

Analysis Report - MADE

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1 Introduction

Global emissions have been rising drastically in the last decades. This is partly due to the excessive use of fossil fuels in many sectors of the global economy like power industries or transport. Economy sectors may be affected by two major parties, which are (1) the consumers of the goods a sector produces and (2) the governments of the states they are produced in. Consumer behavior can have a strong impact on goods-producing companies, as companies have to adjust their strategies to win over customers and assert themselves on the market. One dimension of this consumer behavior is the growing concern towards climate change. However, while there might be a high interest of consumers to reduce emissions, they might not be willing to pay the higher prices of goods that are produced in a climate-friendly way. Changing this mindset and allowing companies to charge higher prices such that they can produce goods with decreased emissions may take time.

Instead of waiting for this to happen, governments can - through regulation - have an immediate effect on companies by enforcing stricter policies. One attempt of governments to enforce a decrease of emissions, is the European Union Emissions Trading System (EU ETS) [3]. The EU ETS tries to stimulate companies to reduce their emissions by setting a price on the emission of CO₂ equivalents (CO₂e) (i.e. a collection of greenhouse gases) and establishing a CO₂e market. For this, a predetermined amount of CO₂e certificates, which defines the amount of CO₂e a company is allowed to emit, are allocated to the companies. The allocated CO₂e certificates are gradually decreased year by year. If a company emits more than their allocated CO₂e certificates allow, it has to buy additional ones from other companies that don't make use of all of their certificates. This way companies, which reduce their emissions, benefit by selling CO₂e certificates, while others that don't are sanctioned, as they have to spend money acquiring CO₂e certificates.

The goal of this analysis report is to assess whether the approach of the EU ETS is able to decrease emissions and additionally what impact reduced emissions in the EU have in comparison to the global state of CO₂e emissions.

2 Used Data

The data that was extracted through a previously built data pipeline and used for this analysis report is listed in Table 1. Both data sets were transformed into a structured SQLite format.

Data Source	Origin	License	Copyright
CO ₂ e Prices	Umweltbundesamt	§ 12a EGovG	© 2024 Umweltbundesamt
Global Emissions	The EU / EDGAR	CC BY-NC-ND 4.0	© European Union, 1995-2024

Table 1: Origin, License and Copyright Notices of the Used Data Sources

The publishers of the data are the EU / EDGAR (Emissions Database for Global Atmospheric Research) [1] and the German Federal Environment Agency (Umweltbundesamt). They both require to have appropriate credit given, which is done by stating their name, a link to their license and a copyright notice.

The **CO₂e Prices** data lists the price of CO₂e certificates at distinct days since 2008 up until 2023. The **Global Emissions** data contains information on global emissions per country and sector per year since 1970 up until 2022. Emissions are registered in MtCO₂e (Megatons of CO₂e).

3 Analysis

This section tries to analyze the previously presented data sources and deduce from them whether CO₂e emissions are impacted by the EU ETS and if there's a correlation between CO₂e certificate prices and decreasing CO₂e emissions.

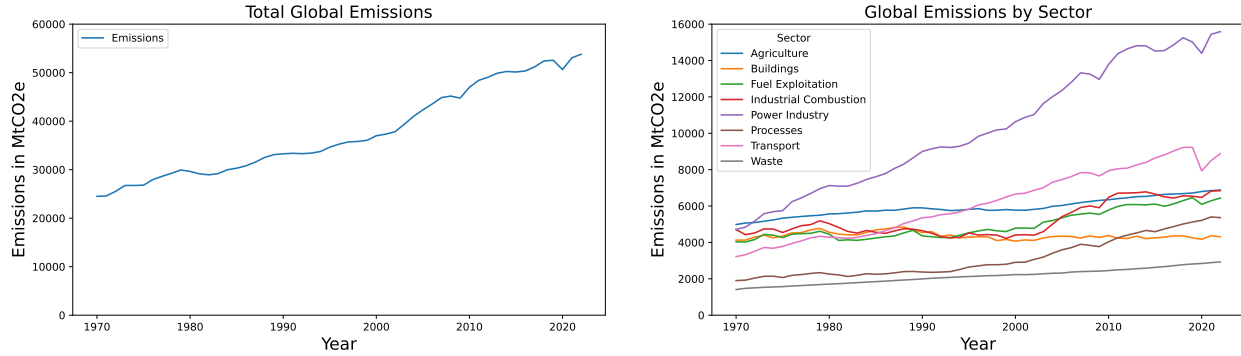


Figure 1: Global emissions are on the rise (left). The sectors that emit the most emissions are *Power Industry* and *Transport* (right).

EDGARs global emissions dataset tracks emissions starting in 1970 (see Figure 1). Emissions were measured at approximately 25.000 MtCO₂e in 1970 and grew steadily by 119 % up to 54.000 MtCO₂e in 2022. The two sectors, which caused the most emissions, are *Power Industry* and *Transport* with a share of 41.7 %. The EU ETS tries to regulate exactly these sectors, which seems intuitive as there is a large potential to reduce emissions.

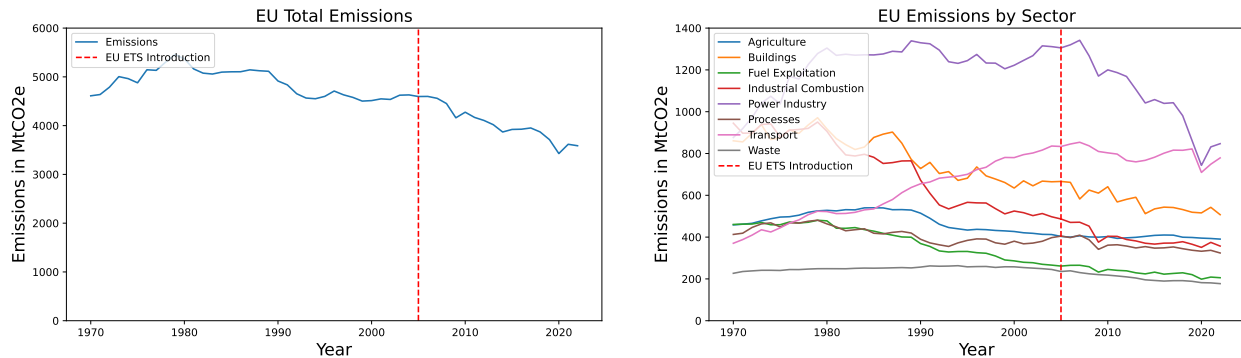


Figure 2: Emissions in the European Union are falling (left). The *Power Industry* sector has the most impact and is the most decreasing (right).

While CO₂e emissions are rising globally, this is not the case for emissions of the European Union (see Figure 2). Quite the opposite is true, as emissions seem to be decreasing since the 1980s. This decrease is especially steep after 2005, the year in which the EU ETS was introduced. In contrast to

the 15 year time period from 1990-2005, in which emissions could be reduced by 6,47 %, emissions were decreased by 21,97 % from 2005-2020. As the EU ETS tries to regulate the *Power Industry* sector, which decreased the most of all other sectors since 2005, it appears that it really has an impact on EU emissions.

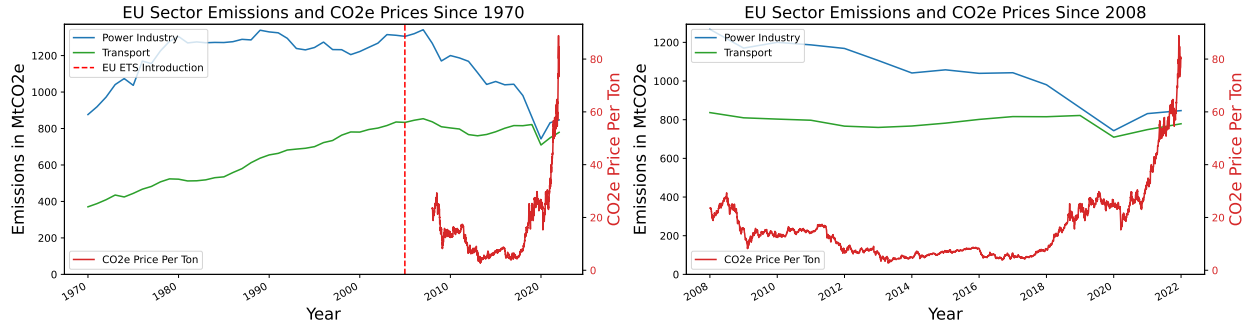


Figure 3: Emission history of the sectors *Power Industry* and *Transport* in the EU since 1970 (left) and 2008 (right) in conjunction with CO₂e prices.

If the EU ETS and thus setting prices on emitting CO₂e really impacts emissions, a correlation between the emission volume and CO₂e price should be visible. The German Federal Environment Agency published CO₂e price data ranging from 2008-2023. In this time span the price per ton of emitted CO₂e increased from 23.54€ to 78.72€. Since the introduction of the EU ETS, emissions in the *Power Industry* sector decreased by 35.12 % and 6.54 % in *Transport*. As the EU ETS foresees that each year gradually less CO₂e certificates are allocated and the price of CO₂e certificates stayed rather low since 2005, this indicates that companies were able to reduce their CO₂e emissions and did not have to pay extra for emitting more than allowed [3]. The relatively extreme rise of CO₂e prices since 2018, however, shows that the approach of decreasing CO₂e allowances might not always lead to a decrease in emissions. This is because companies might not be able to cap their CO₂e emissions fast enough and thus emit more than allowed. Still, if the EU ETS prevails, CO₂e emissions should again fall in response to these high prices in the future.

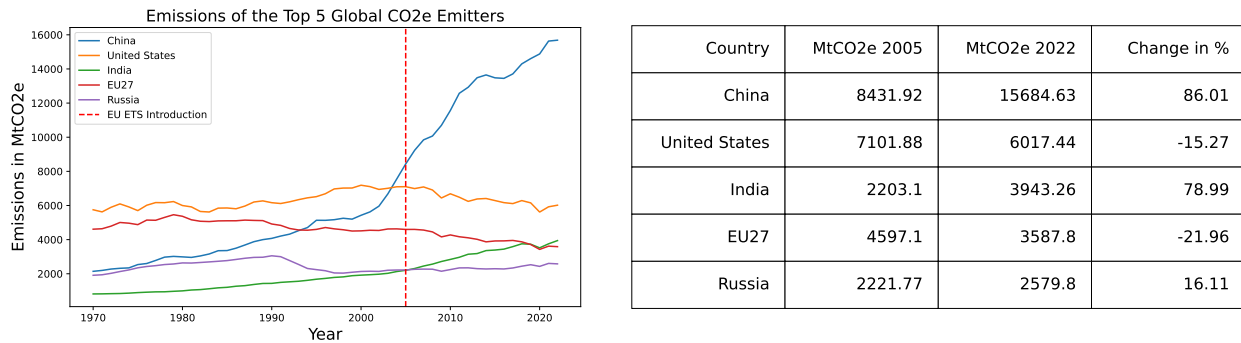


Figure 4: Of the top 5 global emitters only the US and EU were able to reduce emissions as of 2005.

Compared to the top five global emitters, the European Union is the one that was able to decrease its emissions the most (see Figure 4). The amount of CO₂e emissions the EU decreased, however, does not compensate the increase of emissions of other large states. Particularly Chinas emission increase of 7.252 MtCO₂e since 2005 overshadows the EUs emission decrease of 1010 MtCO₂e significantly.

4 Conclusion

Comparing the CO₂e prices, which stem from the regulation attempts of the EU ETS, to the CO₂e emission volumes of the sanctioned sectors *Power Industry* and *Transport* showed, that there is a direct connection between the two. Due to this, the EU was able to decrease their CO₂e emissions significantly since 2005, in fact since the 1980s. This decrease might arise additionally from other environmental policies that the EU introduced in the last decades. In spite of the efforts that went into decreasing EU emissions, however, global emission numbers are still rising.

To be able to tackle the issue of CO₂e emissions, the commitment of the EU alone will not be sufficient. Introducing emission trading systems like the EU ETS in other states will be necessary to make a global impact, and is also already done [2].

The question whether the EUs efforts towards decreasing CO₂e emissions also have an impact on global emissions could be answered - they have seemingly no large impact. While emissions are decreasing in the EU, they are still rising globally.

The EU ETS is seemingly connected to falling CO₂e emissions since 2005. However, there are still a lot of other factors that influence CO₂e emissions other than the EU ETS. Without information on the exact numbers on CO₂e certificate allocations and knowledge on additional environment policies, an accurate correlation between CO₂e prices and CO₂e emissions can not be safely determined.

Additionally the data on global emissions was published by the European Union through EDGAR. The EDGAR database claims to be independent and use data provided by European member states, as well as data provided by parties of the United Nations Framework Convention on Climate Change (UNFCCC) [1]. While EDGAR is internationally recognized, its data is originally raised by different states through possibly very different measuring techniques. This could cause the data accuracy to vary drastically between states. Additionally, states could be able to influence the data they provide according to their political interests.

References

- [1] *EDGAR - Emissions Database for Global Atmospheric Research*. <https://edgar.jrc.ec.europa.eu/>. Accessed: 29.06.2024.
- [2] *Emissions Trading Worldwide: 2022 ICAP Status Report*. <https://icapcarbonaction.com/en/publications/emissions-trading-worldwide-2022-icap-status-report>. Accessed: 30.06.2024.
- [3] *What is the EU ETS?* https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets/what-eu-ets_en. Accessed: 25.06.2024.