JCRECO
Journal of Critical Ecology
JCRECO 1(1): 14–22
ISSN 3048-4200

Institute for Advanced Science, Social and Sustainable Future
MORALITY BEFORE KNOWLEDGE

The role of implementing carbon market scheme and carbon trading as an effort to mitigate climate change

AQIQAH AMALIA NASIR[1]*
[1] *Environmental Engineering, Faculty of Engineering, President University; Bekasi, West Java, 17530, Indonesia*
* Correspondence: aqiqahnasir@student.president.ac.id

Received Date: Accepted Date: December 20, 2023

ABSTRACT
Increasing the amount of greenhouse emissions is a challenge that must be faced considering that these emissions are one of the causes of greenhouse gases, the implementation of carbon markets and carbon trading is an effective effort to implement. **Background:** This journal aims to examine the role of carbon trading and carbon markets in reducing global emissions. **Methods:** The data collection method uses a literature review of reading materials that are relevant to the topic and uses qualitative analysis techniques. **Finding:** From the results of the research it can be seen that the application of an emission trading system is the right thing to implement to reduce carbon emissions, but in its implementation it still requires cooperation from several parties**. Conclusion:** The concept of trade and carbon market is very urgent to be implemented in Indonesia considering the deteriorating environmental conditions that will affect the quality of public health. The implementation of this system can achieve the emission reduction target as committed by Indonesia at the international level.

KEYWORDS: carbon market; carbon trading; climate change; mitigation.

1. Introduction

One of the realities of the modern era is the threat posed by climate change. Droughts, altered rainfall patterns, and other natural calamities started to occur alternately and were recognized as signs that the world in which we now live is beginning to deteriorate. Greenhouse Gas (GHG) concentrations affect global warming which causes climate change (Sutanhaji et al., 2018). The impact of each greenhouse gas on the onset of the greenhouse effect depends on the amount of greenhouse gas in the atmosphere and its energy absorption capacity. Increasing levels of greenhouse gases will increase the greenhouse effect which can cause global warming (Pratama & Parinduri, 2019). Global warming that causes climate change has become an international concern that transcends national borders (Kartika, 2014). Human activities such as industrialization which release greenhouse gas emissions also cause an increase in the earth's temperature. According to a report from the IPCC in the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, it is more than 95% likely that human activities over the last 50 to 100 years caused an increase in the earth's temperature (IPCC, 2022). The negative impacts of climate change should not be underestimated. The negative impacts can include reduced profits and the cost of repairing facilities and infrastructure damaged by climate change. The losses caused by climate change are quite significant in monetary terms (Irama,

Cite This Article:
Nasir, A. A. (2024). The role of implementing carbon market scheme and carbon trading as an effort to mitigate climate change. *JCRECO: Journal of Critical Ecology*, 1(1), 14-22. https://doi.org/10.61511/jcreco.v1i1.659.

2020). If it is estimated, losses due to climate change can reach 8 billion USD every day, this amount comes from medical expenses for diseases, inability to work, and the need for medical equipment (Lavietes, 2020). The issue of climate change which has long been a global issue must get attention from the government. Global competition in handling this issue is one of the main keys to sustainable development in Indonesia in the future. The latest news reports from international financial institutions and mass media show climate change as a crucial economic sector in the future (Kunarto et al., 2022).

Climate change cannot be separated from carbon emissions. Efforts to reduce carbon emissions are efforts to prevent or reduce the negative impacts of climate change. Realizing the risks that arise, developed countries have already tried to manage carbon emissions. However, developed countries cannot solve environmental problems alone, while developing countries continue to destroy nature through deforestation, destruction, water and air pollution, and others. Integrated cooperation between the two parties is required (Pujayanti, 2012).

Therefore, countries continue to develop solutions at conferences, and the terms "carbon markets" and "carbon trading" are used as tools to fight climate change by reducing carbon emissions generated by all activities in all countries. This journal aims to examine the role of carbon trading and carbon markets in reducing global emissions.

2. Methods

The technique of collecting data from this journal is to use a literature review to unravel relevant concepts and theories in explaining the role of implementing carbon market schemes and carbon trading to mitigate climate change. The sources of data and information in this paper are various journals, official reports, as well as credible and reliable sources of electronic media regarding the implementation of carbon market schemes and carbon trading. The data analysis technique used is qualitative analysis, which is a way of analyzing data based on concerns, theories, laws and regulations, expert views, or their views which will try to analyze existing problems related to environmental law enforcement in Indonesia and contribute to the form of solutions to overcome these problems.

3. Results and Discussion

3.1 The history of carbon market and carbon trading

Long before the carbon market scheme began to be discussed by countries in several conferences, the term carbon offsets first appeared in the 1970s, exactly 8 years before the signing of the Kyoto Protocol. The first case that emerged was in applied energy services, an American electric power company, that decided to fund an agriforest in Guatemala to offset the emissions of a coal-fired power plant in Connecticut, making this case the first-ever carbon offset program.

Then, as an effort by each country to fight environmental problems, the Earth Summit was born which was held in Rio de Janeiro in 1992, and in 1997, the Kyoto Protocol was formed which was a continuation of the Earth Summit, in the Kyoto Protocol the concept of Clean Development Mechanism (Clean Development Mechanism) was born (Setyaningrum, 2015). The Kyoto Protocol aims to maintain GHG concentrations in the atmosphere at a level that does not endanger the Earth's climate system. This goal will be achieved if the Protocol regulates the implementation of emission reductions by industrialized countries by 5% below 1990 levels in the period 2008-2012 (Pradita, 2017). One form of CDM application is to carry out Carbon Trade. Carbon trading is a market-based mechanism that allows for the negotiation and exchange of GHG emission rights. The

market mechanism regulated in the Kyoto Protocol can occur on a national or international scale as long as equal rights of negotiation and exchange can be allocated to all market actors involved (*Sekilas Tentang Perubahan Iklim*, 2007).

At the end of 2015 in Paris, France, the 21st Conference of the Parties of the UN Agency for Climate Change (UNFCCC) was held. At the conference, a global agreement was agreed upon called the Paris Agreement (Paris Agreement) to compel all countries in the world to contribute to keeping global warming not exceeding 2 degrees Celsius. The Paris Agreement will be the basis for controlling climate change post-2020, namely after the end of the implementation of the Kyoto Protocol. Indonesia has ratified the Paris Agreement and is committed to contributing by reducing national GHG emissions in 2030 by 29% below emission levels without mitigation efforts (business as usual, BAU). If you get international assistance, this contribution can be up to 41% below the BAU level (Patrianti & Shabana, 2020). This has been legalized in the Law of the Republic of Indonesia Number 16 of 2016 concerning the Ratification of the Paris Agreement to The United Nations Framework Convention on Climate Change (Law Number 16 Year 2016). The utilization of carbon markets and carbon trading is one of the things regulated in the Paris Agreement. One of the effective policy instruments to increase climate change mitigation efforts is the carbon market scheme (Djaenudin et al., 2018).

3.2 The difference between the carbon market and carbon trading

The terms carbon market and carbon trading are two different things. Although related to each other, these two terms have fundamental differences and are often used interchangeably. The difference between these two terms has been listed and explained in Presidential Regulation No. 46 of 2008 Presidential Regulation No. 46 of 2008 concerning the National Council on Climate Change carbon trading is defined as "the activity of buying and selling certificates of reducing carbon emissions from climate change mitigation activities". There is a clear difference between the terms “carbon market” and “carbon trading” in that the market is the cause of trade.

3.3 Implementation of carbon market scheme and carbon trading

Trading of carbon emissions is something that has become an important requirement for the sustainability of ecosystems on Earth. This application is not without reason, but considering environmental conditions and environmental quality degradation due to carbon emissions produced by each activity requires the implementation of an emission trading system. The trading system is also known as the Emission Trading System (ETS) or the cap-and-trade system and is generally a mandatory carbon market formed based on a policy of limiting or reducing greenhouse gas emissions (Carbon Market Watch, 2017). There are two economic instruments for controlling the amount of emissions, namely tax-based instruments (carbon taxes) and market-based instruments, especially ETS. Under ideal conditions, both types of instruments produce the same output. The ETS can be chosen if the government wants to prioritize the certainty of emission reduction targets. This is quite by the condition of Indonesia which is required to meet the emission reduction target in the NDC. Conversely, a tax-based instrument may be chosen if the government wants to be more certain of the magnitude of the reduction costs (OECD, 2021). In the carbon market, what is traded is the right to greenhouse gas emissions in tons of CO2 equivalent (ton CO2 equivalent). The right here can be in the form of the right to release greenhouse gases or the right to reduce greenhouse gas emissions. Meanwhile, the types of greenhouse gases that can be traded on the carbon market are generally the six types of greenhouse gases listed in the Kyoto Protocol1, which include carbon dioxide (CO2), methane (CH4), nitric oxide (N2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF6) (IEA, 2022). The implementation of ETS as well as

the carbon market in general, aims to reduce greenhouse gas emissions as efficiently as possible. An example of the calculation in its implementation is as follows.

Industry A and Industry B are subject to a 30% emission reduction obligation from the government. Initial emission of A is 600 tonnes of CO2 and B 400 tonnes of CO2. Thus, A must reduce emissions by 180 tons and B by 120 tons. After conducting a study of the potential and costs of reducing emissions, the profiles of emission reduction costs for A and B are obtained in Table 1 below.

Table 1. Number of receptors in each container

Industry	First 50 tonnes	Second 50 tonnes	Third 50 tons and so on
A	Rp100.000/ton	Rp200.000/ton	Rp500.000/ton
B	Rp100.000/ton	Rp100.000/ton	Rp300.000/ton

(IEA, 2022)

From these data, if there is no carbon market option, Industry A will have to pay Rp55.000.000 and B will cost Rp16.000.000. The total cost of issuance is Rp71.000.000. Meanwhile, if the carbon market is implemented, industry A will only carry out 100 tons of emission reduction itself and buy the rest from B. Taking into account a trade profit of Rp50.000/ton, then A must pay Rp43.000.000 and B Rp12.000.000. Thus, the total cost of reducing emissions with the carbon market is Rp55.000.000. Calculation details can be seen in the following Table 2.

Table 2. Example of a details calculation of emission reduction cost

Industry	Emission reduction	Emission reduction cost	Purchase /[sale]	Total cost
[A]	[B]	[C]	[D]	[C+D]
		Without carbon trading options		
Industry A(target 1800 tonnes)	180 ton	= (50 ton x Rp. 100.000/ton) + (50 ton x Rp200.000/ton) + (80 ton x Rp500.000/ton) = Rp55.000.000		Rp55.000.000
Industry B (target 120 tonnes)		= (100 ton x Rp16.000.000 100.000/ton) + (20 ton x Rp300.000/ton) = Rp16.000.000		Rp16.000.000
Total emission reduction costs of Industry A and Industry B				Rp71.000.000
		With carbon trading options		
Industry A (target 180 tonnes)	100 ton	= (50 ton x Rp100.000/ton) + (50 ton x Rp200.000/ton) = Rp15.000,00	= 80 ton x Rp350.000 = Rp. 28.000.000	Rp43.000.000
Industry B (target 120 tonnes)	200 ton	= (100 ton x Rp100.000/ton) + (100 ton x Rp300.000/ton) = Rp40.000.000	= 80 ton x Rp [350.000] = Rp. [28.000.000]	Rp12.000.000

(IEA, 2022)

The example above is one of the proofs that implementing carbon markets and ETS can be cost-efficient as a climate change mitigation effort. Although Indonesia is still in the stage of adaptation to this system and is relatively left behind by countries that have carried out trading transactions of carbon emissions. Emissions trading systems (Emission Trading System/ETS) have been operating in several countries, including the European Union since 2005, Switzerland since 2008, New Zealand since 2008, and Kazakhstan since 2013. Then, Korea in 2015, Australia in 2016, Canada in 2019, China and Mexico in 2021. China has conducted trials in seven provinces since 2013 (Nisa & Suharno, 2020).

3.4 Implementation barriers

Direct carbon trading is the result of the principle of common but differentiated responsibilities, namely that there is a difference in responsibility between parties who are obliged to reduce emissions and those who do not have a direct obligation to reduce greenhouse gas emissions (Maharani et al., 2020). However, one of the key factors that can realize the success of carbon trading practices is the alignment and attention of all implementing parties (Budiman et al., 2020).

The carbon market was built to facilitate countries that wish to compensate for their carbon emissions. This system is also made with the hope that efforts to reduce carbon emissions can be seen as something attractive and profitable, thereby supporting efforts to control global warming. But this market is not without problems. One of the problems faced is regarding environmental integrity (Tampubolon, 2022).

Other matters such as the issue of double counting which has been agreed to no longer be allowed under the Paris Agreement with the existence of a corresponding adjustment after the transfer of mitigation results make the prospects for the international carbon market still less attractive (Fearnehough et al., 2020). This is clearly stated in the Paris Agreement Article 6 paragraphs 4-5 regarding the establishment of a mechanism that will contribute to GHG mitigation and support sustainable development under the authority and guidance of the CMA and its use is voluntary; utilization must avoid the occurrence of double counting (Soejachmoen, 2018).

For the capacity of developing countries, Indonesia has a tough task to strive for the successful implementation of carbon market schemes. Reflecting on the success of the Finnish Government, this success was due to other supporting policies that were built together with carbon market policies (Barus & Wijaya, 2022). Furthermore, Indonesia has many sectors that have the potential to support the implementation of carbon trading. Forests that have a protective function have the potential to contribute to emission reduction efforts. It is considered that forest management with a protective function for emission reduction will be more effective if the surrounding community is involved in the decision-making mechanism (Alviya et al., 2018). If we compare the potential between developed and developing countries, the forestry sector provides enormous opportunities for developing countries that own forests or forest lands like Indonesia (Murdiyarso, 2018).

Another problem is the matter of pricing. The problem is that Indonesia's carbon tax price of IDR 30 per kilogram (kg) of carbon dioxide equivalent (CO2e) or an equivalent unit is considered too cheap. Apart from all that, it could be that this is all still a start which can later be adjusted according to the market. The latest World Bank report reveals that the fundraising that can be generated from carbon trading can reach USD 53 billion in 2020 so the funds can be used for green investment (Hidranto, 2021).

Therefore it is necessary to make improvements in the institutional aspect, as well as collaboration and further studies regarding carbon market schemes as well as carbon trading, as well as utilization of potential sectors to support the success of carbon market trading schemes as an effort to mitigate climate change (OJK, 2022).

4. Conclusion

The concept of trade and carbon market is very urgent to be implemented in Indonesia considering the deteriorating environmental conditions that will affect the quality of public health. The emission reduction targets that Indonesia is committed to at the international level can also be achieved by implementing this system. Furthermore, the carbon market and carbon trading system encourage Indonesia to end its dependence on fossil fuels and replace them with renewable and more environmentally friendly fuels. As for its application, cooperation from all stakeholders is required so that its application can be realized effectively and efficiently.

Aknowledgement

In connection with the completion of this research, I would like to thank all those who have provided support and special mention to Dr. Ir. Yunita Ismail Masjud, M.Sc. as a lecturer in the Climate Change and Mitigation course and as a supervisor in making this journal.

Author Contribution

The authors contributed to writing this article.

Funding

This research received no external funding.

Ethical Review Board Statement

Not applicable.

Informed Consent Statement

Not applicable.

Data Availability Statement

Not applicable.

Conflicts of Interest

The authors declare no conflict of interest.

References

Almeida, C. S. de, Miccoli, L. S., Andhini, N. F., Aranha, S., Oliveira, L. C. de, Artigo, C. E., Em, A. A. R., Em, A. A. R., Bachman, L., Chick, K., Curtis, D., Peirce, B. N., Askey, D., Rubin, J., Egnatoff, D. W. J., Uhl Chamot, A., El-Dinary, P. B., Scott, J.; Marshall, G., Prensky, M., … Santa, U. F. De. (2016). The Supplementary Report to The IPCC Scientific Assessment. *Revista Brasileira de Linguística Aplicada*, *5*(1), 1689–1699. https://www.ipcc.ch/report/climate-change-1992-the-supplementary-report-to-the-ipcc-scientific-assessment/.

Alviya, I., Zahrul Muttaqin, M., Salminah, M., & Almuhayat Uhib Hamdani, F. (2018). Community-Based Carbon Emission Reduction Program in Protection Forest. *Jurnal Analisis Kebijakan Kehutanan*, *15*(1), 19–37. https://doi.org/10.20886/jakk.2018.15.1.19-37.

Barus, E. B., & Wijaya, S. (2022). Penerapan Pajak Karbon di Swedia dan Finlandia serta Perbandingannya dengan Indonesia. *Jurnal Pajak Indonesia (Indonesian Tax Review)*, *5*(2), 256–279. https://doi.org/10.31092/jpi.v5i2.1653

Budiman, I., Januar, R., Daeli, W., Hapsari, R. D., & Sari, E. N. (2020). Designing the special pilot economic zone on peatlands. *Jurnal Geografi Lingkungan Tropik*, *4*(1), 1–23. https://doi.org/10.7454/jglitrop.v4i1.73

Carbon Market Watch. (2017). *Policy Briefing: Pricing Carbon to Achieve Paris Goal*. Retrieved from https://carbonmarketwatch.org/publications/policy-briefing-pricing-carbon-achieve-paris-goals/.

Djaenudin, D., Sukandar, Wicaksono, D., Samyanugraha, A., Iqbal, M., Pambudi, R., Aufar, A., & Nathalia, D. (2018). *Peran Instrumen Mitigasi Perubahan Iklim Berbasis Pasar dan Pencapaian Target NDC*. Retrieved from http://perpustakaan.menlhk.go.id/pustaka/images/docs/PERAN%20INSTRUMEN%20MITIGASI%20PERUBAHAN%20IKLIM%20BERBASIS%20PASAR%20DAN%20%20PENCAPAIAN%20TARGET%20NDC.pdf.

Fearnehough, H., Kachi, A., Mooldijk, S., Warnecke, C., & Schneider, L. (2020). *Future role for voluntary carbon markets in the Paris era*. https://www.umweltbundesamt.de/publikationen/future-role-for-voluntary-carbon-markets-in-the%0Ahttps://www.dehst.de/SharedDocs/news/EN/future-role-for-voluntary-carbon-markets.html.

Hidranto, F. (2021). *Perdagangan Karbon Instrumen Baru Pembangunan*. Retrieved from https://indonesia.go.id/kategori/editorial/3415/perdagangan-karbon-instrumen-baru-pembangunan.

IEA. (2022). An Energy Sector Roadmap to Net Zero Emissions in Indonesia. In *An Energy Sector Roadmap to Net Zero Emissions in Indonesia*. OECD. https://doi.org/10.1787/4a9e9439-en

IPCC. (2014). *AR5 Synthesis Report: Climate Change 2014*. Retrieved from https://www.ipcc.ch/report/ar5/syr/.

Irama (2020). Perdagangan Karbon Di Indonesia: Kajian Kelembagaan Dan Keuangan Negara. *Info Artha*, *4*(1), 83–102. https://doi.org/10.31092/jia.v4i1.741.

Kartika, L. A. (2014). *Juridical Review to The Concept of Carbon Trading as International Collaborative in Efforts to Rescue the World from Global Warming* [Skripsi, Universitas Sumatera Utara]. Retrived from https://media.neliti.com/media/publications/15002-ID-tinjauan-yuridis-terhadap-konsep-perdagangan-karbon-sebagai-international-collab.pdf.

Kunarto, Febriharini, M. P., & Solekhan, M. (2022). The Role Of The Community In Enforcement Of Environmental Law. *International Journal of Educational Research & Social Sciences*, *3*(1), 500–508. https://doi.org/10.51601/ijersc.v3i1.301.

Lavietes, M. (2020). *Each day, fossil fuel air pollution costs $8 billion, study says*. Retrieved from https://www.reuters.com/article/idUSKBN2062YP/.

Maharani, A. S., Muhdar, M., & Alhidayah, R. (2020). Penggunaan Certified Emission

Reductions Sebagai Bukti Objek Transaksi Carbon Crediting. *Jurnal de Jure*, *12*(2), 18–31. https://doi.org/10.36277/jurnaldejure.v12i2.467

Murdiyarso, D. (2018). *Perdagangan Karbon Dan Sektor Kehutanan Indonesia.* Retrieved from https://repository.ipb.ac.id/handle/123456789/24719.

Nisa, A. N. & Suharno, S. (2020). Penegakan Hukum Terhadap Permasalahan Lingkungan Hidup Untuk Mewujudkan Pembangunan Berkelanjutan. *Jurnal Bina Mulia Hukum*, *4*(2), 294–312. https://doi.org/10.23920/jbmh.v4i2.337

OECD. (2021). *Indonesia emissions trading system Summary of insights: Focus Group Discussions*. *May 2022*. Retrieved from https://www.oecd.org/environment/cc/cefim/indonesia/Indonesia-ETS-FGD-series-summary-report.pdf

OJK. (2022). *Kolaborasi LPP dengan SJK dalam Mendukung Upaya Disrupsi dan Mitigasi Risiko Terjadinya TPPU terkait Pajak Karbon pada SJK*. Retrieved from https://jdih.ppatk.go.id/storage/dokumen_produk_hukum/Tayangan%20OJK_merged.pdf.

Patrianti, T., Shabana, A., & Tuti, R. WD. (2020). Government Risk Communication on Greenhouse Gas Emission Reduction to Tackle Climate Change. *Jurnal Penelitian Komunikasi dan Opini Publik, 24*(2), 156–170. https://doi.org/10.33299/jpkop.24.2.3416.

Peraturan Pemerintah Pengganti Undang-Undang Nomor 1 Tahun 2008. Menteri Hukum dan Hak Assasi Manusia 6 (2008). http://www.ainfo.inia.uy/digital/bitstream/item/7130/1/LUZARDO-BUIATRIA-2017.pdf

Pradita, S. (2017). Implikasi Ratifikasi Protokol Kyoto terhadap Politik Internasional dan Domestik Indonesia. *Jurnal Analisis Hubungan Internasional*, *6*(1), 181–191. https://repository.unair.ac.id/67769/.

Pratama, R. & Parinduri, L. (2019). Penanggulan Pemanasan Global. *Buletin Utama Teknik*, 15(1), 1410–4520. https://jurnal.uisu.ac.id/index.php/but/article/view/1879.

Pujayanti, A. (2012). Inter-Parliamentary Union (IPU) dan Lingkungan Hidup. *Politica*, *3*(1), 111–133. https://jurnal.dpr.go.id/index.php/politica/article/view/309.

Sekilas tentang Perubahan Iklim. (2005). Retrieved from https://unfccc.int/files/meetings/cop_13/press/application/pdf/sekilas_tentang_perubahan_iklim.pdf.

Setyaningrum, W. (2015). Analisis Yuridis Implementasi Protokol Kyoto Di Indonesia Sebagai Negara Berkembang. *Jurnal Komunikasi Hukum (JKH)*, *1*(2), 185–198. https://doi.org/10.23887/jkh.v1i2.6108.

Soejachmoen, M. H. (2018). Pasar Karbon dalam Persetujuan Paris (Bahan Presentasi). Jakarta, 1 Agustus 2018.

Sutanhaji, A. T., Anugroho, F., & Ramadhina, P. G. (2018). Pemetaan Distribusi Emisi Gas Karbon Dioksida (CO2) dengan Sistem Informasi Geografis (SIG) pada Kota Blitar. *Jurnal Sumberdaya Alam dan Lingkungan*, *5*(1), 34–42. https://jsal.ub.ac.id/index.php/jsal/article/view/266/217.

Tampubolon, R. (2022). Perdagangan Karbon: Memahami Konsep dan Implementasinya. *STANDAR: Better Standard Better Living*, *1*(3), 25–29. http://majalah.bsilhk.menlhk.go.id/index.php/STANDAR/article/view/32.

Undang-Undang Nomor 16 Tahun 2016 tentang Pengesahan Paris Agreement To The United Nations Framework Convention On Climate Change (Persetujuan Paris Atas Konvensi Kerangka Kerja Perserikatan Bangsa-Bangsa mengenai Perubahan Iklim). *Kementerian Sekretariat Negara Republik Indonesia*, 71. https://jdih.setneg.go.id/Produk.

Biographies of Author

AQIQAH AMALIA NASIR, Environmental Engineering, Faculty of Engineering, President University.

- Email: aqiqahnasir@student.president.ac.id
- ORCID: -
- Web of Science ResearcherID: -
- Scopus Author ID: -
- Homepage: -