

Climate change and carbon pricing policies -An analytical study on Emissions Trading Scheme-

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Abstract:

The purpose of this study is to understand the mechanisms of the carbon exchange among global carbon pricing policies adopted to mitigate GHG greenhouse gas emissions. Indeed, the last decades have been marked by serious problems of climate change due to the rate of pollution generated by human activities. In order to remedy this, the international community has tried to find solutions through several aspects: environmental, social but also economic (sustainable finance, green bonds, carbon pricing policies, etc.).

Consequently, the carbon market is responsible for a certain reduction in GHGs, despite its novelty; however, several constraints still exist such as those of carbon leakage and free quota allocations.

Keywords: Emissions Trading Scheme, Carbon tax, Carbon Exchange, Kyoto protocol.

Jel Classification Codes: Q56, Q57 ,Q58.

1. INTRODUCTION

The most recent health crisis successfully demonstrated the harmful effects of greenhouse gases. Indeed, after months of containment, transportation, and various types of traffic disruption, the most significant hole in the ozone layer has been sealed. The international community has always been present to raise awareness and act against the consequences of climate change (increased global average temperature, desertification, water scarcity, severe storms, rising sea levels, and flooding), primarily through the organization of several conferences and protocols to implement the goals of the United Nations Framework Convention on Climate Change.

As a result, several sustainable development programs have been organized to mitigate these climate changes by reducing greenhouse gas emissions by substituting fossil energies for renewable energies, and returning to reforestation activities to compensate for the surplus of gas released into the atmosphere (Benhenni & Ziad, 2022, p194). However, the issue of funding various sustainable development projects has arisen. Thus, our research aims to understand the mechanisms of carbon exchange in order to reduce global greenhouse gas emissions and, as a result, contribute to the achievement of the goals of sustainable development, which leads us to ask the following questions:

- What is the contribution of the Carbon Exchange in reducing GHG emissions?
- What are the carbon pricing policies?
- How does an emissions trading scheme work?
- What are the limits of this new financing method?

To begin our research, it is necessary to consider the following hypothesis: Carbon trading is the most flexible way among world's carbon pricing policies.

This study is organized around three essential axes to answer the questions and verify our hypothesis: the first axis will be devoted to the fundamental international climate change conventions and conferences, the second axis will evoke the instruments of the carbon pricing policy, and the

last axis will focus on the characteristics and overview of the carbon market, where we will explain its functioning, its different actors, some real figures, and finally on its limits and existing constraints.

2. Literature review:

Among the closest studies, we have:

“The impact of CO₂ emissions trading on firm profits and market prices,” by Robin Smale et al. (2006), is an important study on our topic.

Following a large free allocation of allowances, an oligopolistic market study on the following five sectors was conducted to assess the impact of emissions trading on the competitiveness of European industries: cement, newsprint, steel, aluminum, and oil. According to the findings, most participating sectors should benefit overall, though steel and cement may lose market share and aluminum may close.

“The Effectiveness of the EU Emissions Trading Scheme” by Stefano Clo’s (2009) seeks to assess the effectiveness of the EU ETS and clarify how efforts are distributed across sectors. The study’s findings revealed a relative inefficiency in allowance over-allocation, an increase in funding from ETS sectors to other sectors, too many subsidies to ETS sectors, and, as a result, a distortion of competition.

“Reduction of inequalities and ecological transition, the example of carbon pricing,” written by Olivier De Schutter (2022), explains the importance of carbon pricing and its contribution to achieving sustainable development goals. The question of how to use the revenues from this pricing was spread out by giving several real-world examples from a few countries, such as Sweden and Canada. However, the study found that the revenues collected only cover 20% of the amount of greenhouse gas emissions, pending a global price review on a global scale.

3. Flagship Conventions on Climate Change:

3.1 Kyoto Protocol (COP 3):

In response to the United Nations Framework Convention on Climate Change (UNFCCC) proposal in 1992, the 180 states’ negotiators established the Kyoto Protocol in December 1997, known as COP3 (Third Conference of Parties). This protocol aimed to reduce emissions of six greenhouse gases (carbon dioxide, methane, nitrous oxide, and three

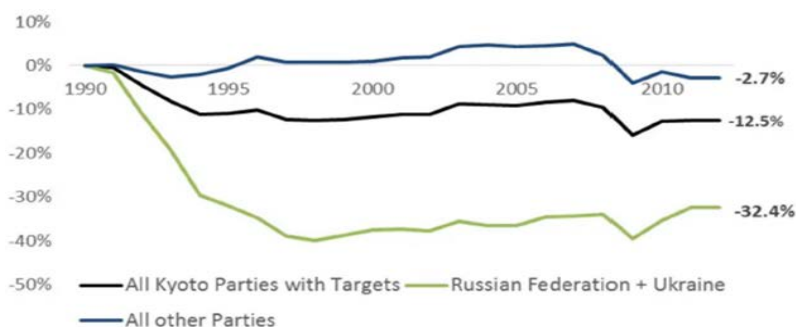
Climate change and carbon pricing policies **-An analytical study on Emissions Trading Scheme-**

substitutes for chlorofluorocarbons) by at least five times the 1990 level for the world's 38 most industrialized countries between 2008 and 2012. (Alberola & Fages,2009, p66)

It should be noted that the protocol did not require reduction targets until the ratifying countries accounted for at least 55 percent of global emissions in 1990. (Fig.1).

Russia, like the majority of countries, signed the protocol in 1999. However, it was not ratified until November 18, 2004, when clause 55 of the 1990 global emissions was fulfilled. It is why, in 2012, the total number of protocol member countries decreased from 2.7 to 12.5. In other words, this rate was achieved due to Russia and Ukraine's significant reductions in emissions. As a result, the treaty was ratified, and entered into force on February 16, 2005, for a four-year initial commitment period (from 2005 to 2009).

Fig.1. Kyoto Protocol Carbon Emissions (1990-2012).



Source: (Circular Ecology,2015)

3.2 The Copenhagen Accord (COP 15):

The international conference of Copenhagen, held in December 2009, gathered delegations from 193 states to continue the roadmap for the post-Kyoto period (post-2012), i.e., the period 2013-2020. After the discussions, there were real power struggles. Indeed, the United States (the world's second-largest CO₂ emitter), which had not ratified the Kyoto Protocol, proposed reducing its emissions by 17 percent below 2005 levels by 2020, equivalent to 4 percent below 1990 levels below the Kyoto targets. Nonetheless, the US opposed establishing a binding agreement involving

penalties for non-compliance with the targets, causing disappointment. (2015) (Energy Knowledge). Nonetheless, developed countries agreed to establish the Green Climate Fund, which will transfer \$100 billion from the most developed to the most vulnerable countries to mitigate the effects of climate change as early as 2020.

3.3 The Paris Agreement (COP 21):

The Paris Agreement, which, like the Copenhagen Accord, replaces the Kyoto Protocol for the post-2020 period, was held on December 12, 2015 (United Nations, 2015) and entered into force on November 4, 2016, with delegations from 196 countries, including the European Union, in attendance. The Paris Agreement establishes a global trajectory similar to previous agreements, limiting global warming to 2°C above 1850. It goes on to say that states' efforts must be stepped up to keep the overall temperature increase to 1.5°C. Furthermore, it highlights new elements, such as mobilizing other non-state actors, such as civil societies, cities, investors, financial institutions, businesses, and the private sector, for more decisive climate action (SDES, 2021).

The Paris Agreement also provides more flexibility to parties in the form of NDCs (Nationally Determined Contributions), which are national efforts tailored to each country's circumstances. Furthermore, it proposes that developed countries transfer \$100 billion to developing countries each year beginning in 2020 to ease the transition. Establishing a five-year cycle of upward revision of parties' commitments is also on the agenda. Following that, several countries filed NDCs with the UN, including Switzerland, which plans to reduce emissions by 50 percent by 2030, China by 60 to 65 percent by 2030, the United States by 26 percent by 2025, India by 33 percent by 2030, and the European Union by 40 percent by 2030.

3.4 The Sharm El-Sheikh Conference (COP 27):

The Sharm El-Sheikh Conference, which took place in Egypt between November 6 and 18, 2022, brought together delegations from 196 countries. This conference's main challenge is encouraging all countries to implement a carbon tax to reduce greenhouse gas emissions. According to federal Environment Minister Steven Guilbeault, the global challenge is for

Climate change and carbon pricing policies **-An analytical study on Emissions Trading Scheme-**

carbon pricing to cover 60 percent of global greenhouse gas emissions by 2030, up from only 20 percent currently.

However, the issue of climate debt was brought up. The goal set in 2009 was to transfer \$100 billion from developed to developing countries by 2020. The positioning of emerging countries such as India, China, and Indonesia has been revised to increase the financing rate, allowing it to exceed the \$100 billion pledged in 2009 (United Nations, 2022).

4. Carbon pricing policy instruments:

Carbon pricing policies are divided into two categories to reduce GHG emissions: the carbon tax and the quota system.

4.1 The carbon tax:

The carbon tax arose from an idea proposed by economist Arthur Cecile Pigou in 1920 to quantify the costs of negative externalities of goods and services. Thus, this tax is a fiscal measure that imposes a tax on each ton of CO₂ emitted and primarily affects fossil fuels such as petroleum products, coal, natural gas, and fuel oil (Insee, 2016).

In other words, this ecotax, inspired by the polluter-pays principle, is incorporated into the final price of any goods or services that emit greenhouse gases to encourage businesses and individuals to consume in a clean and sustainable manner. It was first used in Nordic countries such as Finland in 1990, then Norway and Sweden in 1991, and Denmark in 1992. (World Bank, 2017).

Table 1. Adoption of carbon taxes.

1990	Finland & Poland	2010	Ireland, Iceland & India
1991	Switzerland & Norway	2012	Australia
1992	Denmark	2013	UK
1995	Latvia	2014	France, Mexico & Australia
1996	Slovenia	2015	South Africa & Portugal
2000	Estonia	2016	Canada
2008	Switzerland	2017	Alberta, Chile, Colombia Singapore

Source: (World Bank, 2017, p 29).

The various European Union carbon tax proposals presented between the 1990s and the 2000s did not receive Member State support, which eventually led to the Kyoto Protocol's creation of emission allowance

systems (markets or carbon exchange) as an alternative solution in the framework of carbon pricing policies. However, since the late 2000s, and following the adoption of the Swiss carbon tax in 2008, several European countries, including the United Kingdom (2013) and France (2014), as well as other developed countries, such as Australia (2012), and emerging countries, such as Mexico (2014) and Singapore, have adopted the tax (2017).

4.2 Emissions Trading Scheme:

The emissions trading scheme, also known as the “carbon market,” was established by the Kyoto Protocol in 2005 and is the second instrument for combating pollution and global warming, thanks to a mechanism that allows CO₂ emission rights (or rights to pollute) to be traded in the same way as financial securities. Indeed, this emissions trading scheme is one of the Kyoto Protocol’s three flexibility mechanisms, namely (GERES, 2012, p03):

- Emissions trading system (tradable permits): known as a carbon market or exchange (more details will be discussed in the following sections)

- Joint Implementation (JI): a mechanism by which a Kyoto Protocol signatory country invests in a GHG emission reduction project in the territory of another signatory country.

- Clean Development Mechanism (CDM): a mechanism by which a signatory country to the Kyoto Protocol invests in a project to reduce GHG emissions in a developing country.

However, the carbon market is divided into two types: regulated and voluntary.

- The regulated market: is established under the auspices of the Kyoto Protocol and must be implemented by signatory countries, with each effective emission reduction resulting in a credit.

- The voluntary market: is created and regulated outside of the Kyoto Protocol by individuals and businesses who have chosen to do so voluntarily, and each effective emission reduction yields a credit. This market is distinguished by a lower administrative burden and is accessible to small project developers.

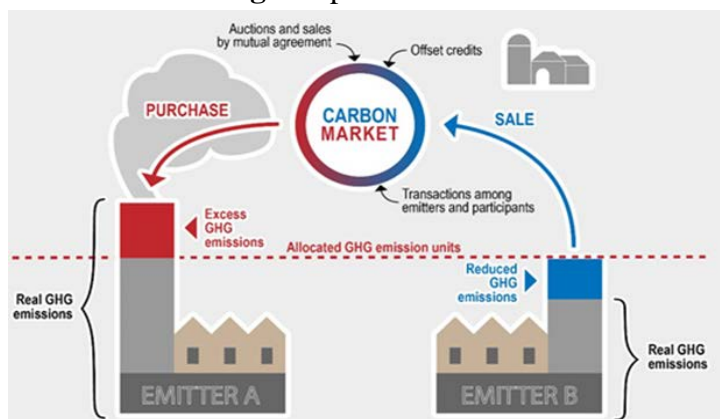
5. Characteristics and overview of the carbon exchange:

5.1 Operation of the Carbon Market:

The carbon exchange or Emissions Trading Scheme (ETS), also known as Cap and Trade, entails (World Bank, 2014) capping a government institution's total amount of greenhouse gas emissions and then converting it into emission allowances, with each allowance equal to one ton of CO₂. The allowances are distributed among companies and sectors, allowing them to pollute without exceeding or facing heavy fines. (Boudada,2021, p419)

The balance of allowances/emissions is calculated at the end of the year. As a result, the less polluting companies have the right to keep the excess allowances for future needs, as they can sell these unused emission allowances to other more polluting industries directly or through stock exchanges. (fig 02)

Fig.2. Operation of the Carbon Market.



Source : Ministry of the Environment, (n.d), The Carbon Market, a Green Economy Growth Tool!, consulted on 04-01-2023, available on :

https://www.environnement.gouv.qc.ca/index_en.asp

5.2 Carbon Exchange Stakeholders : The carbon market, like any other, has many participants :

5.2.1. Purchasers of CO₂ assets: typically include actors seeking to increase their carbon emissions due to increased industrial activity, such as governments in Kyoto Protocol signatory countries seeking to compensate

for exceeding their targets (Dominicis, 2006). We can also note companies that are required to reduce their emissions and are committed to a voluntary approach. We have financial investors who make capital gains by speculating on asset prices.

5.2.2. Sellers of CO2 assets: are actors seeking to reduce their carbon emissions, such as government institutions in an initial market sale, but also sales on secondary markets by financial investors and companies with excess unused emission allowances. (Sandra, 2020, p 301)

5.2.3. Carbon financial assets: publicly traded securities which there are: (Aldrich & Koerner, 2012, p 230)

- AAU (Assigned Amount Unit) : is the instrument that designates the unit of measure representing all greenhouse gases recognized by the Kyoto Protocol comprising "one metric tonne of carbon dioxide equivalent, calculated using global warming potentials"

- ERU (Emission Reduction Unit) : it is the trading instrument reserved for developed countries under the Joint Implementation (JI), no southern country can access this type of instrument, because the (JI) mechanism had no north-south dimension.

- CER (Reduction Certificated Emission) : It is the trading instrument reserved for the voluntary carbon projects.

5.3 Overview of global carbon markets:

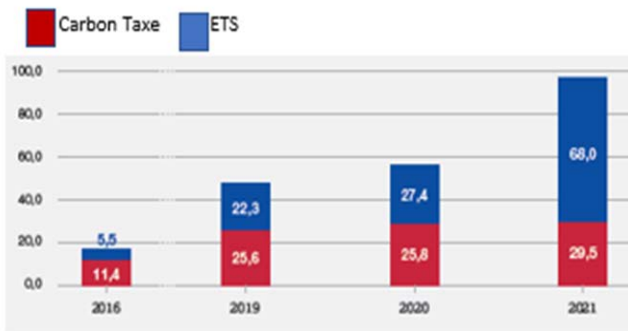
In 2020, some 30 global carbon markets were operational in addition to 31 other carbon taxes (SDES, 2021, p 63), this year was marked by the introduction of the carbon pricing policy by three countries: South Africa, Canada and Singapore.

Since August 2022, there have been 68 pricing mechanisms between taxes and quotas as several markets have seen the day like: Canada (New Brunswick ETS), USA, and finally Austria, which just launched its carbon market for transport and heating of buildings in July, without forgetting the European market, which has committed to reduce its overall emissions by 20% compared to 1990, 40% and 55% by 2030.

Indeed, carbon revenues increased significantly from USD 16.9 billion in 2016 to almost 100 billion USD in 2021. (fig 03)

Climate change and carbon pricing policies -An analytical study on Emissions Trading Scheme-

Fig.3. Overall Evolution of carbon revenues (billion \$)

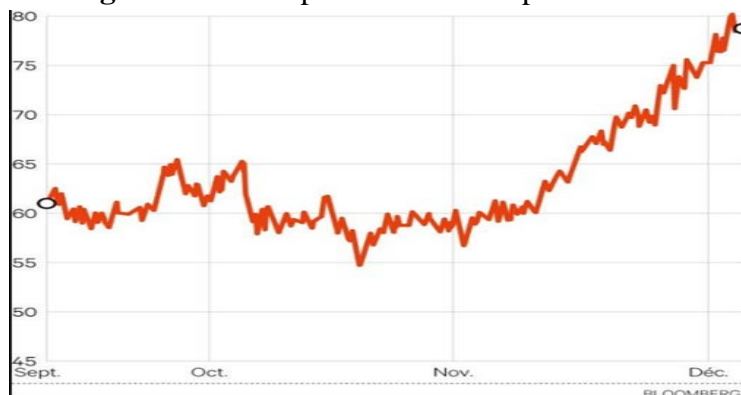


Source: (Poupard & al, 2022, p 08)

It must be said that the European market alone has experienced an increase in the price of its assets, which went from \$32/t CO₂ to \$72/t CO₂ in just one year (2021/2022), to beat a new historical record to €80 (\$87) in late December (fig 04), following several factors such as: (Poupard & al, 2022, p 08)

- The post-covid economic recovery;
- The Cold Spell of Winter 2021;
- The war between Russia and Ukraine that will push the use of coal as a result of rising gas prices.

Fig.4. The carbon price on the European market.



Source: (Heilmann, 2021)

Nevertheless the economic crisis of 2008 caused a significant drop in the price of assets on the stock exchanges which went below 6 €/t, because the crisis led to a decrease in the activity of companies and therefore

mechanically emissions, whereas the price should exceed 20 euros for the system to be effective.

Thus in order to correct the malfunctions of the carbon market, the European Union has conducted several reforms of the ETS among which there was the creation of a market stability fund MSR (Market Stability Reserve) in order to be able to withdraw or place excess quotas in the event of a decline in economic activity.

Indeed, in 2015, the European Union was forced to withdraw 900 million surplus quotas from the market and placed them in the MSR, in addition to suspending 60% of the free allocations to companies, in order to raise the price of the quota to above the €30/t threshold allowing the carbon price to have a truly dissuasive effect. (European Council, 2015)

5.4 Constraints and limitations of the carbon exchange:

Carbon leakage and free emission allowances are the two main constraints to carbon trading. The problem of carbon leakage arises when countries climate change mitigation policies are not coordinated. As a result, companies and industrialists prefer to relocate from regions with strict climate policies to others with less strict policies to maintain competitiveness (WTO, 2022).

Indeed, the European Union has recently raised the issue of border carbon pricing in response to the lack of global coordination of climate policies, particularly concerning carbon pricing, which has deteriorated corporate competitiveness.

Another flaw in the carbon market is the distribution of free quotas by governments to specific sectors under the guise of preserving their competitiveness; however, the original goal of this market was to encourage industrialists to decarbonize their activity according to the polluter-pays principle, not to receive free rights to pollute, which necessitates a strong reinforcement of the entire system on a global scale.

6. Conclusion:

The purpose of this study was to understand the mechanisms of the carbon trading among the global carbon pricing policies adopted to mitigate greenhouse gas emissions.

Climate change and carbon pricing policies **-An analytical study on Emissions Trading Scheme-**

Indeed, the economic component has made significant contributions to the environmental issue of climate change mitigation, primarily through green finance and its various instruments (green bonds, green funds, green monetary and fiscal policy).

This work has focused on the carbon trading, from which we deduce the most important results and suggestions:

6.1 Study results:

The carbon trading is more flexible and tolerated by institutions than the carbon tax, because the latter directly impacts the purchasing power of the poorest.

On the other hand, the carbon market is more flexible because it allows companies to choose between reducing their GHG emissions and selling their unused emission allowances, or buying additional allowances to cover their excess emitted emissions, which proves the validity of our hypothesis.

Although it is a new financial market, the carbon exchange has proven itself despite the abovementioned constraints. As a result, to achieve the objectives of sustainable development while also allowing the carbon price to have a dissuasive effect and effectively contribute to the reduction of greenhouse gases, we propose the following recommendations:

6.2. Suggestions:

- A- International coordination to set a price floor to keep industries competitive and eliminate carbon leakage.
- B- The creation of several reserve funds around the world, such as the European MSR (Market Stability Reserve), to stabilize the price of carbon in the event of a crisis or a drop-in economic activity.
- C- Phasing out free allowances to prevent carbon leakage.
- D- The need for an upward revision of carbon prices above 30 €/t in order to have a dissuasive effect on the reduction of greenhouse gases.
- E- Environmental awareness of citizens from a young age and strengthening the activities of associations and NGOs in the fight against the dangers of climate change.

F- Strengthening the political will of states to combat climate change by establishing effective programs adapted to their situation and in the public interest.

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