The challenges of implementing carbon tax in Indonesia

Meilinda Stefani Harefa[*)], Vebry M. Lumban Gaol, Halomoan Sihombing, Sri Ida Royani Simanjuntak, Prans Hotmaringan Hutabarat
Universitas HKBP Nommensen, Medan, Indonesia

Article Info

ABSTRACT

Carbon taxes have proven to be an effective economic instrument in reducing carbon emissions in countries such as Finland, Sweden and Singapore. These countries have not only succeeded in significantly reducing greenhouse gas emissions but also utilised this policy to encourage the transition to clean energy while creating sustainable economic incentives. However, in Indonesia, the implementation of carbon tax has been delayed several times. This study aims to analyse the factors that cause delays in the implementation of carbon tax in Indonesia and expected to provide practical and applicable recommendations to ensure that the carbon tax can be effectively implemented by 2025. This research uses a qualitative approach. Thematic analysis is used to analyse data by reducing various qualitative data to find relevant and meaningful patterns in accordance with the research objectives. The factors that become obstacles in the implementation of carbon tax in Indonesia are unfinished regulations, readiness of digital infrastructure and technology, company dependence on fossil energy, and consideration of Indonesia's economic conditions. Specifically, the gap in digital monitoring technology still under development in terms of funding and human resources represents a significant barrier, causing Indonesia to lose momentum in integrating a low-carbon economy.

Corresponding Author:

Meilinda Stefani Harefa,
Universitas HKBP Nommensen
Email: meilindastefani@uhn.ac.id

Introduction

The carbon tax has become a global concern today due to the increasing awareness of the impacts of climate change and the need to reduce greenhouse gas emissions in order to achieve a sustainable economy. The concept of a sustainable economy emphasizes the importance of economic growth that does not harm the environment and natural resources, while ensuring the well-being of future generations. Countries around the world are starting to see the carbon tax as one of the effective ways to reduce carbon dioxide (CO_2) and other greenhouse gas emissions, with the aim of accelerating the transition to a low-carbon economy and meeting international climate targets as outlined in the 2015 Paris Agreement.

Indonesia is one of the countries that supports efforts to reduce carbon emissions. The adverse im-pacts of carbon emissions have been felt by Indonesia itself, including climate change that leads to natural disasters and ultimately has the potential to cause national economic losses (Pusparini et al., 2023). According to data from Carbon Brief, in 2015 Indonesia ranked fourth as the country with the highest greenhouse gas emissions in the world, contributing 4.8% of total global emissions. As carbon emissions have been on an upward trend for the past 36 years, this figure has the potential to grow every year. This emphasises the urgency for Indonesia to

immediately implement policies that support emission reductions, including a carbon tax, in order to improve its contribution to mitigating global climate change (Pamungkas & Haptari, 2022).

The Indonesian government has demonstrated its commitment to achieving Net Zero Emission (NZE) by 2060, one of which is through the issuance of a carbon tax policy. This policy is regulated in Undang-Undang Nomor 7 Tahun 2021 of Harmonisasi Peraturan Perpajakan (UU HPP) and Peraturan Presiden Nomor 98 Tahun 2021 concerning the implementa-tion of carbon economic value and control of greenhouse gas emissions (Pratama et al., 2022). This step is a follow-up to the international agreement contained in the Paris Agreement to the United Nations Framework Convention on Climate Change on 12 December 2015 in Paris. This agreement requires each country to commit through a Nationally Determined Contribution (NDC) to address climate change, especially in an effort to contain the rise in global average temperature. Indonesia's first Nationally Determined Contribution (NDC) submitted in 2015 set a target of reducing emissions by 29% through national efforts, and 41% by 2030 with the support of international cooperation, with the aim of achieving Net Zero Emission (NZE) by 2060.

To achieve the emission reduction target in the NDC in 2030, Indonesia through UU HPP establishes a new tax base in the form of a pigouvian tax on carbon, known as carbon tax. Carbon tax is a type of pigouvian tax that is applied to cover the cost of negative externalities due to carbon emissions (Selvi et al., 2020; Suryani, 2021). A pigouvian tax is a tax levied per unit of output from a polluting source, equal to the marginal damage caused by the activity (Barus & Wijaya, 2022). When public policies are designed, economists argue that it is natural for consumers and producers to feel the impact. One example that is often used is the application of taxes to reduce or eliminate negative externalities, such as pollution (Domguia, 2023). The carbon tax was passed through the law on 29 October 2021 and is planned to take effect on 1 April 2022. Article 13 of the law explains that the carbon tax will be imposed on carbon emissions that have a negative impact on the environment. In the initial phase, between 2022 and 2024, the carbon tax will only be applied to Steam Power Plants (PLTU), with plans to expand the tax to other sectors by 2030.

Before Indonesia, many other countries have implemented carbon tax. Finland became the first country in the world to impose a carbon tax in 1990, followed by 16 other European countries (Asen, 2021). Basically, the correct implementation of a carbon tax is the most efficient way from an economic point of view to reduce carbon emissions in a country (Macaluso et al., 2020). In addition, the implementation of carbon tax can be a new breakthrough in creating innovative economic activities such as clean energy innovation with renewable energy technology (Gugler et al., 2023; Tseng, 2022). The implementation of carbon tax has had a positive impact in several countries. Finland managed to reduce carbon emissions by 1.69% compared to before the tax was imposed (Wibowo & Naylah, 2024). Sweden's carbon tax reduced carbon emissions by 40% in 2015 and had no negative impact on the Swedish economy (Runst & Thonipara, 2020). For Singapore, the carbon tax showed a marginal reduc-tion of 0.29 million in 2019 (Tseng, 2022). A carbon tax has been planned and is in the process of being im-plemented in Indonesia. According to Pratama et al., (2022) if Indonesia implements a carbon tax effec-tively and efficiently, the Indonesian government can obtain potential carbon tax revenue from the energy sector worth IDR 23.651 trillion in 2025 for the imposition of carbon tax.

In UU HPP, the Government of Indonesia emphasises that the implementation of the carbon tax will be carried out in stages in accordance with the roadmap determined by the government (Kementrian Keuangan Republik Indonesia, 2021). The stages begin in 2021 with the enactment of the UU HPP, in 2022 a cap (upper limit of emissions) is set for the coal power generation sector. The next stage in 2025 includes the full implementation of carbon trading through carbon exchanges and the expansion of carbon taxation sec-tors according to sector readiness (Suryani, 2021). If the carbon tax is indeed proven to be effective in reducing carbon emissions and has shown positive impacts in countries that have implemented it, the question is why this tax has not been implemented until now in Indonesia. The delay in implementing the carbon tax indi-cates the government's unpreparedness to implement the policy in Indonesia. This issue should be an im-portant concern, considering that until now the carbon tax has not been implemented in Indonesia, as evi-denced by the postponement of the carbon tax implementation scheme at the beginning of 2022, which was shifted to July 2022 and postponed again until now (IKPI, 2023).

Indonesia's industrial sector is very diverse, with three main sectors: manufacturing, energy and mining, and natural resource processing. However, most of these sectors are still dependent on fossil fuels, which poses a major challenge in the transition to a low-carbon economy. Implementing a carbon tax can be a solution to reduce carbon emissions, but it also brings challenges, especially for sectors that are highly dependent on fossil fuels, such as the energy and mining sectors. Implementing a carbon tax is not a simple process and requires careful planning. In addition to fossil energy dependency, an important factor in the implementation of this policy is infrastructure readiness, especially the digital system for monitoring, reporting and verification (MRV) of carbon emissions. This system is crucial for accurately measuring and monitoring carbon emissions to ensure

that the carbon tax is applied fairly and transparently. An efficient infrastructure for monitoring carbon emissions includes sensor technology, digital platforms for data collection, and systems that can verify emissions from different industry sectors. Without the right infrastructure, the implementation of a carbon tax could be ineffective, difficult to monitor, and risk unfairness. In addition, Indonesia's economic condition also poses a challenge for carbon tax implementation. Dependence on cheap fossil fuels, the need to maintain industrial competitiveness, and the impact of the COVID-19 pandemic that has disrupted the economy, further complicate the implementation of this policy.

Many studies have discussed carbon taxes. For the case of Indonesia, (Irama, 2019) conducted re-search on the potential tax revenue of Indonesia if carbon tax policy is implemented using carbon emission data from Trucost, Bloomberg and Reuters/ Refinitiv. Research that reviews carbon tax as a potential state revenue using data in Indonesia has been conducted by Pratama et al., (Pratama et al., 2022). Dyarto & Setyawan (2021) examined the political challenges faced by Indonesia in implementing carbon tax. Tjoanto & Tambunan's research (2022) discusses the challenges and strategies that can be carried out in the process of implementing carbon tax policies in Indonesia. This study aims to analyse the factors that hinder the delay of carbon tax implementation in Indonesia between 2022 and 2024. By taking into account Indonesia's unique socio-economic context, this research is expected to provide practical and applicable recommendations to ensure that the carbon tax can be effectively implemented by 2025, support the achievement of carbon emission reduction targets, and accelerate the transition to a sustainable economy.

Method

This research uses a qualitative approach by utilising data collection methods from library sources or secondary data. The secondary data used comes from: (1) Government publications and online news. Data was obtained from online news that discussed the implementation of carbon tax and was published at least since 2021. The sources include Kompas.com, Research and Innovation Agency, Antara.News, CNBC Indonesia, Indonesian Information Portal (Indonesia.GO.ID), the website of the Ministry of Finance of the Republic of Indonesia, the website of the Indonesian Tax Consultants Association, and the Editor of DDTC.News. (2) National and international journals. Journals used as references were published within the last 5 years and related to the implementation of carbon tax. References include two national journals accessed through Google Scholar, and three international journals-one from ScienceDirect and two from the World Bank website. (3) Indonesian government regulations. The Law on Harmonisation of Taxation Regulations (UU HPP) that addresses carbon tax was also used as a data source and can be accessed online through Google. All of this secondary data was processed into compiled data, which is data that has been selected, summarised and arranged systematically.

All this secondary data was processed into compiled data, which is data that has been selected, summarised and arranged systematically. In analysing the data, researchers used thematic analysis, which is an analysis technique that focuses on identifying themes. The analysis process was carried out through qualitative data reduction using a coding process. This analysis approach is deductive, where the researcher first sets a list of codes before coding the collected data. The following are the themes, descriptions and categories that the author used in coding the secondary data:

Table 1. Thematic Analysis Deductive

Theme	Description	Category
Carbon tax scope	Topics that discuss the what and who of carbon tax subjects	• Carbon tax subject • Carbon tax object
Carbon tax implementation design in Indonesia	Topics that discuss the design approach to implementing a carbon tax in Indonesia.	• Indonesia's carbon tax roadmap 2021-2025
Factors hindering the delay of carbon tax implementation in Indonesia	Topics that discuss the factors that delay the implementation of carbon tax.	• Indonesia carbon tax regulation/roadmap • Infrastructure readiness • Fossil energy use • Indonesia's economic condition

(source: processed by the author)

Results and Discussions

Carbon Tax Scope
Carbon Tax Subject

Based on Article 13 paragraph 5 of Law Number 7 Year 2021, carbon tax subjects in Indonesia consist of individuals and/or entities that purchase carbon-containing goods and/or conduct activities that produce carbon emissions. In the explanation of the article, it is explained that in 2022-2024 carbon tax in Indonesia will be imposed on coal-fired power plants. The following are some considerations why coal-fired power plant is the first carbon tax subject in the initial implementation scheme in Indonesia: (1) Large contribution to carbon emissions. The dominance of coal-fired power plants (PLTU) in electricity generation where coal-fired power plants are the largest contributor to carbon emissions in the energy sector in Indonesia, given the high dependence on coal as the main energy source. By imposing a carbon tax on coal-fired power plants, the government is targeting the sector that has the greatest impact on achieving emission reduction targets. (2) Ease of monitoring and measurement. Coal-fired power plants have carbon emissions that are relatively easy to monitor and verify because they are centralised and measured through monitoring systems. Coal-fired power plant is the first step to test monitoring, reporting, and verification (MRV) mechanism before the policy is expanded to other sectors. (3) Encouragement for energy transition. The carbon tax aims to provide economic incentives for businesses in the energy sector to switch from coal to more environmentally friendly renewable energy. With this policy, it is expected to create pressure that encourages investment in low-carbon technologies, such as carbon capture technology. (4) Consistent with international commitments. The focus on coal power plants is in line with Indonesia's commitment in the Nationally Determined Contributions (NDC) to reduce carbon emissions. This policy also prepares Indonesia for the European Union's Carbon Border Adjustment Mechanism (CBAM) that will affect exports of fossil energy-based products. (5) Relatively restrained economic effects. By imposing a carbon tax on coal-fired power plants, the impact is more concentrated on energy businesses, without directly burdening individual consumers, making it more politically acceptable. Coal-fired power plants also provide a stable tax base to support state revenues that can later be allocated for renewable energy development. (6) Pilot implementation for more far-reaching policies. Coal-fired power plants are chosen as the initial stage to test the effectiveness of the policy and the readiness of its implementation before expanding the scope to other sectors such as transport, manufacturing, or households. This policy also helps build awareness among businesses and the public about the importance of carbon tax as an instrument for climate change mitigation. By starting with coal power plants, the government can mitigate implementation risks while gaining experience to improve the system before expanding the carbon tax scheme to other sectors.

Carbon Tax Object

Based on Article 13 paragraph (1) of UU HPP, the object of carbon tax in Indonesia includes emissions that have a negative impact on the environment. These emissions are not limited to CO_2 gas alone, but include all types of exhaust gases, including greenhouse gases, as defined in the emission criteria. However, in the context of tackling climate change to achieve the Net Zero Emission target, the definition of emissions becomes more specific and focuses only on carbon emissions. This is justified, as Article 8 of UU HPP explains that CO_2e is a representation of other greenhouse gas emissions. CO_2e gas has a significant dominance over other greenhouse gases, as seen from data showing that carbon dioxide accounts for around 76% of total greenhouse gas emissions globally (United States Environmental Protection Agency, 2022). This dominance is one of the bases for implementing a carbon tax in Indonesia, with the main focus on CO_2e emissions as a representation of various types of greenhouse gases (Pamungkas & Haptari, 2022), as shown in Figure 1 below (United States Environmental Protection Agency, 2022).
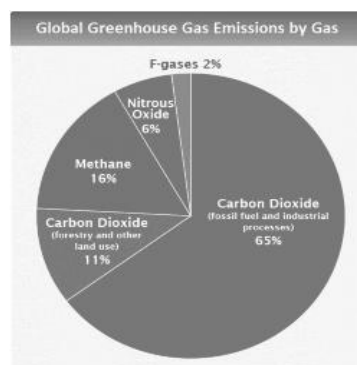

Figure 1. Global Greenhouse Gas Emissions by Gas Type
(resource: https://www.epa.gov/ghgemissions/globalgreenhouse-gas-emissions-data)

Design of Carbon Tax Implementation in Indonesia

In order to implement a carbon tax in Indonesia, the government has developed a carbon tax policy roadmap for the period 2021-2025. This roadmap illustrates the stages of carbon tax implementation as part of the Indonesian government's efforts to reduce greenhouse gases and support the energy transition.
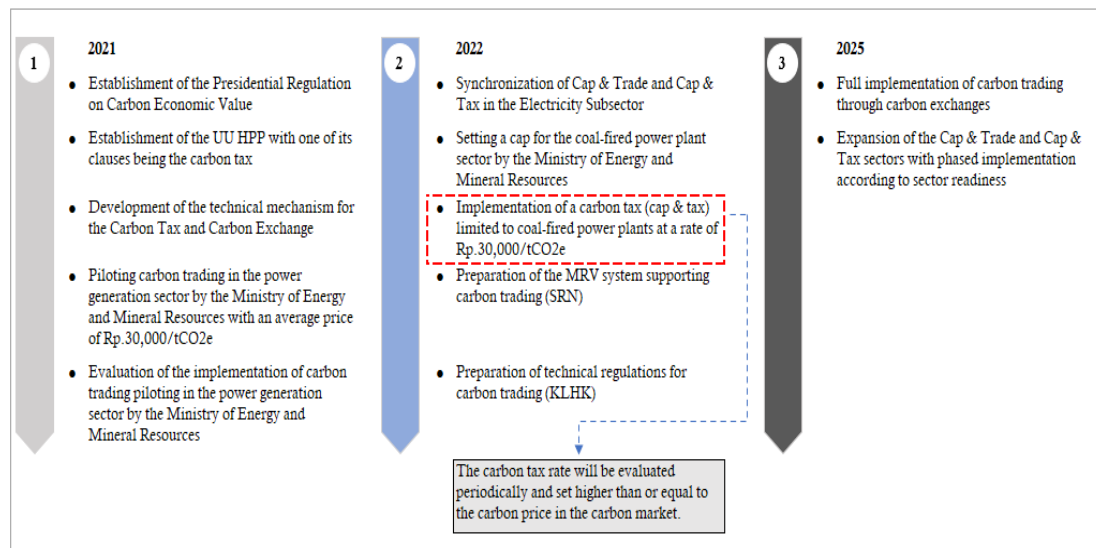
Figure 2. Indonesia Carbon Tax Roadmap 2021-2025
(resource:https://gatrik.esdm.go.id/assets/uploads/download_index/files/2bb41-bahan-bkf-kemenkeu.pdf)

The roadmap shows the stages of implementation starting with trials and development in 2021, followed by limited deployment in the power sector in 2022, and progressing to full expansion and implementation in 2025.

Factors Delaying the Implementation of Carbon Tax in Indonesia
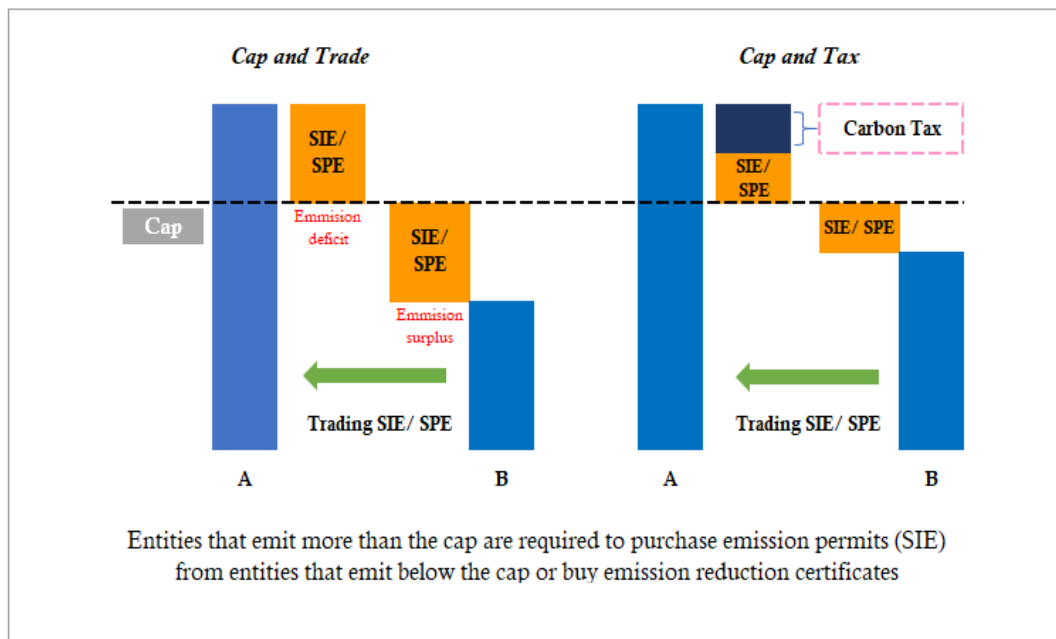
The implementation of carbon tax in Indonesia continues to be delayed. Initially, the government planned to implement the carbon tax in April 2022, but the plan was cancelled and postponed to July 2022. However, the carbon tax was again postponed to an undetermined time until now (Pristiandaru, 2023). Through the researcher's search of Indonesian government publications, news, and journals related to carbon tax in Indonesia, the following are some of the factors that caused the delay, including:

Carbon Tax Roadmap is not 100% complete yet

Finance Minister Sri Mulyani said that the postponement of the carbon tax implementation in April 2022 was due to the fact that the carbon tax roadmap in Indonesia had not been completed 100% (Redaksi DDTCNews, 2022). The carbon tax roadmap is the concrete steps to implement a carbon tax in a sustainable manner. According to finance minister Sri Mulyani's presentation, the carbon tax implemented in Indonesia will use a *cap* and *tax* scheme and will be integrated with a *cap* and trade scheme (Pamungkas & Haptari, 2022). This means that entities that have emissions exceeding the set limits will have additional options. Besides being able to purchase SIE/SPE from entities that have surplus emissions, these entities can also pay a carbon tax for emissions that exceed the cap. For example, in the illustration between entities A and C, if entity A has an emission deficit, then it will purchase SIE/SPE from entity C. Currently, the carbon tax implementation scheme that has been designed by the government is as shown in Figure 3.

Article 13 paragraph (3) of UU HPP explains that this roadmap includes carbon emission reduction strategies, priority sector objectives, linkages with new and renewable energy development, and alignment with various other policies. The enactment of these provisions is an implementation of the regular function of taxes to suppress the excessive use of carbon emissions, mainly generated from energy use such as power plants. However, this regulation only regulates the imposition of carbon tax in outline, while the technical mechanism of carbon tax implementation such as the determination of tax rates based on carbon market prices and the basis for imposing carbon tax has not been regulated in detail (Pratama et al., 2022). This reveals that government policies are still inconsistent, as seen from the existence of regulations for carbon taxes, but the use of the budget is not necessarily used seriously to reduce emissions (Badan Riset dan Inovasi Nasional, 2022). Without a carbon tax roadmap, there will be uncertainty, confusion and obstacles in implementing the tax. Companies may not have sufficient guidance to plan strategic changes, invest in clean technologies, and accurately measure emissions. Therefore, a clear and transparent carbon tax roadmap is essential to guide effective carbon tax implementation and support carbon emission reduction goals. With a clear roadmap in place, companies and

industry sectors will have better guidance to prepare for and invest in the sustainable practices needed to fulfil the carbon tax requirements.

Figure 3. Design of Carbon Tax Implementation in Indonesia
(resource: https://gatrik.esdm.go.id/assets/uploads/download_index/files/2bb41-bahan-bkf-kemenkeu.pdf)

Some aspects that need to be included in the regulation include: (1) Carbon tax goals and objectives. Regulations should clearly explain the objectives of this policy, for example to reduce carbon emissions, increase the use of renewable energy, or support greenhouse gas emission reduction targets in accordance with global climate commitments. (2) Tax setting mechanism. Regulations should outline how the carbon tax will be set, including the calculation of the tax rate per tonne of carbon emissions, the sectors subject to the tax, and the method of reporting emissions. (3) Sectors affected by the tax. Sectors of the economy that will be subject to the carbon tax should be identified, such as energy, industry, transport, and other high-emitting sectors. (4) Exemptions and incentives. Regulations should include whether there will be exemptions for certain industries or incentives for companies that use low-carbon technologies or invest in renewable energy. (5) Use of tax funds. There needs to be clarity on how the funds obtained from the carbon tax will be used, for example to fund environmental programmes, improve green infrastructure, or support a sustainable energy transition. (6) Implementation timeframe. Regulations should include a plan for the stages of carbon tax implementation, including the timing of when the policy comes into effect and emissions reduction targets in the short, medium and long term. (7) Monitoring and enforcement. *The roadmap* should set out how the government will monitor and supervise business compliance with the carbon tax policy, including sanctions for violators. (8) Consistency with international commitments. Regulations need to ensure that carbon tax policies are in line with Indonesia's commitments to international climate agreements, such as the *Paris Agreement*, as well as its Nationally Determined Contributions (NDC) targets. With a clear and detailed explanation of all these aspects, the carbon tax policy is expected to be implemented effectively and have a positive impact on reducing carbon emissions in Indonesia.
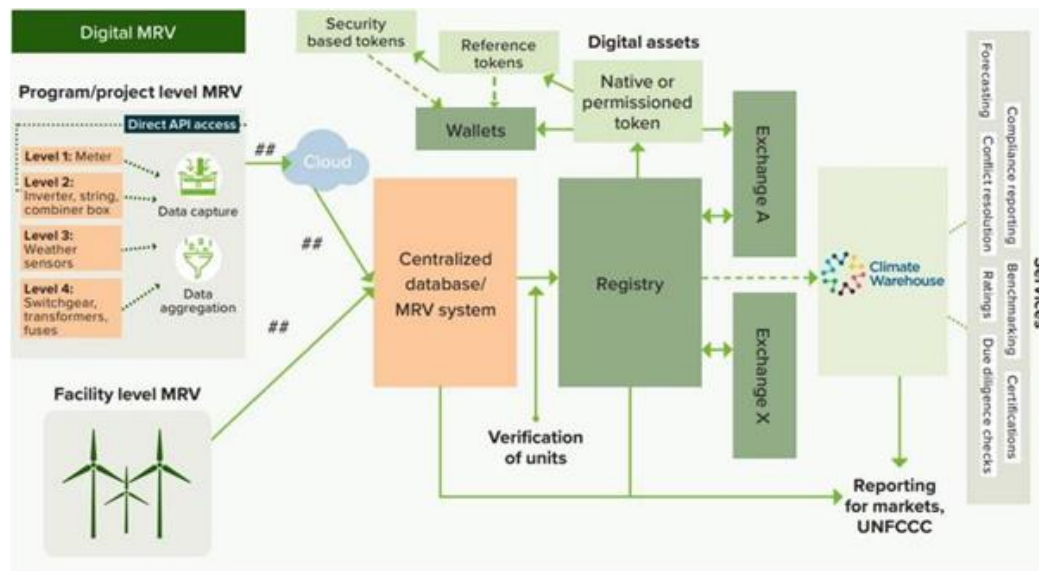
Infrastructure Readiness - Digital Technology
According to Djoenudin, a researcher at the Centre for Behavioural and Circular Economy Research, infrastructure readiness is a factor that hinders the implementation of the carbon tax in April 2022 (Pristiandaru, 2023). To implement a carbon tax, the government needs to build infrastructure that enables accurate measurement and monitoring of carbon emissions. Emissions monitoring should be conducted on an ongoing basis, not just limited to one-off measurements. Emissions data needs to be monitored regularly to gain a deeper understanding of changes in emissions over time. Therefore, a monitoring system that can conduct continuous monitoring is essential for effective carbon tax implementation. In addition, carbon emission data must comply with the principles of carbon tax implementation, namely transparency and public access.

One of the foundations of the carbon market is Monitoring, Reporting and Verification (MRV) of greenhouse gas emission reductions. MRV is a series of steps to calculate emission reductions resulting from certain mitigation activities, report the results to authorised third parties, and verify the reductions in order to be certified

and generate carbon credits. Conventional MRV is being abandoned as the process is often costly, time-consuming and error-prone as it relies on manual record-keeping or direct surveys (World Bank, 2022). From the research of Zeng & Yang (2023), digital technology has a positive role in reducing carbon emissions. Digital technology support is essential to promote low-carbon sustainable development and more environmentally friendly economic and social transformation, in order to achieve carbon neutrality earlier. Based on the mechanism test, digital technology indirectly impacts carbon emission reduction through changes in industrial structure, technological innovation, and taxation policies.

Figure 4. Comprehensive digitalisation of carbon market infrastructure
(resource: https://hdl.handle.net/10986/37622)

Currently, the digital technology considered is also widely used by countries in the world to reduce greenhouse emissions is digital Monitoring, Reporting, and Verification (D-MRV) technology (Belenky, 2022). The D-MRV system is a key part of the overarching digitisation of carbon asset generation, transfer and reporting processes in the post-2020 carbon market. Utilising advanced technologies to improve data collection and verification, it can also be integrated with national or global registries to automate the fulfilment of reporting obligations. The use of digital blockchain technology to generate immutable and auditable data, and record transfers including the creation of mitigation outcomes in digital form supported by smart contracts, is another important component of the comprehensive digitisation of the carbon market currently being designed and implemented by the industry (World Bank, 2022).

The D-MRV system has the potential to make future carbon markets more efficient and cost- effective in generating carbon assets and verifying emission reductions. It is widely believed that utilising market mechanisms to reduce carbon emissions will greatly reduce the cost of decarbonising the world economy. The full potential of carbon markets to help combat climate change can be unlocked through digital technologies and D-MRV systems. These technologies lay the groundwork for future innovations such as the tokenisation of carbon assets through blockchain technology, and the real-time publishing of mitigation results from D-MRV certified projects across the system. Indonesia is also in the process of adapting a digital MRV system. At the online public lecture of the Youth Camp for Future Leaders on Environment (15/21/2021), Minister of Finance Sri Mulyani, as a guest speaker, said that the CO2 calculation system cannot be measured through the chimney but must use accountable measurement, reporting and verification, namely by implementing digital MRV (Riswan, 2021).

However, the procurement of this system is quite costly and requires experts, so the digital MRV preparation process is one of the reasons for the delay in implementing carbon tax in Indonesia. (1) Here are some important aspects to consider regarding the readiness of infrastructure and digital technology in implementing this policy, namely. (2) Emissions reporting and monitoring system. To implement a carbon tax, the government needs an effective system to measure, report and verify (MRV) carbon emissions from different sectors of the economy. Digital technologies, such as data-driven platforms, need to be adopted to enable real-time and accurate emissions monitoring. The resulting data should be accessible to relevant authorities for monitoring purposes. (3) Integration of digital tax systems. A digital infrastructure that enables integration between the general taxation system and the emissions monitoring system is essential. This will facilitate the collection of carbon taxes based on valid emissions data. Blockchain technology or cloud-based systems can be considered to ensure

transparency and security of data related to carbon emissions and tax payments. (4) Technological capacity in the industrial sector. Implementing a carbon tax requires collaboration with various industries that must report their emissions. Many industries may not have sufficient technology to accurately calculate their emissions. Therefore, there is a need for technological capacity building in these sectors, as well as training in the use of emission calculation and reporting technologies. (5) Development of national digital infrastructure. The government needs to ensure that digital infrastructure across Indonesia supports the implementation of this policy, especially for companies or industries operating in remote areas. Equitable access to high-speed internet and modern technology is important to ensure smooth implementation of the carbon tax. (6) A digitalised and secure tax payment system. Carbon tax will require a payment system that can be easily accessed by various sectors, be it large companies or MSMEs. The implementation of secure and efficient fintech technology is essential to support a transparent and leak-free carbon tax payment system. (7) Development of big data and *artificial intelligence* (AI) for emissions analysis. Big data and artificial intelligence (AI) technologies can be used to analyse emission trends across different sectors of the economy and estimate the impact of carbon tax implementation. This will help the government make better decisions and ensure policies remain relevant to changing economic and environmental dynamics. (8) Collaboration between technology sectors. The government can work with the private sector, such as information technology and fintech companies, to build digital infrastructure that can support the efficient implementation of carbon tax. This collaboration will ensure that the technology used is suitable for national needs and keeps up with global developments. Overall, the readiness of digital infrastructure and technology will play a key role in ensuring that Indonesia's carbon tax policy can be implemented efficiently, transparently, and effectively in achieving emission reduction goals.

Companies Still Depend on Fossil Energy
In addition to the infrastructure of the government itself as a tax collector, the infrastructure readiness of the company as a tax subject must already use environmentally friendly high technology if a carbon tax is implemented. As explained earlier, carbon tax will be applied to carbon emissions that adversely affect the environment. In the scheme designed by the Government of Indonesia, for the initial stage (2022), the carbon tax will be imposed on the coal-fired power plant sector using a tax based on emission limits (cap and tax). The existence of coal-fired power plants as the first sector to implement a carbon tax with a cap and tax scheme contradicts Indonesia's dependence on fossil energy. Based on data from the Ministry of Energy and Mineral Resources (ESDM), most of the main energy sources used for electricity generation in Indonesia still come from coal. In 2022, the use of coal reached 67.21% of the total primary energy mix (Putri, 2023). Diantika's research (2022) that the use of coal in most PT ABC's (a coal-fired power plant company) power plant has a significant impact on the carbon tax burden they will incur. PT ABC's estimate is that they will have to pay a carbon tax of twelve trillion rupiah. The magnitude of this carbon tax could potentially disrupt the company's financial performance.

This dependence on fossil fuels is the reason for the delay in implementing a carbon tax, as efforts to reduce carbon emissions could disrupt aspects that support the lives of Indonesians. Some factors that influence this challenge include: (1) The high cost of transitioning to clean energy. Replacing fossil energy sources with renewable energy requires large investments, both in technology and infrastructure. Many companies, especially in the heavy industry sector, may not be ready to bear such costs. As a result, the implementation of a carbon tax could be burdensome for companies that still rely on fossil fuels, as they will face additional costs without an easy solution to transition. (2) Limited access to renewable energy. While Indonesia has great potential in renewable energy resources, such as solar, wind and geothermal power, access to this energy is uneven across regions. Many companies, especially in remote areas, do not have adequate access to renewable energy sources and remain dependent on more accessible and cheaper fossil fuels. (3) The relatively low price of fossil energy. Government subsidisation of fossil fuels keeps fossil energy affordable for many companies in Indonesia. This creates a disincentive to switch to renewable energy sources that may be more expensive upfront. As such, implementing a carbon tax may add to the cost burden without driving significant behavioural change in companies. (4) Competitive impacts for companies. Companies that rely on fossil energy could feel squeezed by the implementation of a carbon tax, especially if their competitors in other countries do not face similar regulations. This could affect the competitiveness of Indonesian companies in the global market, especially in industries that rely heavily on fossil fuels such as manufacturing and transport. (5) Lack of incentives for investment in clean technologies. Many companies have not seen strong enough incentives to invest in clean energy technologies, especially if they are still getting fossil energy supplies at low prices. Policies that encourage investment in renewable energy, such as subsidies for green technologies or tax exemptions for companies investing in clean technologies, need to be strengthened to make companies more interested in making the energy transition. (6) Inadequate technology. In many sectors, the technology needed to reduce emissions or switch to renewable energy is not yet fully available or is still under development. This prevents companies from making an immediate switch away from fossil fuels. Without easier and cheaper access to low-emission

technologies, the implementation of a carbon tax could affect the productivity and profitability of companies that still rely on conventional energy.

Therefore, companies' dependence on fossil fuels is one of the main challenges in implementing a carbon tax in Indonesia. Addressing this requires more targeted energy transition policies, strong incentives for investment in renewable energy, and collaborative efforts between the government and the private sector to accelerate the shift to greener energy sources.

Consideration of Indonesia's Economic Conditions

Basically, a carbon tax is a policy instrument designed to reduce greenhouse gas emissions, especially carbon dioxide (CO_2), by setting a fee or price on carbon emissions generated by industrial activities, companies, or individuals. The goal is to encourage economic actors to reduce the use of fossil fuels and switch to cleaner energy sources and environmentally friendly technologies, so the carbon tax instrument is an instrument that is considered appropriate for climate control in achieving sustainable economic growth and creating a greener Indonesian economy.

Suahasil Nazara, Deputy Minister of Finance of Indonesia, said that the implementation of carbon tax will consider the readiness of the entire ecosystem. Currently, the government's top priority is to protect the national economy from the impact of global risks, including rising energy and food commodity prices in international markets, which were triggered by the conflict in Ukraine and contributed to rising domestic inflation (Hidranto, 2022). The Russia- Ukraine war resulted in the disruption of energy supplies to Europe and the distribution of several important commodities needed by industry. Russia is one of the main exporters of energy, including fuel oil, coal and liquefied natural gas, as well as wheat. With the world's largest and cheapest natural gas reserves, Russia is an important supplier to Europe, which relies heavily on its gas. Ukraine, on the other hand, is a major exporter of vegetable oil, corn and wheat. The disruption affected the performance of industries and households, and led to a rise in the prices of foodstuffs and commodities such as petrol. These conditions triggered high inflation, increasing the risk of recession in several countries and depressing global economic growth including Indonesia. The inflation rate experienced by Indonesia in 2022 reached 4% (Khairizka, 2022).

If a carbon tax in Indonesia is forcibly implemented under inflationary conditions, it could have several negative impacts, including: (1) Additional Economic Burden. A carbon tax will increase production costs for industries that rely on fossil-based energy, such as manufacturing, transport and energy. These additional costs are likely to be passed on to consumers through higher prices for goods and services, which could exacerbate existing inflation. (2) Rising Energy and Food Prices. As many key sectors in Indonesia, including energy and transport, are still heavily dependent on fossil fuels, the introduction of a carbon tax could push up energy prices. This will impact the cost of distribution of goods, including food, which in turn will increase the prices of essential commodities. (3) Decrease in Purchasing Power. With inflation already high, the added burden of the carbon tax will further reduce people's purchasing power. Rising prices of basic goods, energy, and transport will make it harder for households, especially those on low incomes. (4) Risks to Economic Recovery. Indonesia is trying to recover its post-pandemic economy and faces global challenges, such as rising commodity prices due to the conflict in Ukraine. The implementation of a carbon tax amidst an inflationary situation may slow down the economic recovery as industrial sectors will face increased operational costs. (5) Social and Industrial Resistance. Industries may resist a carbon tax because it will increase production costs, which may reduce their competitiveness in the international market. In addition, people who feel the impact of the price increase may resist this policy, fuelling social discontent.

Therefore, the implementation of a carbon tax in the midst of inflationary conditions needs to be done carefully, accompanied by mitigation policies that can help ease the burden on society and industry, such as renewable energy subsidies or incentives to switch to more environmentally friendly technologies.

Conclusions

Based on the results of the literature review, there are several factors that become the reason for the Indonesian government to delay the implementation of carbon tax. First, Indonesia's carbon tax regulation (roadmap) has not been 100% finalised. The carbon tax regulation (roadmap) in Indonesia should cover several important aspects to ensure the policy can be implemented effectively. The second factor is infrastructure readiness - digital technology. Infrastructure and digital technology readiness are crucial factors in supporting the implementation of carbon tax in Indonesia. Third, Indonesian companies are still dependent on fossil fuels. This dependence can complicate the transition to clean energy and make implementing a carbon tax more complex. And finally, the condition of the Indonesian economy. Indonesia's economic condition has been one of the main considerations that have resulted in the delay of carbon tax implementation, especially considering the impact of the Russian and Ukrainian wars that have affected inflation in Indonesia.

Carbon taxes do have great potential to support a sustainable economy by reducing greenhouse gas emissions. Several countries, such as Finland, Sweden, China, and Singapore, have successfully implemented carbon taxes and shown positive impacts, both in emission reduction and in the development of green energy-based economies. However, the situation in Indonesia is slightly different. Although Indonesia has developed a carbon tax scheme, its implementation has been postponed for the second time. Such a complex issue is interesting to research, what causes the delay in implementing a carbon tax in Indonesia? The following are some recommendations for stakeholders, including government and business, to support the implementation of carbon tax, including: first, a clear and transparent roadmap. The government should review the carbon tax roadmap with a clear timeline covering the preparation, piloting, and full implementation of the carbon tax. In addition, engage stakeholders through public consultations to ensure policy alignment with the needs of the industry sector and society. And establish a team that conducts regular monitoring and evaluation to assess the success of implementation and make adjustments as necessary.

Second, the government must have infrastructure readiness in terms of tools and human resources, which includes building a reliable technology infrastructure for emissions measurement, reporting, and verification (MRV). This is followed by training for industry players and government officials on emission measurement and reporting procedures, and the development of a digital platform to facilitate transparent and efficient carbon tax monitoring and administration. Third, the government encourages renewable energy by providing subsidies or tax cuts to companies that invest in renewable energy such as solar, wind, and bioenergy, strengthening policies that require the use of renewable energy in certain sectors, such as energy at least 25% of total consumption for large companies, and accelerating the development of renewable energy infrastructure to reduce dependence on fossil fuels. Fourth, providing incentives in the form of carbon tax breaks for industrial sectors that demonstrate commitment to reducing emissions, facilitating access to green finance, such as low-interest loans for sustainability initiatives, and rewarding companies that have significantly reduced emissions as examples of best practice. Fifth, conduct public education and awareness through information campaigns and collaboration with the media. Finally, the government can collaborate/partner with the private sector, for example with the development of green technology and renewable energy, and it is possible to collaborate internationally, for example learning from other countries that have successfully implemented carbon taxes to adopt best practices. By integrating the above measures, carbon tax implementation will not only be an instrument for emission control, but also a catalyst for transformation to a low-carbon economy.

This research does have some limitations that need to be recognised. The results were compiled by summarising information available online through government publications, news from credible media (such as Kompas, Antara, IKPI), and national and international journals. However, this reliance on secondary sources has the potential for several weaknesses, including the potential for disinformation or faulty reasoning, limited access to primary sources, incomplete data, and media bias. Indeed, if the information on the delay in the implementation of carbon tax is obtained through direct interviews with resource persons who have the capacity and competence, the results of this research will be much more in-depth and accurate. Sources from the government, academics, or industry players who are directly involved in the carbon tax policy formulation process will provide more specific and contextualised insights. After two delays, the plan to implement a carbon tax in Indonesia in 2025 is indeed an important policy that is interesting to analyse further. Future research needs to explore whether this policy will actually be realised by 2025 and its impact on various parties, including the government, companies and society.

Acknowledgments

References

Asen, E. (2021). *Carbon Taxes in Europe*. Tax Foundation. https://taxfoundation.org/data/all/eu/carbon-taxes-in-europe-2021/
Badan Riset dan Inovasi Nasional. (2022). *Riset Diperlukan untuk Regulasi dan Penerapan Pajak Karbon*. Organisasi Riset Ilmu Sosial Dan Humaniora. https://ipsh.brin.go.id/2022/08/23/riset-diperlukan-untuk-regulasi-dan-penerapan-pajak-karbon/

Barus, E. B., & Wijaya, S. (2022). *Pajak Karbon: Belajar dari Swedia dan Finlandia*. Penerbit Adab.

Belenky, L. (2022). *Carbon markets: Why digitization will be key to success*. worldbank. org.
https://blogs.worldbank.org/en/climatechange/carbon-markets-why-digitization-will-be-key-success

Diantika, N. (2022). *Analisis Kesiapan Penerapan Pajak Karbon pada Perusahaan PLTU Batubara di Indonesia*. Universitas Indonesia.

Domguia, E. N. (2023). Taxing for a better life? The impact of environmental taxes on income distribution and inclusive education. *Heliyon*, *9*(11), e21443. https://doi.org/10.1016/j.heliyon.2023.e21443

Dyarto, R., & Setyawan, D. (2021). Understanding the political challenges of introducing a carbon tax in Indonesia. *International Journal of Environmental Science and Technology*, *18*(6), 1479–1488. https://doi.org/10.1007/s13762-020-02925-4

Gugler, K., Haxhimusa, A., & Liebensteiner, M. (2023). Carbon pricing and emissions: Causal effects of Britain's carbon tax. *Energy Economics*, *121*(May 2022), 106655. https://doi.org/10.1016/j.eneco.2023.106655

Hidranto, F. (2022). *Menunda Pajak Karbon untuk Dampak Optimal*. Portal Informasi Indonesia, 3 Juli 2022. https://indonesia.go.id/kategori/editorial/5188/menunda-pajak-karbon-untuk-dampak-optimal%3Flang%3D1

IKPI. (2023). *Pemerintah Belum Terapkan Pajak Karbon, Menkeu Sebut Masih Utamakan Isu Perubahan Iklim*. Ikatan Konsutan Pajak Indonesia. https://ikpi.or.id/tag/pajak-karbon/

Irama, A. B. (2019). Potensi Penerimaan Negara Dari Emisi Karbon: Langkah Optimis Mewujudkan Pembangunan Berkelanjutan di Indonesia. *Info Artha*, *3*(2), 133–142. https://doi.org/10.31092/jia.v3i2.585

Kementrian Keuangan Republik Indonesia. (2021). *Pajak Karbon Di Indonesia*. https://gatrik.esdm.go.id/assets/uploads/download_index/files/2bb41-bahan-bkf-kemenkeu.pdf

Khairizka, P. N. (2022). *Dampak Perang Ukraina, Inflasi RI Dapat Tembus 4%*. Pajakku, 14 Maret 2022. https://www.pajakku.com/read/622af310a9ea8709cb189691/--wwwpajakkucom-read-622af310a9ea8709cb189691---wwwpajakkucom-read-622af310a9ea8709cb189691---wwwpajakkucom-read-622af310a9ea8709cb189691---wwwpajakkucom-read-622af310a9ea8709cb189691---wwwpajakkucom-r

Macaluso, N., Tuladhar, S., Woollacott, J., Mcfarland, J. R., Creason, J., & Cole, J. (2020). *The Impact Of Carbon Taxation And Revenue Recycling On U.S. Industries*. *0*. https://doi.org/10.1142/S2010007818400055.THE

Pamungkas, B. N., & Haptari, V. D. (2022). Analisis Skema Pengenaan Pajak Karbon Di Indonesia Berdasarkan United Nations Handbook Mengenai Penerapan Pajak Karbon Oleh Negara Berkembang. *JURNAL PAJAK INDONESIA (Indonesian Tax Review)*, *6*(2), 357–367. https://doi.org/10.31092/jpi.v6i2.1843

Pratama, B. A., Ramadhani, M. A., Lubis, P. M., & Firmansyah, A. (2022). Implementasi Pajak Karbon Di Indonesia: Potensi Penerimaan Negara Dan Penurunan Jumlah Emisi Karbon. *JURNAL PAJAK INDONESIA (Indonesian Tax Review)*, *6*(2), 368–374. https://doi.org/10.31092/jpi.v6i2.1827

Pristiandaru, D. L. (2023). *Pajak Karbon Tak Kunjung Diterapkan, Ini Alasan BRIN*. KOMPAS.Com, 28 Oktober 2023. https://lestari.kompas.com/read/2023/10/28/180000886/pajak-karbon-tak-kunjung-diterapkan-ini-alasan-brin

Putri, A. M. H. (2023). *EBT Jauh, Pembangkit Listrik RI Masih Didominasi Batu Bara*. CNBC Indonesia, 23 Mei 2023. https://www.cnbcindonesia.com/research/20230523113140-128-439740/ebt-jauh-pembangkit-listrik-ri-masih-didominasi-batu-bara

Redaksi DDTCNews. (2022). *Implementasi Pajak Karbon Ditunda, Sri Mulyani Beri Penjelasan*. DDTC News. https://news.ddtc.co.id/berita/nasional/37998/implementasi-pajak-karbon-ditunda-sri-mulyani-beri-penjelasan

Riswan, K. K. (2021). *Sri Mulyani: Penerapan nilai ekonomi karbon butuh MRV yang akuntabel*. ANTARA News, 15 November 2021. https://www.antaranews.com/berita/2525141/sri-mulyani-penerapan-nilai-ekonomi-karbon-butuh-mrv-yang-akuntabel

Runst, P., & Thonipara, A. (2020). Dosis facit effectum why the size of the carbon tax matters: Evidence from the Swedish residential sector. *Energy Economics*, *91*. https://www.sciencedirect.com/science/article/abs/pii/S0140988320302383

Selvi, Notika Rahmi, & Idar Rachmatulloh. (2020). Urgensi Penerapan Pajak Karbon Di Indonesia. *Jurnal Reformasi Administrasi*, *7*(1), 29–34.

Suryani, A. S. (2021). Pajak Karbon Sebagai Instrumen Pembangunan Rendah Karbon di Indonesia. *Info Singkat Pusat Penelitian Badan Keahlian DPR RI*, *13*(18), 14. https://berkas.dpr.go.id/pusaka/files/info_singkat/Info Singkat-XIII-18-II-P3DI-September-2021-236.pdf

Tjoanto, A. K., & Tambunan, M. (2022). Tantangan dan Strategi dalam Proses Implementasi Kebijakan Pajak Karbon. *Jurnal Riset Akuntansi & Perpajakan (JRAP)*, *9*(02), 237–248. https://doi.org/10.35838/jrap.2022.009.02.20

Tseng, S. (2022). Appraising Singapore's Carbon Tax Through the Lens of Sustainability. *SSRN Electronic Journal*, *January*. https://doi.org/10.2139/ssrn.4005891

United States Environmental Protection Agency. (2022). *Global Greenhouse Gas Emissions Data. Retrieved from Greenhouse Gas Emissions*. https://www.epa.gov/ghgemissions/globalgreenhouse-gas-emissions-data

Wibowo, R. S., & Naylah, M. (2024). The Implementation of Carbon Tax as an Emission Reduction Instrument Policy in The Nordic Countries : Pigovian Tax Effect Analysis. *Educoretax*, *4*(10), 1262–1272.

World Bank. (2022). *Digital Monitoring, Reporting, and Verification Systems and Their Application in Future Carbon Markets*. https://hdl.handle.net/10986/37622

Zeng, J., & Yang, M. (2023). Digital technology and carbon emissions: Evidence from China. *Journal of Cleaner Production*, *430*. https://doi.org/https://doi.org/10.1016/j.jclepro.2023.139765