Tata Steel                         | JSW Steel   |
|         |              | Jindal Steel                       | Rashtriya Ispat Nigam Limited                         |
| 2       | Cement       | UltraTech Cement                   | Shree Cement  |
|         |              | Ambuja Cements                     | JK Cement   |
| 3       | Textiles     | Trident                            | Vardhman Textiles                                     |
|         |              | Arvind Mills                       | Sri Kannapiran Mills                                  |
| 4       | Fertilizers  | National Fertilizers Limited (NFL) | Pradeep Phosphates Ltd.                               |
|         |              | Chambal Fertilizers                | Deepak Fertilizers and Petrochemicals Corporation Ltd |
| 5       | Pulp & Paper | JK Paper                           | West Coast Paper Mills Limited                        |
|         |              | ITC Limited                        | Century Pulp and Paper                                |

*Source: <https://www.pib.gov.in/PressReleasePage>*

The data related to the companies under compliance and the voluntary carbon market have been collected from the particular websites of those companies. The parameters used for the present study are geographical area, industrial sectors and contribution in the carbon market as per the nature of the companies.

The parameter geographical area will be used to understand the company's geographical area wise contribution in particular carbon credit market. The industrial sector-wise contribution of the carbon credit was determined using this parameter. The parameter nature of companies will be used to identify the contribution of public and private companies in particular carbon credit market.

**Data Analysis:**
**Descriptive Analysis :**

In this section, descriptive analysis of various parameters has been made by descriptive statistical tables.

**1. Parameter: Geographical Area**

Geographical area covered by the companies under the compliance and voluntary market. The location of the plants and number of the plants are mentioned in below table:

**Table 2**

| Compliance Carbon Market |                                    |  |               | Voluntary Carbon Market |   |   |               |
|--------------------------|------------------------------------|--|---------------|-------------------------|---|---|---------------|
| Sr. No.                  | Name of the Company                | Location of the Plant  | No. of Plants | Sr. No.                 | Name of the Company                                   | Location of the Plant   | No. of Plants |
| 1                        | Tata Steel                         | Kalinganar, Meramandali, Gamharia, Odisha, Ludhiana  | 05            | 1                       | JSW Steel   | Vijaynagar, Dolvi, Salem, Vasind, Kalmeshwar  | 05            |
| 2                        | Jindal Steel                       | Angul, Raigarh, Barbil, Patratu, Krishnaptnam  | 05            | 2                       | Rashtriya Ispat Nigam Limited                         | Vishakhapatnam,   | 01            |
| 3                        | UltraTech Cement                   | Gujrat, Rajasthan, Madhya Pradesh, Maharashtra, Tadipatri                                  | 06            | 3                       | Shree Cement  | Rajasthan, Laksar, Bihar, Chhattisgarh, Haryana, Pune, Bulandshahr, Etah, Prayagraj | 09            |
| 4                        | Ambuja Cements                     | Ambujnagar, Darlaghat, Maharashtra, Marwar   | 04            | 4                       | JK Cement   | Rajasthan, Panna, Katni, Hamirpur   | 04            |
| 5                        | Trident                            | New Delhi, Pakhowal, Noida,  | 03            | 5                       | Vardhman Textiles                                     | Baddi, Budhni, Ludhiana, Malerkotla, Mandideep, Satlapur                            | 06            |
| 6                        | Arvind Mills                       | Naroda, Santej, Khatraj  | 03            | 6                       | Sri Kannapiran Mills                                  | Sowripalayam, Annur, Eshwara, Jadayampalayam, Kalapatti, Perundurair                | 06            |
| 7                        | National Fertilizers Limited (NFL) | Vijaipur, Panipat, Nangal, Bathinda, Ramagundam  | 05            | 7                       | Pradeep Phosphates Ltd.                               | Odisha, Goa, Mahad  | 03            |
| 8                        | Chambal Fertilizers                | Gadepan  | 01            | 8                       | Deepak Fertilizers and Petrochemicals Corporation Ltd | Taloja, Srikakulam, Panipat, Dahej  | 04            |
| 9                        | JK Paper                           | Raayagada, Songadh, Kagaznagar   | 03            | 9                       | West Coast Paper Mills Limited                        | Dandeli   | 01            |
| 10                       | ITC Limited                        | Bengaluru, Munger, Saharanpur, Kolkata, Pune, Bhadrachalam, Haridwar, Tiruvottiyur, Guntur | 09            | 10                      | Century Pulp and Paper                                | Lalkuan   | 01            |
|                          |                                    | <b>Total</b>   | <b>44</b>     |                         |   | <b>Total</b>  | <b>40</b>     |

*Source: data compiled from websites of different Companies*

The above data in Table 2 shows that the maximum geographical area covered by the companies that come under the Compliance Carbon Market as compared to the voluntary carbon market.

## 2. Parameter: Industrial Sector-wise

Industrial sector-wise contribution of the companies in the compliance and voluntary carbon market

**Table 3**

| Compliance Carbon Market |                    |  |               | Voluntary Carbon Market |                    |  |               |
|--------------------------|--------------------|--|---------------|-------------------------|--------------------|--|---------------|
| Sr. No.                  | Name of the Sector | Name of the Plant  | No. of Plants | Sr. No.                 | Name of the Sector | Name of the Plant  | No. of Plants |
| 1                        | Iron & Steel       | Kalinganar, Meramandali, Gamharia, Odisha, Ludhiana, Angul, Raigarh, Barbil, Patratu, Krishnaptnam                         | 10            | 1                       | Iron & Steel       | Vijaynagar, Dolvi, Salem, Vasind, Kalmeshwar, Vishakhapatnam   | 06            |
| 2                        | Cement             | Gujrat, Rajasthan, Madhya Pradesh, Maharashtra, Tadipatri, Ambujnagar, Darlaghat, Maharashtra, Marwar                      | 10            | 2                       | Cement             | Rajasthan, Laksar, Bihar, Chhattisgarh, Haryana, Pune, Bulandshahr, Etah, Prayagraj, Rajasthan, Panna, Katni, Hamirpur         | 13            |
| 3                        | Textiles           | New Delhi, Pakhowal, Noida, Naroda, Santej, Khatraj  | 06            | 3                       | Textiles           | Baddi, Budhni, Ludhiana, Malerkotla, Mandideep, Satlapur, Sowripalayam, Annur, Eshwara, Jadayampalayam, Kalapatti, Perundurair | 12            |
| 4                        | Fertilizers        | Vijaipur, Panipat, Nangal, Bathinda, Ramagundam, Gadepan,  | 06            | 4                       | Fertilizers        | Odisha, Goa, Mahad, Taloja, Srikakulam, Panipat, Dahej   | 07            |
| 5                        | Pulp & Paper       | Raayagada, Songadh, Kagaznagar, Bengaluru, Munger, Saharanpur, Kolkata, Pune, Bhadrachalam, Haridwar, Tiruvottiyur, Guntur | 12            | 5                       | Pulp & Paper       | Dandeli, Lalkuan   | 02            |
|                          |                    | Total  | 44            |                         |                    | Total  | 40            |

*Source: data compiled from the websites of different Companies*

It was observed from Table 3, maximum contribution was made by the Pulp and Paper industry sector, which comes under the Compliance Carbon Market. Whereas, in the Voluntary Carbon Market Cement industry contributes more than other sectors.

### 3. Parameter: Nature of Companies

**Table 4**

| Compliance Carbon Market |                                    |               |                          |               | Voluntary Carbon Market |   |               |                          |               |
|--------------------------|------------------------------------|---------------|--------------------------|---------------|-------------------------|---|---------------|--------------------------|---------------|
| Sr. No.                  | Public Sector Companies            | No. of Plants | Private Sector Companies | No. of Plants | Sr. No.                 | Public Sector Companies                               | No. of Plants | Private Sector Companies | No. of Plants |
| 1                        | Ambuja Cements                     | 04            | Tata Steel               | 05            |                         | JSW Steel   | 05            | JK Cement                | 04            |
| 2                        | Trident                            | 03            | Jindal Steel             | 05            |                         | Rashtriya Ispat Nigam Limited                         | 01            | Vardhman Textiles        | 06            |
| 3                        | Arvind Mills                       | 03            | UltraTech Cement         | 06            |                         | Shree Cement  | 09            | Sri Kannapiran Mills     | 06            |
| 4                        | National Fertilizers Limited (NFL) | 05            |                          |               |                         | Pradeep Phosphates Ltd.                               | 03            |                          |               |
| 5                        | Chambal Fertilizers                | 01            |                          |               |                         | Deepak Fertilizers and Petrochemicals Corporation Ltd | 04            |                          |               |
| 6                        | JK Paper                           | 03            |                          |               |                         | West Coast Paper Mills Limited                        | 01            |                          |               |
| 7                        | ITC Limited                        | 09            |                          |               |                         | Century Pulp and Paper                                | 01            |                          |               |
|                          | <b>Total</b>                       | <b>28</b>     | <b>Total</b>             | <b>16</b>     |                         | <b>Total</b>  | <b>24</b>     | <b>Total</b>             | <b>16</b>     |

Source: data compiled from the websites of different Companies

The above data in Table 4 shows that the maximum contribution, as per mentioned in the sectors are made by the Public Sector Companies rather than the Private Sector Companies in both Carbon markets.

#### **A Comparative analysis of parameters, geographical area, industrial sector-wise and nature of the companies engaged in the compliance carbon market and the voluntary carbon market**

Different attributes were selected to measure the parameters, geographical area, industrial sectors and nature of the companies related to the Compliance Carbon market and the Voluntary Carbon market.

#### Levels

| Levels          | Score Obtained |
|-----------------|----------------|
| Low Level       | 0-20           |
| Average Level   | 21-40          |
| Moderate Level  | 41-60          |
| High Level      | 61-80          |
| Very High Level | 81-100         |



Table 5

| Attributes of Parameters related carbon market | Compliance Carbon Market |          | Voluntary Carbon Market |         | Comparison between the Compliance carbon market and the Voluntary Carbon market      |
|--|--------------------------|----------|-------------------------|---------|--|
|  | Extent of No. of Plants  | Level    | Extent of No. of Plants | Level   |  |
| 1. Geographical Area                           | 44                       | Moderate | 40                      | Average | Moderate level in the carbon market and average level in the voluntary carbon market |
| 2. Industrial Sector-wise                      | 44                       | Moderate | 40                      | Average | Moderate level in the carbon market and average level in the voluntary carbon market |
| 3. Nature of the Companies                     | 44                       | Moderate | 40                      | Average | Moderate level in the carbon market and average level in the voluntary carbon market |

Comparison shows that:

1. Compliance carbon market is at a ‘Moderate level, and the voluntary carbon market is at an ‘Average Level’ in the case of the geographical area.
2. In the case of the industrial sector, the compliance carbon market is at a ‘Moderate level’, and the voluntary carbon market is at an ‘Average Level’.
3. In the case of the nature of companies, the compliance carbon market is at a ‘Moderate level’, and the voluntary carbon market is at an ‘Average Level’.

### Hypothesis Testing :

The following hypotheses were put forth:

**Null Hypothesis:** There is no significant difference between the compliance and voluntary carbon market mechanisms in India.

**Alternative Hypothesis:** There is a significant difference between the compliance and voluntary carbon market mechanisms in India.

The above table 5 shows that the dimensions used for the difference between the Compliance Carbon Market and the Voluntary Carbon are at the ‘Moderate Level’ in the case of the compliance market and at the ‘Average Level in the case of the voluntary market.

As a result, the null hypothesis is accepted.

Therefore, it can be concluded that there is no significant difference between the compliance and voluntary carbon market mechanisms in India.

### Conclusion:

The present study examined and compared the compliance and voluntary carbon markets. Therefore, as a result of this, India's carbon credit market is a rapidly growing sector that might be seen as an essential component in the nation's transition to a low-carbon and sustainable society. Carbon markets play a significant role in different industrial sectors to achieve the objective of carbon emission reduction. Overall, the Compliance carbon market and the Voluntary carbon markets play a significant role.

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