

Indonesian Carbon Tax: How Newborn Learn to Jump into The Next Step?

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ABSTRACT

As one of the largest emitting countries globally, Indonesia is a newcomer to carbon tax implementation. However, the carbon tax literature in Indonesian context is still minimal. This study aims to examine the implementation of carbon taxes in various countries, review the roadmap for implementing carbon taxes in Indonesia, and examine various mechanisms in other countries that have previously implemented carbon taxes by conducting literature review. The study results show that several countries have applied a broader carbon tax to several sectors and relatively higher tariffs than Indonesia. The long journey of the carbon tax before finally being scheduled on April 1, 2022, still needs to be improved in term of object, subject, reporting mechanism, and carbon tax rate. The author proposes the transportation sector as a complement to the coal power plant to change consumer behaviour towards products that produce carbon emissions.

Keywords: Taxation; carbon tax; Indonesia; early implementation; carbon emissions; countries comparison.

INTRODUCTION

The industrial revolution that occurred in the 18th century had a significant impact on the transformation of the world economy. Extreme changes in technology, methods of production, innovative ways of organizing production and creating markets in Europe and the USA were responsible for the fast escalation of the economy [33]. Thanks to the transformation of technology and communication, goods are abundant, and trade is growing because local production has developed into international production. As a result, almost all regions that underwent the industrial revolution experienced increased per capita income and living standards [33].

However, the rapid economic growth during the Industrial Revolution negatively affected the environment. The use of fossil fuels such as coal, oil, and gas for industrial activities causes an increase in carbon dioxide [16]. The volume of greenhouse gases resulting from the burning of fossil fuels continues to increase from year to year, starting with the 2.0 industrial revolution that puts forward mass industry [47]. In the era of industrial revolution 4.0, energy consumption patterns are increasing because of the uneven distribution of energy needs to renewable energy [15]. So that climate change conditions are increasingly worrying.

Experts and policymakers have the same understanding that global warming is a problem that poses an unpredictable disaster risk [13]. It is a big challenge for governments in various countries, considering the need for development becomes a trade-off against the production of greenhouse gases that contribute to global warming. In line with economic growth, increased economic activity is generally followed by an increase in greenhouse gas emissions [27]. This situation has been explained for a long time in the concept of the environmental Kuznets curve, where economic growth will contribute to environmental damage. Apergis et al. [3] said that environmental damage begins to decrease along with technological advances and increased welfare at a certain point.

The common understanding between academics and bureaucrats has resulted in several milestones of the sustainable development movement, such as the concept of a green economy or circular economy initiated in the 1980s [31]. However, the Climate Change Convention Kyoto in 1997 might be the most vital turning point. The Climate Change Convention, which is popularly known as the Kyoto Protocol, demands the commitment of developed countries to contribute to reducing greenhouse gas emissions [42]. There are several emission reduction schemes, including joint implementation, carbon trading, and implementation of cleaner production [21].

There are many variations of policies implemented by countries committed to the Kyoto Protocol, one of which is implementing a carbon tax. The implementation of a carbon tax is applied to change the behaviour of individual energy consumption, which is a significant contributor to the release of greenhouse gases into the air. Several studies have proven that a carbon tax can reduce the number of greenhouse gases [9; 10]. There are some countries currently implementing a carbon tax. As the sixth-largest emitter of greenhouse gases globally, Japan is implementing a carbon tax to reduce carbon emissions to reach 26% by 2030 [39]. This initiative makes Japan the first country to implement a carbon tax in Asia by adopting the principles of Finland, the Netherlands, Norway, and Sweden [19]. Indonesia is the most recent country to implement a carbon tax, following the enactment of the Harmonization of Tax Regulations.

The initiative to implement a carbon tax in Indonesia is motivated by the fact that Indonesia is a country that contributes significant carbon emissions [4]. The primary source of emissions resulting from deforestation activities [12]. It strengthens the opinion of Birkmann et al. (2015), which places Indonesia as a vulnerable country to climate change. To respond to the condition, Indonesia built the National Carbon Scheme (SKN) [24]. Furthermore, Indonesia participated in ratifying the 2015 Paris Agreement with a target of 29% emission reduction in 2030 [1]. The latest progress of the Indonesian carbon reduction strategy was publishing a regulation in 2021 as a starting point for carbon tax implementation [10]. Even though the politicians tried to challenge it [37], the carbon tax finally became one of the environmental taxes that apply in Indonesia. In the first stage, the carbon tax charge to the coal-fired power plant in April 2022. The Indonesian government plans to gradually expand the carbon tax taxation sector under the readiness of each sector [5].

The implementation of the carbon tax in 2022 deserves appreciation. Reflecting on the experience of Ireland, the imposition of a carbon tax has succeeded in significantly reducing carbon emissions while at the same time generating tax revenues for the country [9]. However, a mechanism that only touches one sector (Coal power plant) has the potential to have negative consequences. Sectors subject to a carbon tax tend to lower their production levels, but the need for these commodities will be met by increasing production from sectors that are not subject to a carbon tax [23]. In the Indonesian context, electricity from coal-fired power plants is predicted to decline and be replaced by other power plants, which is not necessarily zero-emission. In addition, the imposition of a carbon tax in Indonesia

has not touched the sector that is the most significant contributor to carbon emissions, namely the forestry sector.

The carbon tax in Indonesia is scheduled to be implemented in April 2022. The first target of implementation is the Coal Steam Power Plant. Data shows that Indonesia's energy sector is the most significant contributor to greenhouse gases. Table 1 shows the dominance of the energy sector in contributing to greenhouse gases after the forestry and other land use (FOLU) sector.

Table 1. Greenhouse Gas Emissions by Sector Type (thousand tons of CO₂e), 2001-2017 in Indonesia

Year	Sector					Forest Fire	Total
	Energy	IPPU	Farm	Waste	FOLU		
2001	341,919	48,269	94,134	67,602	329,243	50,885	932,053
2002	349,485	41,688	93,856	70,063	373,189	301,753	1,230,034
2003	378,050	41,402	94,863	73,061	328,958	132,075	1,048,410
2004	380,434	43,146	96,586	75,225	475,851	232,018	1,303,260
2005	376,988	42,296	98,492	77,216	439,638	258,887	1,293,516
2006	386,100	38,641	97,828	82,578	479,246	510,710	1,595,103
2007	402,989	35,919	101,487	83,933	553,803	62,747	1,240,878
2008	391,784	36,499	98,659	85,023	513,712	81,744	1,207,420
2009	405,653	37,546	102,956	89,326	620,566	299,920	1,555,967
2010	453,235	36,033	104,501	87,669	383,405	51,383	1,116,226
2011	507,357	35,910	103,161	91,853	427,310	189,026	1,354,617
2012	540,419	40,078	106,777	95,530	487,928	207,050	1,477,781
2013	496,030	39,110	106,814	100,515	402,252	205,076	1,349,797
2014	531,142	47,489	107,319	102,834	480,033	499,389	1,768,206
2015	536,306	49,297	111,830	106,061	766,194	802,870	2,372,559
2016	538,025	55,307	116,690	112,351	545,181	90,267	1,457,821
2017	558,890	55,395	121,686	120,191	282,098	12,513	1,150,772

Source: BPS [8]

However, the implementation of a carbon tax has its pros and cons. Pro-environment people certainly agree that the carbon tax is one of the environmental instruments that can change human behaviour because it affects price elasticity [45], but the middle and lower classes income will face the challenge because their demand is less elastic for basic goods such as electricity because Indonesia is currently dependent on Coal Steam Power Plants [41]. Despite the pros and cons, Indonesia is one of the few tropical countries that implement a carbon tax. Table 2 shows that not many countries implement carbon policies in the form of cap and trade or carbon taxes.

There are many potential improvements for Indonesian carbon tax implementation to reduce carbon emissions in Indonesia. This study uses literature review to explore three discussion areas. In the beginning, the research will examine the implementation of carbon taxes in various countries on four continents that have recently implemented carbon taxes. Moreover, it will be reviewing the roadmap for implementing Indonesia's carbon tax from 1980 until the issuance of the Taxation

Harmonization Law related to the carbon tax in 2021. Lastly, it will collect lessons learned from other countries and assess the possibility of adaptation in Indonesia. This research also contributes to the existing literature by comparing the implementation plans in Indonesia with other countries, considering that this has only been implemented in Indonesia by law. The derivative rules of the law are not yet available until this research is compiled. In addition, the literature on carbon taxes is still very limited in Indonesia. Furthermore, this study also offers recommendations related to several additional policies that must be made before the Indonesian government implements a carbon tax in the conclusion section.

Table 2. Tropical Countries with carbon policies

Countries	Cap and Trade	Carbon Tax
Bolivia	-	-
Brazil	-	-
Brunei	-	-
Darussalam	-	-
Cambodia	-	-
Camerun	-	-
Chad	-	-
Colombia	-	-
Ecuador	-	-
Hong kong	-	-
India	-	-
Indonesia	-	2022
Kenya	-	-
Laos	-	-
Malaysia	-	-
Maldives	-	-
Mexico	2020 (Piloting)	2014
Myanmar	-	-
Nigeria	-	-
Panama	-	-
Peru	-	-
Philippines	-	-
Singapore	-	2019
Sri Lanka	-	-
Tanzania	-	-
Thailand	-	-
Timor Leste	-	-
Vietnamese	-	-

Source: World Bank [46]

RESEARCH METHOD

Figure and Table

This study conducted a simple literature review based on available research on the database of major scientific works (including and not limited to Scopus and Sinta) and grey literature that selected based on the publisher of the document (from pages with domains.go.id, .gov, or .org). The literature selection adopts the applied framework

[28]. Furthermore, both English and Indonesian literature are used in this study. This study uses literature as a preliminary study of the implementation of the carbon tax in Indonesia, considering that the carbon tax in Indonesia is currently at the beginning of the implementation phase, so there is still not much data that the researcher can analyze. By comparing implementation in other countries with existing literature sources, it is hoped that further research can easily find research gaps.

This study used a qualitative review based on an analysis of the available and selected literature regarding carbon taxes. The literature review process aims to answer three research questions: how the implementation of carbon taxes in several countries, how Indonesia's journey to implementing carbon taxes, and the success factors of other countries can be adapted in implementing carbon taxes in Indonesia.

This research question is not designed to cover all aspects relevant to the carbon tax. It is designed to explore the relevant literature to be easy to manage and analyze in a limited period.

Review of literature

The scope of this research is a published scientific document or work and gets a peer-review process. Documents are preferably obtained from the Scopus database and the web of science, as suggested by Green et al. [20] In addition, it also considering relevant grey literature and scientific papers from journals indexed by SINTA Kemendikbud, Research, and Technology. However, only data obtaining from trustworthy sources that considering in this research, following by domain extension .gov, .go.id, and .org. Relevant keywords are used to find keywords in the title, abstract, or research. The keywords used can be seen in table 1.

Table 3. Literature search keywords

Database	Keywords
Scopus	carbon tax, Indonesia
Sinta	pajak karbon
Grey Literature	“pajak lingkungan” / “environment* tax” “pajak karbon” / “carbon tax” / “tax” and “carbon” “cukai Karbon” / “carbon excise” / “excise of carbon” / “excise” and “carbon.”

Study selection

The outcome of the literature search strategy is that it can filter out irrelevant literature. The literature exclusion process to be analyzed was based on exclusion criteria based on research questions set out in table 2. Our literature search was conducted from February 1 to February 28, 2022.

Table 4. Literature exclusion criteria

Criteria	Definition	
	Inclusion	Exclusion
Search Time	No special criteria	
Language	English and Indonesia	Except English dan Indonesia
Literatur Type	Literature that goes through a peer-review process, conference proceedings, government documents, or certain organizations	Documents that have not gone through a peer-review process or news articles/popular articles
Publication Status	Published or available by online	Published but no related documents available

This literature review was conducted by considering the compiled research framework of Gambelli et al. [17] and Kitchenham [28], including scoping the literature, identification, screening & eligibility, and final selection. In simple terms, this research was carried out through several stages as illustrated in Figure 1

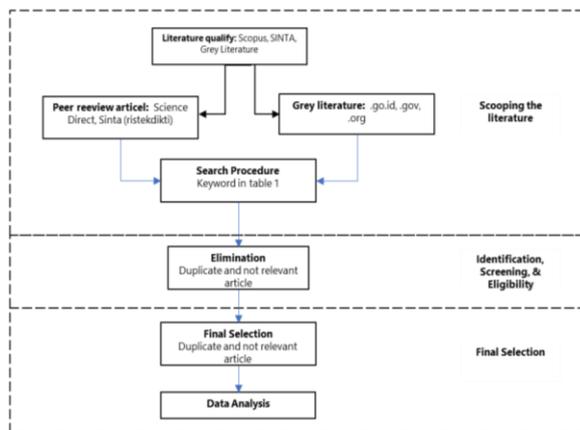


Figure 1. Process of Literature Review

RESULTS AND DISCUSSION

Overview of the Carbon Tax Literature

There has been much literature that discusses the application of carbon taxes in various countries. This study will review some existing research on nationally and internationally scientific research databases. Based on the Sinta database containing accredited national journals, research on carbon taxes in Indonesia began in 2008. After going through a long vacuum, carbon tax research re-emerged in 2014 and reached its peak in 2021 with a total of 4 articles published. The increase in research intensity aligns with enacting regulations on implementing the carbon tax at the end of 2021.

A different situation is found in the Science Direct database, where the carbon tax has been widely published since the 1990s. More than 56 thousand articles discuss carbon taxes, of which 38 thousand are from research articles. In line with the condition of the Sinta database, research on carbon taxes that takes the Indonesian context is minimal. Only seven research articles are found if the word "Indonesia" is added to the search for title, abstract, and keywords. The contents of the discussion of some of these articles are about the carbon tax on power plants.

Research on carbon taxes stored in the Science Direct database can be discussed from various angles. By looking at the subject area, it turns out that almost a third of the research articles are reviewed in terms of environmental science. The subject areas relevant to this research cumulatively approach 12 thousand research articles, detailing Social Sciences (6.773), Economics, Econometrics and Finance (4.864), and Business, Management and Accounting (1.849). The author adds the criteria that there must be the word "carbon tax" in the title, abstract, and keywords search to get relevant results. The search results show the number 2401, with 740 articles according to the subject area of this research.

By narrowing the scope for articles published in 2022, there are 32 research articles related to carbon taxes. However, seven articles are omitted since it was not discussing the carbon tax topic. Of the 25 selected articles, the most discussing carbon taxes in Europe were eight articles, followed by Asia with seven articles. Details regarding the discussion of the carbon tax by region division are shown in Figure 1.

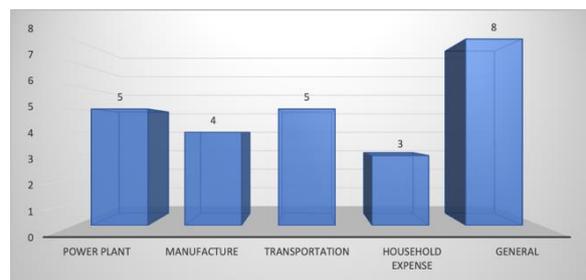


Figure 2. Distribution of the Science Direct 2022 literature by region

In addition, most Science Direct articles published in 2022 discuss about carbon taxes in general. The following article discusses the application of a carbon tax to the transportation and power generation sectors. The manufacturing sector and household needs occupy the fourth and fifth positions, as shown in Figure 2.

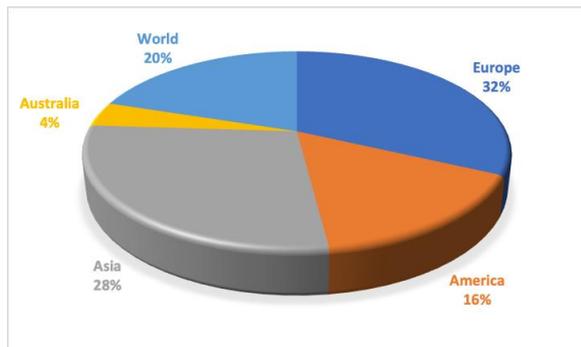


Figure 3. Carbon tax discussion topic in Science Direct 2022 literature

As a complement, the existence of grey literature provides data and information related to carbon taxes. Our search results found several pages containing information of a global nature, such as worldbank.org, oecd.org, and ourworldindata.org, as well as from the Indonesian government, such as kemenkeu.go.id, kemenperin.go.id, menlhk.go.id, and esdm.go.id.

Implementation of Carbon Taxes in Various Countries

This study uses data available on the World Bank website to determine the implementation of carbon taxes in various countries (2022). Based on this data, 33 countries have taken the initiative to implement a carbon tax scheme, both implemented, scheduled, and under consideration, as shown in Figure 3. In addition, 12 states are also committed to implementing a carbon tax.

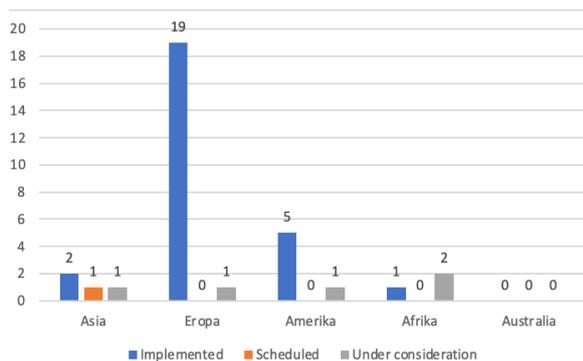


Figure 4. List of countries with initiatives to implement carbon tax schemes

Carbon tax in Europe spread to 19 countries, it would be interesting if Indonesia learn about the continent. However, the majority of implementation started almost 2 decades later, except Netherland and Luxemburg. Moving to other continents, the number of countries implementing carbon tax is relatively limited, especially in Africa that only has one representative. But Africa is much better than

Australia that absence of carbon tax implementation. To have an equal perspective, this study will pick up a country on every continent. Furthermore, the selected country is the most recent in implementing the carbon tax to minimize the time lag issue.

America

On the American continent, five countries have implemented a carbon tax. This research will discuss Argentina because it is one of the countries that recently implemented a carbon tax in 2018. Canada is more recent in its implementation, namely in 2019, but at the subnational level, it has been around since 2008.

On January 1, 2018, Argentina implemented a stage carbon tax with the official name Impuesto al dióxido de carbono [7]. This tax is an additional tax for all fuel types that replaces the fuel tax [22]. Revenues from carbon taxes are used for various purposes, such as financing the housing sector, building transportation infrastructure, and relating to social security. The plan is that the tax rate will be imposed in stages, starting from 10% of the standard rate in 2019, and will be implemented in full 100% in 2028. The income derived from the carbon tax will be distributed under a federal revenue distribution system scheme. Due to the pandemic, implementation was postponed until December 2020 [7].

The tax subjects of the carbon tax in Argentina are producers, distributors, and importers of fossil fuels derived from either oil or coal. However, there are exceptions for several sectors, such as (1) fuel for national aviation and shipping and (2) the export of fossil fuels either as raw materials for fuel or chemical processing purposes. Tax subjects fulfill their obligations every month at a rate of ARS542/tCO₂e or approximately US\$6/tCO₂e. After inflation, tariffs will be evaluated every four months [36].

The carbon tax in Argentina is one of Argentina's tax administration reform products in 2017 with three main objectives, including becoming a member of the OECD, reducing fossil fuel consumption, and financing-related projects dealing with climate change issues. The first goal is the political promise of President Mauricio Macri, who served from 2015 to 2019, and the other two goals are goals that are directly related to the environment as a commitment of Argentina which participated in ratifying the Paris Agreement in 2016. One form of seriousness is the implementation of environmental taxes. However, after three years of implementation, the three main goals of tax reform have not been realized, plus a pandemic problem has hit the world.

The effectiveness of a tax to change polluting behaviour is related to the taxed activity. In addition, it is influenced by the assessment or perception of whether an environmental tax or conventional tax is applied. Milne [34] said that the primary purpose of environmental taxes is non-fiscal purposes. Regarding related taxes, it does not provide clear boundaries on whether it is included in the environmental tax category because the purpose of the imposition is not behaviour change but tax revenue [44]. Recall the environmental tax criteria, the effectiveness of the carbon tax can be seen from changes in fuel consumption behaviour. However, fuel consumption in Argentina from 2010 to 2019 did not change drastically. Fuel consumption in 2017 before the carbon tax was 12 million m³, while in 2018 and 2019, it increased by 12.2 million m³ and 12.3 million m³, respectively [7]. As for 2020, there was a sharp decline to 9.3 million m³, but this can be excluded considering that this year was a pandemic that limited mobility [7].

Another characteristic of environmental taxes is their effectiveness in financing expenditures in the environmental sector. In Argentina, revenues from taxes are mostly part of the central government, then distributed at the provincial level, and local governments under it. Environmental projects are under the Ministry of Energy and Mining, so when viewed from the allocation of revenue distribution, the carbon tax has not shown the characteristics of an environmental tax where there is a specific use. In its implementation, all types of taxes will be in one revenue container, which is then distributed without regard to the portion of the revenue from each type of tax.

There are exciting things in terms of tariffs. Previously, the tax rate could be evaluated following inflation every three months. However, the trend of the effective tariff was a shrink. For instance, the initial tariff was 1.8% in January 2018 but slightly diminished to 1.4% in January 2021 [7]. Boix [7] argues that there is no proper planning for long-term implementation. Indeed, there is a change in government, where the initial implementation is different from 2021. However, the carbon tax implementation in Argentina is dominated by financial interests rather than environmental interests.

Asia

According to the World Bank, only two countries have implemented a carbon tax in Asia, namely Singapore and Japan [46]. Japan has implemented a carbon tax since 2012, so this study will discuss Singapore, which has implemented a carbon tax since January 1, 2019.

Before implementing the carbon tax, Singapore already set some regulations for environmental

concerns. For instance, the Singapore government is not subsidizing fossil fuels [35]. Additionally, Li et al. [32] mentioned that Singapore has a regulation to tax fuel consumption in vehicles. Furthermore, almost all power generators in Singapore produces from natural gas are more eco-friendly than oil gas [32]. So, the possible effort that Singapore can make to contribute to carbon emission would be a carbon tax.

The carbon tax in Singapore is imposed on all industrial and power generation sectors that produce greenhouse gases of 25 ktCO₂e or more without exception [46]. Initially, the tariff is S\$5/tCO₂e (US\$3.7/tCO₂e) and will be evaluated in 2023. Tariff target in 2030 is S\$10-\$15/tCO₂e (US\$7/tCO₂e to US\$11/tCO₂e). The Singapore government allocates special tax revenues for expenditures related to climate change. The tax subject to liability is at the operator level, which must pay annually.

Europe

Europe is the region that applies the most carbon taxes, with 19 countries. The Netherlands and Luxembourg will be the most recent in their implementation in 2021 [46]. This research will take lessons from the Netherlands, a more influential country with historical ties to Indonesia. The Netherlands is one of the countries in Europe that has just implemented a carbon tax as of January 1, 2021. The initial rate applied is EUR30 (US\$35.24)/tCO₂e. The main sectors that are targeted for carbon taxes are defined industries. There are at least 235 companies and 284 industrial installations that have been assigned a carbon tax. The industry should report and pay carbon taxes monthly.

Before implementing the carbon tax, the Netherlands commits to emission reduction through tax regulation. Kok [30] mention that the Netherlands gives tax incentive to support less carbon emission vehicle, including vehicle purchase tax, annual road tax, and company car tax. As a result, the Netherlands had the lowest carbon emission in Europe, and even the tax revenue decreased by 50% in those periods [30].

Africa

The African region is the fewest country to implement a carbon tax. South Africa is the only country implementing it, while Senegal and Cote D'Ivoire are still under consideration. The carbon tax in South Africa has been implemented effectively since June 1, 2019 [46]. The carbon tax implementation is important since South Africa is enriched with coal reserves that produce large carbon emissions [2; 18].

South Africa's Carbon tax applies the polluter pay principle, where people who will produce carbon must pay to internalize the costs of externalities for the emissions they produce. The carbon tax applied is borne by the end-users of fossil fuels, paid twice a year. The tariff set in 2021 is R134/tCO₂e (US\$7/tCO₂e) and will be increased according to inflation plus 2% in 2022 for the industrial, electricity, building, and transportation sectors that use fossil fuels [46]. Although transportation and electricity are the subject sectors, several sub-sectors are exempt from the carbon tax, such as public transportation or electricity for the housing sector.

To understand the differences in implementing carbon taxes in the four countries above, Table 3 presents a summary.

Table 5. Comparison of carbon tax implementation in 4 countries

Description	Argentina	Singapore	Netherland	South Africa
Implementation	2018	2019	2021	2019
Sector	Fossil-fuel consumption	1. Industry 2. Power	Industry	1. Industry 2. Power 3. Building 4. Transportation
Exemption	1. domestic aviation 2. domestic shipping 3. fossil-fuel export	no exemption	Emissions below the baseline	1. public transportation 2. residential electricity
Subject	1. Producer 2. Distributor 3. Importer	Operator	Operator	Consumer
Reporting	Month	Year	Month	Semester
Tarif	6	3,7	35,24	7
Tarif evaluation	every 4 month	2023	N/A	2022
Revenue	general-purpose	climate changes purpose	N/A	N/A

Source: Adaptation from Worldbank (2022)

Roadmap of Indonesian Carbon Tax

Indonesia is a developing country with the most significant carbon emission contributor in the world [10; 14]. Ritchie et al. [40] revealed that the increase in emissions from 1889-to 2019 was 660.59 million tons and is predicted to experience an increase in emissions every year above 800 million tons by 2035 [43]. The issue of climate change in Indonesia first emerged before 1980. In the 1980s and before, the issue was only discussed briefly between the ministry of environment and a few scientists who focused on climate [38]. Resosudarmo et al. [38] said that environmental issues were rarely discussed in Indonesia in that year, and research related to climate change emerged in the mid-1990s.

Indonesia's commitment to controlling climate change occurred in 2007, especially when it hosted

the 13th Conference of the Parties (COP) [38]. The conference resulted in a Bali action plan, including agreeing on approaches and positive incentives for REDD+ in developing countries to provide solutions for reducing deforestation for developing countries. However, they can continue their national development [11]. In that year, several centres for environmental studies were established at various universities in Indonesia. It was the impact of the international research community, which at that time focused more on climate change issues [38].

In 2009 there was pressure for the government to respond to climate change actions, both international and domestic. It is related to some data that states that Indonesia is the largest emitter country globally, so real action is needed to reduce CO₂ emissions [38]. Furthermore, suppose the Indonesian government takes real action. In that case, it will invite international assistance and attract world attention because it is the first developing country to focus on the issue of climate change [38]. Thus, at the G-20 meeting in Pittsburgh and Copenhagen in 2009, the president committed to reducing CO₂ emissions by 26% with self-financing while international assistance by 41% [26]. The following action was issued by President Law Number 70 of 2009 concerning energy conversion [26].

The Paris agreement that occurred in 2016 contained in Law No. 16 of 2016 related to climate change forced the government to start thinking about implementing a carbon tax to meet the target of reducing greenhouse gas emissions. However, the discourse on implementing a carbon tax in Indonesia faces various political challenges and obstacles. First, institutional resistance, policymakers, including ministries, believe that there is no consensus on the urgency of a carbon tax in Indonesia and that applying this tax is not the right policy [14]. Both business interests, many members of the House of Representatives come from entrepreneurs, so they have a paradigm that environmental issues will cause costs, which will reduce their business profits. Finally, the carbon tax is not a sexy issue to discuss [14]. The three lobbying powers, more than 50% of DPR members are entrepreneurs who are not happy with the additional tax, so they seek to lobby for the carbon tax in Indonesia to be replaced with other options, such as subsidies for renewable energy and clean technology [14].

As an archipelagic country, Indonesia is vulnerable to climate change and experiences an increase in Greenhouse Gas (GHG) emissions of 4.3% per year [11]. The national GHG emission level in 2019 reached 1,866,552 Gg CO₂e [11]. The energy sector is ranked first to contribute to GHG emissions of 638,808 Gg CO₂e [11]. The next ranking comes

from industrial processes and product use of 60,175 Gg CO₂e. As a strategic sector in Indonesia, agriculture contributes 108,598 Gg CO₂e [11]. Peat fire is one of the GHG emitters and causes the forestry sector to be in the fourth position with GHG emissions of 924,853 Gg CO₂e. Waste has GHG emissions in the last position of 134,119 Gg CO₂e [11].

Mitigation of climate change in Indonesia requires a large amount of money. According to the 2018 Ministry of Environment and Forestry report, the cumulative climate change mitigation costs to achieve NDC will reach IDR 3,462 trillion by 2030 [11]. This climate change can increase the risk of hydrometeorological disasters, which reach 80% of the total disasters in Indonesia and are estimated to have a potential economic loss of 0.66%-3.45% of GDP in 2030 [29].

Implementation of Carbon Tax in Indonesia

After going through these various challenges and considerations, in October 2021, the government issued a law related to carbon taxes in one sector, which will be gradually expanded to other sectors in 2025. It is in line with the recommendations of economists, environmental scientists, and international organizations that to carry out decarbonization in line with the Paris agreement, it is necessary to have carbon pricing, both through taxes and emission trading [6; 5].

Kemenkeu [25] stated that the Taxation Harmonization Law related to the carbon tax includes several essential things. Firstly, the carbon tax will be carried out in stages according to a roadmap that considers economic aspects, sector readiness, and achievement of NDC targets. Second, implementing this carbon tax will prioritize the principles of fairness and affordability. Third, the carbon tax rate implemented in 2022 is set to be higher or equal to the carbon price in the carbon market with a minimum rate of IDR 30.00 per kilogram of CO₂ equivalent. This rate will be evaluated periodically and set higher or equal to the price on the carbon market. This carbon tax will be implemented for the first time on April 1, 2022, in the coal-fired power plant sector [5]. The carbon tax roadmap will go through two carbon trading schemes that will be tested: cap and trade and cap and tax [6].

In the cap-and-trade scheme, companies that produce emissions above the cap must purchase an emission permit certificate (SIE) from another company whose emissions are below the cap. Meanwhile, in the cap and tax scheme, emission restrictions are imposed, and companies will be subject to tax if the emissions issued exceed the limits set by the government [25]. The two schemes are depicted in Figure 4 below.

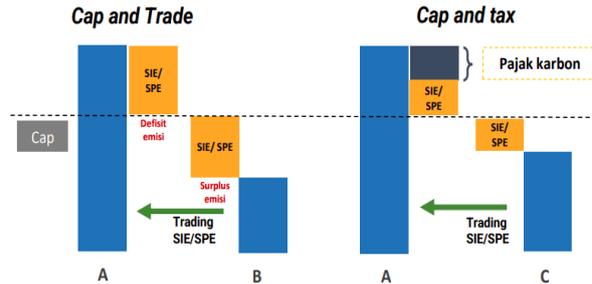


Figure 5. Carbon Tax Scheme in Kemenkeu [25] Indonesia

Lessons Learned from Other Countries

In the initial phase of implementing the carbon tax in Indonesia, there is still room for improvement in a better direction. For this reason, it is essential to see the success of carbon taxes implementation in other countries. In this section, the discussion focus on the experiences of other countries, from the sectors affected to the use of carbon tax revenues.

Some of the countries discussed in the previous section are not much different from Indonesia in terms of implementation time of carbon tax. Argentina was the first to implement a carbon tax in the four countries in 2018. Although it is relatively new to implementing a carbon tax, almost all these countries have applied it to a reasonably broad sector. It should be an important note for Indonesia to expand the scope of the carbon tax implementation. In the initial phase, it only imposed a carbon tax on one of the sub-sectors in the energy sector, namely power generation. Indeed, carbon emissions from the energy sector are the most significant contributor to carbon emissions in Indonesia. However, other sub-sectors, such as transportation and industry, contributed significantly to carbon emissions, especially the FOLU sector, which historically has surpassed carbon emissions in the energy sector [8].

The potential for implementing a carbon tax is quite vast in mainstream sectors such as power generation, manufacturing, transportation, and household consumption. The imposed sector is quite broad contemplating the general overview of the carbon tax literature in various countries published in 2022 (Figure 2). For this reason, when the government expands the implementation of the carbon tax plan in 2025, it is necessary to include the forestry sector (FOLU), industry, and transportation which still produce carbon emissions. In addition, if the transportation sector is included in the carbon tax scheme, then there are two tax subject schemes, the power generation sub-sector at the producer/distributor level while the transportation level is at the consumer level. As a result, the behaviour of fuel users at the consumer level will change.

To achieve the carbon emission target, the government still needs to implement it in the emission contributor sectors in Indonesia. Nevertheless, there must still be exceptions unless they could be counterproductive to the economy and the public interest. The transport sector needs special treatment, as in South Africa, which exempts carbon taxes on all public transport. The same approach was taken by Argentina, which eliminated the carbon tax on national airlines and shipping. Furthermore, for non-commercial purposes such as housing, electricity consumption also needs a carbon tax exemption applied by South Africa. One thing that is unique in Argentina, the carbon tax was waived for fuel exported abroad. It is applied in Indonesia as a fossil-fuel-producing country.

The Taxation Harmonization Law has provided space for distributors and final consumers to be subject to a carbon tax by allowing individuals or entities to buy goods containing carbon to be subject to a carbon tax. It is moving on to the tax subject side of the carbon tax, wherein the early stages of its application in Indonesia focus on coal power plant operators. This condition is the same as Singapore and the Netherlands, which set operators as carbon tax subjects. In the future, if Indonesia also expands the scope of the carbon tax to the industrial sector, the determination of operators as tax subjects is still relevant. However, suppose the carbon tax later also penetrates a broader sector. In that case, the appointment of distributors and end-users is also worth considering, as has been applied in Argentina and South Africa.

After determining the object and subject of the carbon tax, the reporting mechanism also deserves attention. It aims to find the right combination between the convenience of carrying out obligations for taxpayers and the accuracy of tax authorities' reporting data. Taking lessons from the Netherlands, which requires monthly reporting, the government will find it easier to monitor and evaluate. However, it should be emphasized that the taxpayer profile in the Netherlands is different from that in Indonesia, although Argentina, as a developing country, also applies monthly reports for its carbon tax. Meanwhile, Singapore, as the closest country to Indonesia, uses an annual mechanism for reporting carbon taxes.

Meanwhile, South Africa took a middle ground by requiring taxpayers to report carbon taxes every semester. The Taxation Harmonization Law stipulates that when a carbon tax is payable from activities that produce carbon emissions, it is the end of the calendar year period. It means that carbon tax reporting in Indonesia is directed annually. Since Indonesia has a periodic tax return

reporting mechanism, the government can use the monthly cycle to maintain intense supervision.

The carbon tax rate in Indonesia under the Taxation Harmonization Law refers to the price of carbon in the carbon market. Unlike other countries, which state the carbon tax rate at the beginning of its implementation. However, the Taxation Harmonization Law provides a minimum carbon tax rate of IDR 30.00 CO₂e (equivalent to US\$ 2.08/tCO₂e), although this value is relatively low when compared to other countries' carbon tax rates. The Netherlands, which will start implementing the carbon tax in 2021, has set a high price of US\$35.24/tCO₂e. Argentina and South Africa were US\$6/tCO₂e and US\$7/tCO₂e, respectively. Meanwhile, Singapore, which is still in the Southeast Asia region, is still above Indonesia at US\$3.7/tCO₂e.

Meanwhile, the fastest rate evaluation period for Argentina is every four months. After two years after implementation, South Africa said it would increase the carbon tax rate by 2%. Since it was implemented, Singapore needed three years to evaluate the carbon tax rate. For this reason, Indonesia can consider the reference tax rate not based on the carbon price in the carbon market but can adopt a scheme in other countries that adjusts to inflation (CPI). So it will better reflect the level of public consumption.

If considered environmental taxes, carbon tax revenues should be allocated to finance government programs to reduce the impact of climate change. The country that explicitly mentions this is Singapore, where this tax revenue is specifically for expenditures related to climate change. In contrast to Argentina, which uses non-specific carbon taxes to address environmental issues. For this reason, the Indonesian government needs to place a carbon tax as a fiscal instrument that encourages behavioural change toward environmental improvement. So that the benchmark for the success of implementing a carbon tax is not seen from the amount of tax money collected but from the decline in production and consumption of goods that emit carbon emissions; meanwhile, the carbon tax revenue should be used only for environmental quality improvement programs.

CONCLUSION

Indonesian carbon tax is one of unattractive topic research in the last two decades for both national and international journal database. In contrast, carbon tax in other countries became an exciting theme for 56 thousand articles published in Scopus database since 1990. With abundant resources outside, Indonesia as a new-born in carbon tax must learn to other countries.

This study focuses on capturing four countries that recently implementing the carbon tax. First lesson learning is the object of carbon tax. Almost all these countries impose a carbon tax on the industrial sector, except for Argentina that tax the fuel consumption sector. Moreover, both South Africa and Singapore imposes a carbon tax on the power generation sector. Furthermore, South Africa put the building and transportation sectors as an object of carbon tax. Subject of carbon tax should be the second learning which generally are operators, except for South Africa that making consumers become a tax subject. Third, carbon taxpayers in Argentina and the Netherlands must submit reports every month, while South Africa and Singapore are every semester and yearly, respectively. Lastly, regarding tariffs, Singapore is the lowest at 3.7, much different from the Netherlands, which has the highest tariff at 35.24.

In the case of Indonesia, the journey of implementing a carbon tax requires tremendous time and energy. The initial stage of implementing a carbon tax in Indonesia, which only targets coal power plants, deserves to be improved. The main thing that needs to be developed is expanding the tax object to the transportation sub-sector and protecting public transportation. If this happens, Indonesia will have two tax subject schemes: power generation at the producer/distributor level and transportation at the consumer level. Hopefully, it led to change the behaviour of non-renewable energy users. The absence of regulations to implement a carbon tax in Indonesia until this research opens space to provide input from the reporting period side using the current cycle in Indonesia, which can be applied monthly or annually. Meanwhile, in terms of the carbon tax rate in Indonesia, it is better to adopt a scheme in other countries that adjusts it to inflation (CPI) which reflects the level of public consumption.

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