The Carbon Tax Implementation Plan in Indonesia

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***Abstract*: An increase in the concentration of greenhouse gases in the atmosphere damages the environment. The increase in greenhouse gases also causes global warming and negatively impacts it. The majority of the implementation of these policies showed a significant impact on the environment and state revenues. As one of the countries that are also committed to reducing the impact of climate change, Indonesia will start implementing a limited carbon tax policy in 2022 in the Coal Steam Power Plant (PLTU) sector at a rate of IDR 30 per kilogram of carbon dioxide equivalent (CO2e). However, in implementing the carbon tax policy, the Indonesian government still has to pay attention to several things that can be caused by implementing the policy, such as the emergence of economic distortions and the impact on low-income households. Therefore, the carbon tax policy must be designed in a suitable, synergistic, and compatible machine with the structure of the Indonesian economy.**

***Keywords*: Carbon, Tax, policy, Indonesia, greenhouse gases**

I. INTRODUCTION

Developed countries have already explored revenues from carbon emissions. State revenues from carbon emissions are then used to finance programs related to carbon emissions. Furthermore, Indonesia can follow the example of the developed countries in seeking funding sources for the State Budget sourced from carbon emissions by implementing a carbon tax policy.

The term carbon footprint has become popular in recent years and has been widely used. Climate change is high on the political and corporate agenda. Accounting for a carbon footprint is urgently needed. Many approaches have been proposed to calculate the carbon footprint. Carbon footprint calculations range from basic online calculators to sophisticated life cycle analysis and input-output-based methods or tools. Despite its ubiquitous use, there is still a lack of an academic definition of what a 'carbon footprint' actually means. The scientific literature has no clear clarification. The definition of a carbon footprint is unclear, even though extensive energy and ecological economics research claims to measure a 'carbon footprint' has been published for decades (Hammerschlag and Barbour 2003).

A review of the scientific literature, publications, and statements from the public and private sectors, as well as the general media, shows that the term 'carbon footprint' has become widespread in the public domain even though it is not clearly defined in the scientific community. The notion of 'carbon footprint' includes all direct and indirect CO2 emissions, that a unit of measurement mass should be used, and should not include other greenhouse gases or the indicator should be called the climate footprint. Whatever method is used to calculate the carbon footprint, it is important to avoid double counting along the supply chain or life cycle, as there are significant implications for carbon trading and offsetting practices (Lenzen et al. 2007).

An increase in the concentration of greenhouse gases in the atmosphere damages the environment. The increase in greenhouse gases also causes global warming and negatively impacts it. Following the rule that can manage only measurable, measurements of the greenhouse gas intensity of various products, entities, and processes are underway worldwide, expressed as their carbon footprints. Methodologies for calculating carbon footprints are still evolving and are emerging as important tools for greenhouse gas management. The concept of a carbon footprint has permeated and is being commercialized in all areas of life and the economy. There is little coherence between studies' definition and calculation of the carbon footprint. There is disagreement over the selection of gases and the order in which emissions will be included in the calculations. Greenhouse gas accounting standards are a common resource used in footprint calculations, although there is no mandatory provision for trace verification. The carbon footprint is intended as a tool to guide relevant emission cuts and verifications. Therefore standardization at the international level is required. The current review describes the applicable carbon footprint methods and raises related issues.

II. METHODS

The literature review is a research conducted by researchers by collecting several books and magazines related to the problem and research objectives. This technique reveals various theories relevant to the problems being faced/researched as reference material in discussing research results. Literature reviews can be carried out from several sources, such as national and international journals, using three databases (BASE, Science Direct, and Neliti) and the relevant textbook or handbook on carbon footprint research and taxation.

Life Cycle Assessment

The carbon footprint is analyzed so that a production activity knows how much greenhouse gas emissions from these activities are. Calculating carbon footprint can use a life cycle approach (life cycle assessment). Sources of greenhouse gas emissions at each production stage can be identified using a life cycle assessment approach. Life cycle assessment (LCA) is a method used to analyze environmental impacts that occur. Environmental impacts can occur due to the production

process of a product (ISO 14040: 2006). The LCA method is used to analyze the carbon footprint.

LCA has the advantage that it is comprehensive because by using the LCA method, an analysis of the potential environmental impacts that occur in processes related to the life cycle of a product can be carried out. The resources used (input) of a process and the resulting product (output) of a process can be identified using the LCA method (Fernando R, 2014).

One form of environmental impact that LCA often analyzes is greenhouse gas (GHG) emissions as the cause of global warming. The application of LCA is useful so that the source and magnitude of greenhouse gas emissions can be identified at each stage in the life cycle of a product. The amount of GHG emissions produced in making a product is known as the product's carbon footprint.

Applying the LCA concept benefits product improvement, process improvement, and strategic planning (Megasari et al., 2008). The amount of GHG emissions indicates that the production process is inefficient. An inefficient production process will increase production costs and product selling prices, reducing the company's competitiveness. Increasing awareness of environmental sustainability, as well as the issuance of various regulations in the environmental sector, require the introduction of environmentally friendly processes and products. Food supply is one of the activities that contribute significantly to global GHG emissions (González, 2011). GHG emissions occur at every stage of the food product life cycle, starting from the supply of raw materials, transportation, processing, and marketing.

Carbon Dioxide Emissions In Indonesia

The effect of global warming on the environment has become an international concern. The greenhouse gas effect causes global warming. Carbon dioxide emissions continue to increase and accumulate in the atmosphere. The biggest greenhouse gas (GHG) effect is caused by carbon dioxide emissions (Srivastava et al., 2011). Global warming makes international efforts to reduce carbon dioxide gas emissions.

As a developing country, Indonesia needs energy that continues to grow just like other developing countries. Energy is an important need for Indonesia, but the energy sector is one of the main contributors to greenhouse gas emissions. The magnitude of the emission and environmental impact of the energy sector needs to be renewed. One of the important energy sectors in Indonesia is the power generation sector (Viola et al., 2010).

Reports on Indonesia's electricity generation and carbon dioxide (CO2) emissions are still limited. The Indonesian Environmental Statistics Report published in 2016 reports CO2 emissions but is limited to household and motor vehicle emissions and does not mention emissions from Indonesian power plants (Badan Pusat Statistik Indonesia, 2016). Previous studies (Hasan et al., 2012) Reports regarding power generation, and carbon dioxide (CO2) emissions in Indonesia are still limited. The Indonesian Environmental Statistics Report published in 2016 reports CO2 emissions but is limited to household and motor vehicle emissions and does not mention emissions from Indonesian power plants (Badan Pusat Statistik Indonesia, 2016). A previous study (Hasan et al., 2012) examined the pattern of electricity generation in Indonesia. This study focused more on the study of the type of power plant. However, carbon dioxide emissions were also given until 2009 but have not presented opportunities for biofixation as an alternative. CO2 reduction. Therefore, this paper will contribute by completing the study of CO2 emissions from the power generation sector in Indonesia over 15 years (until 2015), especially for steam power plants, as well as identifying and discussing emission reduction opportunities with CO2 biofixation (Ball, 2008; Meinshausen et al., 2009).

Power plants in Indonesia are still heavily reliant on non-renewable fuels, especially coal, with an average increase of about 7%. Without efforts to reduce carbon dioxide emissions in the BAU (Business as Usual) scenario, carbon dioxide emissions in Indonesia will continue to increase with a projection that in 2030 it can reach 287 million tons and contribute to global warming. Biofixation using microalgae is one of the opportunities to reduce carbon dioxide emissions from human activities (anthropogenic) in the energy sector of power generation, which is discussed in this paper. The potential for reducing carbon dioxide emissions can reach 30 to 50% of the projected figure in 2030; this is valuable in environmental protection and is also indicated to have economic value through carbon trading mechanisms (Gunawan, 2017).

Implementation of Carbon Taxes in the World

The Carbon Tax is included in the Pigovian tax, as Rosen (2001) described. The Pigovian tax levy on each unit of output from a pollutant source in an amount proportional to the marginal damage effect it causes by charging it into efficient output. Arthur C. Pigou introduced the Pigovian tax itself in 1920. The Pigovian tax is closely related to the carbon tax. A carbon tax is applied to materials with carbon content which results in carbon emissions which are negative externalities (Pigou, 2013).

The first country to implement a Carbon Tax was Finland in 1990, followed by New Zealand, which started implementing a Carbon Tax in 2005. Furthermore, several other countries have also started to implement a Carbon Tax, namely Ireland (2010), Japan and Australia (2012), the United Kingdom (2013), Chile (2014), Portugal (2015), then China (2017). In the Southeast Asian region, Singapore started to impose a Carbon Tax in 2019. Other countries that have also

implemented a carbon tax, such as Finland, Denmark, the Netherlands, and Sweden, could reduce carbon emissions by 1.5% - 6% (Selvi et al., 2020).

According to World Bank data (2020), carbon taxes have been implemented in at least 27 countries worldwide. Many other countries have implemented the Carbon Tax, and the policy is considered effective in reducing the resulting carbon emissions. Finland was the first country in the world to implement a carbon tax in 1990. Finland's current carbon tax rate reaches US$68 per tonne of carbon emissions and is the 4th highest carbon tax rate in Europe. A carbon tax is imposed on CO2 emissions, especially from the industrial, transportation, and building sectors. However, there are exceptions for certain industries (Tax Foundation, 2020; World Bank, 2020).

Sweden has implemented a carbon tax since 1991. The current rate is US$119 per tonne of carbon emissions. The tariff is the highest in the European region. Sweden's carbon tax applies to fossil fuels and CO2 emissions, mainly from the transport and building sectors (Tax Foundation, 2020; World Bank, 2020).

The Swiss government has implemented a carbon tax since 2008. The carbon tax rate applied is US$99 per tonne of carbon emissions. The rate is equivalent to Liechtenstein and is the second-highest rate in Europe. The Swiss carbon tax applies to CO2 emissions mainly from the industrial, electricity, building, and transportation sectors (Tax Foundation, 2020; World Bank, 2020).

The Polish government has imposed a carbon tax since 1990. The current rate is US$0.10 per tonne of carbon emissions and is the lowest in Europe. This tax applies to all fossil fuels and other fuels that produce GHG emissions as well as GHG emissions from all sectors, except for certain entities.

The Canadian government has implemented a carbon tax since 2019, with rates starting at US$20 per tonne of carbon emissions. However, tariffs will continue to increase by US$15 annually until they reach US$170 by 2030. A carbon tax in Canada is imposed on GHG emissions from all sectors with some exceptions for the industrial, agricultural, and transport sectors, including on 21 types of fuel (World Bank 2020, Government of Canada, 2020).

The Mexican government imposed a carbon tax in 2014. Tariffs are set from US$0.4 per tonne of CO2 to US$3 per tonne of CO2. The carbon tax in Mexico applies to CO2 emissions from electricity, industry, road transport, aviation, shipping, buildings, waste, forestry, and agriculture (World Bank, 2020).

For example, Japan has imposed a carbon tax per tonne of CO2 emissions, which is 289 Yen or equivalent to Rp. 38,000. Over the last six years (2013-2018), Japan has reduced carbon emissions by 8.2%. Through a carbon tax policy, Japan targets a 26% reduction in GHG emissions by 2030. By 2020, compared to 1990, Japan has reduced carbon emissions by 0.5% (Gokhale, 2021). This figure is considered not optimal enough and does not follow the target set. Then in terms of income, the nominal earned is also relatively small and only affects a small part of Japan's economic growth. The influencing factors are, among others, that the determined tax carbon rate tends to be too low. Even this nominal does not meet international recommendation standards.

Carbon Tax Implementation in Indonesia

The government has promulgated Law Number 7 of 2021 concerning the Harmonization of Tax Regulations, one of which regulates the carbon tax. The carbon tax in Indonesia will begin to be applied on April 1, 2022, in the Coal Steam Power Plant (PLTU) sector at IDR 30 per kilogram of carbon dioxide equivalent (CO2e). This rate is lower than that stated in the draft Law on General Provisions and Tax Procedures (RUU KUP), which is Rp75 per kilogram of CO2e. The tariff of Rp30/kg CO2e is still considered too low because the tariff to be applied is still far from the recommendations of the World Bank and the International Monetary Fund. Based on Indonesian conditions, the recommended tariff application uses the equation marginal benefit of abatement = marginal cost. Referring to this equation, the ideal tariff for Indonesia to achieve the emission reduction target set out in the NDC is IDR 300,000/ton CO2e (Ratnawati, 2016).

The income from the carbon tax can later be used to fund research and development of renewable energy and reduce greenhouse gas emissions (Ratnawati, 2016). Revenues can also be allocated to reduce future carbon emissions' impact and control climate change. In addition, using income for energy efficiency is an effort to encourage the reduction of carbon emissions (Ratnawati, 2016). Hartono and Resosudarmo's (2008) research shows that energy efficiency positively impacts households because it can increase their income.

Although it looks quite simple, implementing this carbon tax requires strong regulations and a complete database. In many cases, implementing carbon taxes faces major obstacles in this regulatory area, where the challenges usually come from industry players and other emission sources as objects of taxation. In addition, it is necessary to look at the object's condition in question to create a new policy. The industry itself is deemed appropriate to be the initial object to get used to the Carbon Tax being implemented because it is clear that the impact generated between industry players on the environment and the effect on the sustainability of the earth in the future is clear.

We will recognize reciprocity in implementing carbon tax collection in the industrial sector. When a Carbon Tax is applied, the related tax subjects will certainly have pros and cons. In this case, we give an example of the application in the industrial sector. The solution we offer is “Feedback Taxes”. With the feedback tax method, companies or industries subject to tax will not object because there is reciprocity for what has been paid.

Carbon taxes can support the achievement of Indonesia's Nationally Determined Contribution targets, but a lot of effort

and a new economic regime is also needed. Several scenarios might be applicable in Indonesia, such as:

- Carbon Tax in Industry and Power Generation. It requires firm policies and commitments from the government and industry. It can increase the price of the product.
- Carbon Tax in transportation. The Carbon Tax that can be used in this transportation can be in the form of vehicles or fuel. Implementing this Carbon Tax is simpler but requires stable policies and commitments from government and industry.

III. CONCLUSION

The carbon tax policy as a Pigouvian tax is one of the efforts of countries to overcome the negative externalities caused by carbon emissions. Carbon tax policies have been implemented since 1990 by both developed and developing countries. The majority of the implementation of these policies showed a significant impact on the environment and state revenues. As one of the countries that are also committed to reducing the impact of climate change, Indonesia will start implementing a limited carbon tax policy in 2022 in the Coal Steam Power Plant (PLTU) sector at a rate of IDR 30 per kilogram of carbon dioxide equivalent (CO2e). The income from the carbon tax in Indonesia can later be used to fund research and development on renewable energy and reducing greenhouse gas emissions or can be allocated to reduce the impact of future carbon emissions as an effort to control climate change. However, in implementing the carbon tax policy, the Indonesian government still has to pay attention to several things that can be caused by implementing the policy, such as the emergence of economic distortions and the impact on low-income households. Therefore, the carbon tax policy must be designed in a suitable, synergistic, and compatible machine with the structure of the Indonesian economy.

Before the official carbon tax policy is implemented, the government should have carried out socialization activities so that all people understand and are aware of the new policy. In addition, implementing a carbon tax is believed to have an impact on increasing economic costs broadly. The government can make several efforts to prevent this, including providing relief on other tax policies. For example, the government can increase the nominal Non-Taxable Income (PTKP) as compensation in the income tax policy. In addition, the government can also provide incentives for reducing tax rates for taxpayers in the renewable energy industry.

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