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Carbon Trading as a New Paradigm for Indonesia's Polluter Pays Principle

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Abstract

Climate change is a global phenomenon caused by natural variability or as a result of human activities such as large-scale use of fossil fuels (coal, oil and natural gas), land use changes (clearing land for logging, farming, and farming), and end-of-use activities. land and forestry, and consumerism. The critical issue of global carbon trading is related to market competition between developed and developing countries due to non-uniform carbon prices. First, regarding mitigation results transferred internationally, namely international trade for excess

emissions reductions over NDC targets. Second, regarding sustainable development mechanisms, namely emission offsets through projects carried out by public and private entities everywhere. Third, regarding non-market approaches, namely reducing emissions through mitigation and adaptation efforts, financial assistance, technology transfer, and capacity building, including carbon taxes and CBAM. This research uses a type of juridical-normative research, namely research carried out by studying, describing, synthesizing, interpreting, assessing, and analyzing positive law. The results of this research are a paradigm shift related to the "polluter pays principle" which is a concept that recognizes that entities or individuals who pollute the environment must be responsible for the costs of the pollution they produce. The carbon market ecosystem in building a new paradigm of sustainable development. The carbon market ecosystem plays an important role in building a new paradigm of sustainable development by providing economic incentives to reduce greenhouse gas (GHG) emissions and tackle climate change.

Keywords
GHG Emissions, Carbon Trading, Polluter Pays Principle.

Introduction

The global environmental issue is nothing new. This is now the case serious attention in almost all countries, especially on legal and policy aspects. Environmental problems do not only occur in developed countries, but also occurs in developing countries. The impact of climate change on economic performance will not be limited to its effect on average temperatures. Other extreme weather events such as drought and fires, as well as sea level changes, appear to be equally relevant.[1] While there is already evidence that climate change has led to more frequent and intense heatwaves, droughts and fires, this has not been

[1] Solomon M. Hsiang and Amir S. Jina, "The Causal Effect of Environmental Catastrophe on Long-Run Economic Growth: Evidence From 6,700 Cyclones," *National Bureau of Economic Research Working Paper* 20352 (2014): 2–68, https://doi.org/10.3386/w20352.

true for cyclones, hurricanes and floods.[2] One way to think about these effects is to consider how extreme weather events would shape "growth episodes." Economic performance in the medium and long term is episodic for all but the richest countries which remain on the technological frontier. Almost all countries have experienced periods of rapid economic growth and periods of dismal growth. Comparative performance is explained by the superior ability of some countries to sustain growth; poorer countries have a greater tendency to regress.[3] Problem the global environment does not fully new. Currently, that is only become attention serious in almost all countries, especially in aspects laws and policies. Problem environment No only occurs in developed countries, but also in developing countries.[4]

Change climate is a global phenomenon caused by variability natural or as consequence from activity man like use material burn fossil in scale large (coal, oil and natural gas), use land change (opening land For logging, farming and farming), activities end use land and forestry, and consumerism . Time to take and use This source power, house gas glass released in a way massively to atmosphere due to industrial processes. Other gases are also released and pollute atmosphere, like carbon dioxide (CO2), methane (CH4), nitrous oxide (N20). All this gas called "house gas glass". Activity man is source main house gas glass and factors biggest change climate, especially carbon dioxide (CO2). Contribution biggest originates from industrialized countries. CO2 has ability for absorb originating heat from radiation the sun emits returned by the earth. Absorption has cause warmup atmosphere or increase temperature and change climate. Home gas emissions glass Keep going increase and impact to locally and also throughout the world.

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[2] Roger Pielke Jr, "How to Understand the New IPCC Report: Part 2, Extreme Events," 2021, https://rogerpielkejr.substack.com/p/how-to-understand-the-new-ipcc-report-1e3.

[3] Benjamin A. Olken Benjamin F. Jones, "The Anatomy of Start-Stop Growth," *Review of Economics and Statistics* 90, no. 3 (2008): 582–87, https://doi.org/https://doi.org/10.1162/rest.90.3.582.

[4] Muhammad Akib, Actualization of Environmental Legal Politics in the Implementation of Regional Autonomy (Bandar Lampung: University of Lampung, 2015). *See also* Ega Rijal Mahardika, and Muhammad Azhary Bayu. "Legal Politics of Indonesian Environmental Management: Discourse Between Maintaining Environmental Sustainability and Economic Interests." *Indonesian Journal of Environmental Law and Sustainable Development* 1, no. 1 (2022): 1-28.

In response to this situation, the governments of countries around the world are committed to maintaining the earth's temperature so that it does not exceed 2 degrees Celsius, and as much as possible does not reach 1.5 °C, by cutting global carbon emissions. After the adoption of the Paris Agreement in 2015, each party country, including Indonesia, prepared a nationally determined contribution document (NDC), which contained an action plan to deal with climate change. In this document, the Indonesian government is targeting a reduction in greenhouse gas emissions of 29 percent with its own capabilities and up to 41 percent with international support by 2030. Indonesia is also working to achieve *net zero emissions* (NZE), namely the condition that GHG emissions that still occur can all be achieved. absorbed so that it does not enter the atmosphere, by 2060 or sooner. One policy instrument that is believed to be effective in achieving this target is carbon trading, a market-based mechanism for reducing greenhouse gas emissions through buying and selling carbon emission reduction certificates. Certificate sellers are parties who have succeeded in reducing carbon emissions more than required, while buyers are parties who produce carbon emissions more than the permitted emission limit.

Indonesia has great potential to implement a domestic carbon market and actively participate in the international carbon market. Both will bring benefits, not only in suppressing climate change from an environmental perspective, but also economic benefits in the form of cash flow and investment. Apart from that, the carbon market can also provide benefits for the mastery of clean technology and provide social benefits. The development of renewable energy will very likely occur more quickly with the implementation of carbon markets. Indonesia has great potential to implement a domestic carbon market and actively participate in the international carbon market. Both will bring benefits, not only in suppressing climate change from an environmental perspective, but also economic benefits in the form of cash flow and investment. Apart from that, the carbon market can also provide benefits for the mastery of clean technology and provide social benefits. The development of renewable energy will very likely occur more quickly with the implementation of carbon markets. This form of market-based mechanism as an effort to reduce emissions is also known as Carbon *Trading*. Carbon trading, also known as *cap and trade,* was first demonstrated between 1967 and 1970 using microeconomic

computer simulation methods. *The National Air Pollution Control Administration* (now *the United States Environmental Protection Agency's Office of Air and Radiation*) applied a mathematical model to calculate emission sources in several cities to compare the effectiveness of changing industries to low-carbon technologies or solving emissions problems through buying and selling on carbon markets. The results obtained from these calculations are that reduction using the carbon trading method is more effective and cheaper than changing industry to low-carbon technology. That's where the concept of *cap and trade* began. [5] As a manifestation of the seriousness and commitment of countries in the world in efforts to control climate change through carbon trading, towards the end of the Kyoto Protocol commitment period, at COP 21 in Paris at the end of 2015 an international agreement was formed to suppress and monitor global GHG reduction efforts. known as *the Paris Agreement to the UNFCCC. The Paris Agreement* includes commitments from all countries to reduce their emissions and work together to adapt to the impacts of climate change, and calls on countries to continue strengthening these commitments over time. The agreement also allows developed countries to assist developing countries in mitigating and adapting to global climate change.

Indonesian government has do ratification of the Paris Agreement through Constitution Number 16 of 2016 concerning Endorsement Paris Agreement to the United Nations Framework Convention on *Climate Change* Convention Framework Work United Nations about Climate Change) which is in it load obligation Government in contribution subtraction house gas emissions specified glass in a way national For limit increase global average temperature below 2^{o}c to 1.5^{o}c of level temperature pre industrialization . This thing aim to support the achievement of Indonesia 's contribution targets The nationally *determined contribution and control of greenhouse gas emissions* has been set at 29% (twenty-nine percent) to 41% (forty-one percent) in 2030

[5] Amanda Humaira, Indonesia's Role in Carbon Emissions Trading (Carbon Trading) Seen from an International Law Perspective (North Sumatra: USU Faculty of Law, 2021).

in national development .[6] The Indonesian government has too have Regulation of the Minister of Environment and Forestry of the Republic of Indonesia Number 21 of 2022 concerning procedures for implementing the economic value of carbon , Regulation President Number 98 of 2021 concerning maintenance mark economy carbon For achievement of established contribution targets in a way national and control house gas emissions glass in development national .

Issue critical trading related global carbon market competition between developed and developing countries consequence price carbon that doesn't uniform. First, regarding *internationally transferred mitigation outcomes*, namely international trade for excess emissions reductions over NDC targets. Second, regarding sustainable development mechanisms, namely emission *offsets* through projects carried out by public and private entities everywhere. Third, regarding non-market approaches, namely reducing emissions through mitigation and adaptation efforts, financial assistance, technology transfer and capacity building, including carbon taxes and CBAM.

There are still many problems related to Article 6 of the Paris Agreement and carbon trading that need to be addressed by Indonesia. The reality shows that, until the end of 2020, commitments of financial assistance from developed countries to developing countries amounting to 100 billion US dollars per year had never been realized. This results in a reduction in developing countries' trust in developed countries. There is also no agreement on carbon market rules *in* an effort to avoid the risk of double counting in world carbon trading. In addition, with the end of the second period of commitment to the Kyoto Protocol, several countries -like Brazil and India- wants the emission reduction credit units from the clean development mechanism period *to* be tradable.

Imposing a carbon tax as an instrument to control climate change will be easier to implement in Indonesia than using an emissions trading system (ETS) because its implementation is simpler. Even though ETS or what is often called cap and trade has more advantages than a carbon tax because it provides more certainty about the amount of emission

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[6] Article 2 Regulations President Number 98 of 2021 concerning Implementation of Carbon Economic Value for Achievement of Determined Contribution Targets Nationally and Controlling Greenhouse Gas Emissions in National Development.

reductions that will be produced and less certainty about the emission price (which is set by the emissions trading market), this system is more complex and complicated in administration, causing high transaction costs. Based on background behind above that becomes problem in study This How carbon trading in building a new paradigm in polluter *pays principle* in Indonesia.

This research uses a type of juridical-normative research, namely research carried out by studying, describing, synthesizing, interpreting, assessing and analyzing positive law.[7] Normative research can be interpreted as research to test an applicable norm or regulation. This type of research can also be interpreted as research carried out by examining library materials or secondary data.[8] Research approach includes, firstly, the legislative approach. This prioritizes legal materials in the form of statutory regulations as a reference in conducting research. Second, historical approach used to determine the historical values that lie behind and influence the values contained in a regulation. Third, the conceptual approach is a type of approach that provides a viewpoint related to analysis in solving problems in legal research in terms of the legal aspects or concepts behind it. Secondary legal materials in this research are in the form of legal opinions or doctrines that have been widely recognized and accepted among legal experts, books, journals, scientific articles, etc. that can be used as valid supporting primary legal materials for research. This. The analysis is carried out by inventorying and systematizing all legal materials according to the issues discussed or researched, then interpreting all statutory regulations or international conventions related to the issues discussed and assessing other legal materials that are relevant to this research.

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7 Bahder Johan Nasution, *Legal Research Methods* (Bandung: Mandar Maju, 2008).

8 Irwansyah, *Legal Research: Choice of Writing Methods & Practices* (Yogyakarta: Mirra Buana Media, 2020).

Carbon Trading in the Context of Polluter Pay Principle: Contemporary Development in Indonesia and Future Challenges

Trading carbon is approach used for control pollution carbon dioxide (CO2) with give help economy for reach subtraction emissions. Carbon dioxide (CO2) is a house gas important glass in influence global warming. With development industrial, developed countries contribute to global warming in the world, so that developed countries need developing countries that have source Power nature, like forests and land For Work The same in reduce emission carbon caused by industry. Carbon is universal denominator in all polluting gases that cause global warming. Carbon dioxide is the most common gas considered as house gas glass. the gas responsible answer on around half from hot atmosphere maintained by trace Gases. This thing produced especially by combustion material burn fossils and deforestation accompanied with combustion and biodegradation biomass. Trapped gas analysis in polar ice samples show that pre-industrial CO2 levels in the atmosphere is about 260 parts per million. For 300 years Lastly, this level has increase to mark moment This about 375 ppm; Mostly enhancement so far, this own happen with increasing speed fast for 100 years last.

Trading: Here researchers examine carbon trading because the high level of industry carried out by developed countries in the world certainly causes an increase in emissions which gives rise to environmental issues, namely the *Global Warming problem*, where this results in disruption of the stability of the world's climate. Global warming is a form of imbalance in the ecosystem on earth due to the process of increasing the average temperature of the atmosphere, sea and land on earth. The increase in the average temperature on earth is due to the increase in Green House Gases (GHG). After establishing carbon trading cooperation through the JCM mechanism, the Indonesian and Japanese governments began implementing several projects that had been created before the official agreement on carbon trading between the two countries was formed. Carbon trading is a market-based mechanism that allows negotiation and exchange of GHG emission rights. The market mechanism regulated in the Kyoto Protocol can

occur on a national or international scale as long as the same negotiation and exchange rights can be allocated to all market actors involved.[9]

Forest carbon trading is the exchange of money by buyers to providers for efforts to absorb and store carbon in forest biomass. In this carbon trading activity, there is what is called a carbon market where producers or sellers, for example forest managers or communities, receive rewards or compensation from buyers who then receive written certification for the carbon stored as part of their forest conservation efforts. Not all countries can carry out carbon trading through carbon-fixing farming activities. Several requirements must be met:

1. The government has ratified the Kyoto Protocol and the National *Board for Carbon Projects* (DNA) has been formed .
2. Before implementation, the project was registered as a CDM project with DNA and *the Executive Board* (the international body appointed to handle CDM).

There are two terms in trading patterns that are becoming a hot topic in Indonesian forest management, namely Forest Management Unit (KPH) and Carbon Trading. KPH can be interpreted as a forest management unit, while carbon trading is a new business or business pattern in utilizing forests. Forests are assessed not only for wood or NTFPs, but also for the amount of carbon they contain. When combined, these two things will create a new business and management system that the public needs to understand carefully. Three types of forests based on their function, namely protected forests, production forests and conservation forests, will experience forest management methods according to their main functions and designation which can be managed sustainably by the KPH Organization. Trading forest carbon with KPH organization managers will be more profitable for the country because the organization is an extension of the government which will be sustainability and profit oriented. Utilizing forests through the service of fixing carbon dioxide (CO^2) in the air to mitigate greenhouse gases and as a non-formulated carbon stock will further guarantee a reduction in forest damage.

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[9] United Nations Framework Convention On Climate Change, "A Glimpse into Climate Change," unfccc.int, 2018, http://unfccc.int/files/meetings/cop_13/press/application/pdf/sekilas_untuk_cepat_iklim.pdf.

Principle polluter pay is principle base policy determination price environment for ensure that damage caused by a activity reflected in cost do business. Determination price carbon is application principle polluter pay for house gas glass, usually in form tax carbon or condition For buy permission For pollute, which is normal called as cap and trade or scheme trading emissions. Strong carbon pricing, can predictable, and increasing required for reflect cost Actually from house gas emissions glass society. We need clear signal for industry For reduce pollution more hurry, invest in alternative friendly climate, and spur innovation low carbon more continue.

The polluter pays principle is a principle that is often stated in international declarations which are then included in international conventions and become principles of international environmental law. The first international instrument referring to the polluter pays principle was *the Organization for Economic Co-operation and Development* (OEDC) 1872[10] namely an international economic organization founded by 34 countries in 1961, which aims to stimulate economic development and world trade. The agency supports the polluter pays principle to allocate the costs of pollution prevention and control measures to encourage rational management of environmental resources and avoid deviations in international trade and investment. The recommendation contains a definition of the pollutant principle which requires polluters to bear the costs necessary for the efforts taken by public officials to maintain environmental conditions in an acceptable condition or in other words the costs required to carry out these measures. This effort must reflect the prices of goods and services that have caused pollution during the production and consumption processes .[11]

This principle stipulates that the costs resulting from pollution are borne by the actors responsible for causing the pollution. The real application of the polluter pays principle is the allocation of economic obligations related to activities that damage the environment and

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[10] Ni Putu Rai Yuliartini Nazifah, Dewa Gede Sudika Mangku, "Fulfillment of Labor Rights for Persons with Disabilities in Indonesia," I*nternational Journal of Criminology and Sociology* 10 (2021): 272–80, https://doi.org/https://doi.org/10.6000/1929-4409.2021.10.33.

[11] Elli Louka, International Environmental Law, Fairness, Effectiveness, and World Order (New York: Cambridge University Press, 2006).

specifically related to liability, the use of economic instruments and the application of regulations related to competition and subsidies. Implementation of *the polluter pays principle* in the national legal system is necessary based on the idea that the position of international law in the framework of law as a whole is based on the assumption that a type or field of law, international law is part of law in general.[12] This assumption cannot be avoided if we want to see international law as an effective set of provisions and principles, which actually exist in reality and therefore have an effective relationship with the provisions of other fields of law, including the legal provisions which regulate human life in each national environment, known as national law.[13]

The polluter pays principle can also be implemented in various ways, starting from predetermined process and product standards, to collecting levies. One instrument that can be used is to impose or charge taxes on polluters, the amount of which is equivalent to the value of the damage they cause. So, with the carbon tax planned by the government, it could be an effort to pass on the costs of improving the environment to those who emit carbon emissions. The Indonesian Ministry of Finance has set a new milestone regarding support for world climate change. On October 7 2021, the carbon tax was born through the Law on Harmonization of Tax Regulations (UU HPP) and adds to a series of fiscal policies used as an instrument to control climate change. One of its contents is that the HPP Law stipulates the existence of a new type of tax in the form of Carbon Tax (listed in Chapter VI). The reason for imposing a carbon tax, in principle, is similar to one of the reasons for imposing excise, namely that it is imposed on goods whose use can have a negative impact on society and the environment, but the scope of carbon tax is wider because apart from being able to be applied to goods

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[12] Adi Wijayanto, Hatta Acarya Wiraraja, and Siti Aminah Idris. "Forest Fire and Environmental Damage: The Indonesian Legal Policy and Law Enforcement." *Unnes Law Journal* 8, no. 1 (2022): 105-132; Milah Sarmilah, Lina Mustafidah, and Hellen George. "Civil Liability for Mining Companies for Environmental Pollution Based on Indonesian Laws." *Indonesian Journal of Environmental Law and Sustainable Development* 1, no. 2 (2022): 165-188.

[13] Elly Kristen Purwendah, "Implementation of the Responsibility and Compensation Regime for Oil Pollution by Tanker Ships in Indonesia," *Journal of Legal Communication* (JKH) 2, no. 2 (2016): 127–46, https://doi.org/https://doi.org/10.23887/jkh.v2i2.8410.

whose form is clear and visible to the naked eye , a carbon tax can also accommodate activities that leave a carbon footprint. Indonesia is the first mover of carbon taxes in the world, especially from emerging economic powers. This is proof of the consistency of the Indonesian Government's commitment to realizing a strong, just and sustainable economy.

The impact of climate change has become a global challenge that needs to be addressed collectively. As a country that is classified as vulnerable to the threat of climate change, Indonesia ratified the Paris Agreement through Law Number 16 of 2016 concerning Ratification of the Paris Agreement to the United Nations Framework Convention on Climate Change (Paris Agreement to the United Nations Framework Convention on Climate Change). . The main objective of the Paris Agreement is to hold the global average temperature increase below 2°C above pre-industrialization temperatures and continue efforts to reduce the temperature increase to 1.5°C above pre-industrialization temperatures. The Paris Agreement includes a commitment to Nationally Determined Contribution (NDC) in 2016 and makes handling climate change one of the national priority agendas in planning and implementing development for 2020-2024. In the NDC document, Indonesia is committed to reducing greenhouse gas (GHG) emissions which are harmful to the environment, with a reduction of 29% on its own and 41% with international support by 2030. The main priority for reducing greenhouse gas emissions is the forestry sector, as well as the energy and transportation sectors which have covered 97% of Indonesia's total NDC emission reduction target. Furthermore, with the increasingly strong global trend towards the issue of climate change, Indonesia has also targeted to achieve Net Zero Emissions in 2060 or earlier. In order to achieve this target, a reform agenda in fiscal policy to accelerate green investment has been initiated intensively. The government has provided fiscal incentives such as tax holidays, tax allowances and VAT facilities to increase the development of renewable energy. In the last 5 years, state spending on handling climate change has averaged 4.1% of the APBN. To strengthen policy instruments for controlling the impact of climate change, the Government has established a policy on the economic value of carbon (carbon pricing) which includes the implementation of a carbon tax. By introducing a carbon tax in the HPP Law, Indonesia has become one of

the few countries, even the largest in the developing world, to implement it first. In fact, the implementation of this carbon tax puts Indonesia on par with developed countries that have implemented this carbon tax policy, including the UK, Japan and Singapore.

Currently, Indonesia is the fourth country out of the 20 largest carbon emitting countries in the world . The OECD, in its publication Taxing Energy Use for Sustainable Development (2021), suggests imposing a tax on carbon. This policy has two advantages (double dividend), namely as an instrument to reduce carbon emissions and also as a fiscal tool to increase state revenue if designed ideally. These funds can then be used specifically to finance programs related to carbon emissions (earmark) such as environmentally friendly investments and support for improving the welfare of poor and vulnerable communities.[14] The legal basis for the carbon tax has been established, while derivative regulations are being drafted. The following is the legal basis.

1. Article 13 of Law 7/2021 concerning Harmonization of Tax Regulations (UU HPP) Principles of Regulation:
   a. Imposition: imposed on carbon emissions that have a negative impact on the environment.
   b. Direction for imposition of carbon tax: pay attention to the carbon market road map and/or carbon tax road map which contains strategies for reducing carbon emissions, priority sector targets, alignment with the development of new and renewable energy as well as harmony between various other policies.
   c. Carbon tax principles: principles of justice and affordability by taking into account the business climate and small communities.
   d. The carbon tax rate is set higher or equal to the carbon price on the carbon market with a rate as low as IDR 30.00 per kilogram of carbon dioxide equivalent (CO2e).
   e. Utilization of state revenues from Carbon Tax is carried out through the APBN mechanism. It can be used, among other things, to control climate change, provide social assistance to poor

[14] Maria Madalina Fachrizal Woma Yudhana, "Policy Formulation for the Implementation of Carbon Tax in Indonesia," *Souvereignty: Journal of Democracy and National Resilience* 1, no. 1 (2022): 68–78, https://doi.org/https://doi.org/10.13057/souvereignty.v1i1.217.

households affected by carbon taxes, subsidize renewable energy, and so on.

f. Taxpayers who participate in carbon emissions trading may be granted carbon tax deductions.
g. Implementation of carbon tax: effective on April 1 2022, which will be imposed for the first time on entities operating in the coal-fired power plant sector with a cap and tax scheme which is in line with the implementation of the carbon market which has already started running in the coal-fired power plant sector.

2. Article 58 of Presidential Decree 98/2021 concerning Implementation of NEK Principles of Regulation:
   a. Levy on Carbon is defined as a state levy at both the central and regional levels, based on carbon content and/or potential carbon emissions and/or amount of carbon emissions and/or performance of Mitigation Actions.
   b. Furthermore, arrangements for implementation are carried out in accordance with statutory provisions.
   c. Thus, Carbon Charges can be in the form of existing state levies (for example Motor Vehicle Tax, Fuel Tax, PPnBM), or other levies that will be implemented (for example imposition of Carbon Tax).
3. Implementing Rules that are being Drafted
   a. RPMK Concerning Carbon Tax Rates and DPP
   b. PMK Concerning Procedures and Mechanisms for Imposing Carbon Tax
   c. PP on Carbon Tax Roadmap
   d. PP Concerning the Subject and Allocation of Carbon Tax

Shift paradigm related with the "polluter pays principle" is a concept that recognizes that entity or polluting individual environment must responsible answer on cost their pollution produce. Principle This push for enter cost pollution to in cost production or creating activities pollution that, so push subtraction impact negative to environment [15].

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[15] Shinta Wahyu Purnama Sari and Widya Krulinasari, Carbon Trading According to International Law and Its Implementation in Indonesia, *Fiat Justisia Jurnal Ilmu Hukum* 9 No. 2, (2015): 151-155. *See also* Novia Faradila, and Dewi Shafarhunny Aqilla. "Good Environmental Governance Mainstreaming in Preparation for the

Shift paradigm related with the "polluter pays principle" especially happen along with increasing understanding in about impact environment from activity humans, as well change in regulations and approaches policy for overcome problem environment. A number of change possible paradigm has happened are:

1. From Post- Pollution Financing to Prevention: Previously, the common approach is for wearing costs to polluters after pollution happened. However, the shift paradigm more going to push prevention pollution with push more production practices friendly environment.
2. From Focus on Individual Polluters to Shared Responsibility: Shift paradigm This Can covers understanding that not quite enough answer For protect environment No only on individuals or polluting companies, but also society in a way overall. Principle this can leads to cooperation For reduce impact environment negative.
3. From Thought Purely Economic Approach to Social and Ecological Aspects: Increasingly Lots confession about importance consider aspects social and ecological in taking decision economy. Principle polluter pay No only about cost financial, but also about impact social and ecological.
4. From Punishment to Incentive: One change paradigm Possible is shift focus from punishment for violators principle polluter pay become give incentive to company or reducing individual impact environment them.

Change paradigm This can reflected in laws and regulations implemented by the government, as well in action companies and individuals in practice business them. The goal is For push growth sustainable and sustainable economy balance between activity humans and health environment.

Carbon market ecosystem in build paradigm new Sustainable development Carbon market ecosystem play role important in build paradigm new development sustainable with give incentive economy for reduce house gas emissions glass (GHG) and coping change climate.

Implementation of Carbon Trading in Indonesia." *The Indonesian Journal of International Clinical Legal Education* 4, no. 4 (2022): 421-454.

Paradigm This covers a number of element key that contributes to development sustainable:

1. Decline GHG Emissions: One objective main from the carbon market is for reduce GHG emissions. With give mark financial to subtraction emissions, carbon markets push companies and countries to adopt more technology and practice friendly environment. This is in line with objective development sustainable for guard balance environment.
2. Promotion Innovation Technology Clean: Carbon markets give incentive economy for company for invest in technology clean and sustainable. With thus, the carbon market facilitate development technology that can help reduce footsteps carbon and promote innovation in various sector economy.
3. Assigning Value to Natural Assets: Carbon markets can help value service ecosystem like absorbing forest carbon, land controlling wetness floods , and others . This can give incentive For protect and maintain important ecosystem for sustainability.
4. Distribution Justice and Inclusive Development: Paradigms new development sustainable notice distribution profit in a way fair and inclusive. In the context of carbon markets, this can achieved through sure approach that benefit financial from decline emission spread with fair, vulnerable communities to impact change climate.
5. International Cooperation: Change climate is global problems, and paradigms development new sustainability confess importance cooperation international. Carbon market can encourage countries to collaborate in reduce GHG emissions by together through projects together and trade emissions.
6. Approach Holistic: Paradigm development sustainable emphasize approach holistic to development, integrating aspect economic, social and environmental. Carbon market, with give value on carbon and assets nature, helps create more economic sustainable in a deeper sense wide.

However, it is important for remembered that the carbon market also has criticism and challenges, such as risk speculation, lack of effectiveness in a number of case, and expansion issues social and justice. Therefore, that's temporary carbon market ecosystem can become valuable tool in development sustainable, they also need attention to

proper design and follow through proceed carefully for reach desired result.

Mechanism credit carbon is tools used in carbon markets for measure, report, and verify subtraction house gas emissions glass (GHG) or absorption carbon by projects or activities that contribute to reduction global emissions. Mechanism This aim for give mark financially on efforts subtraction emissions, so push investment in friendly projects environment and contribute to change positive climate. There are several type mechanism credit different carbons, including:

1. Clean Development Mechanism (CDM):
    a. CDM is mechanism credit carbon regulated by the Kyoto Protocol an agreement international for reduce GHG emissions.
    b. CDM project focuses on reduction emissions in developing countries. Projects This can produce Certified Emission Reductions (CERs), which can for sale to industrialized countries that have obligation emission based on Kyoto Protocol.
    c. CDM projects must fulfil strict criteria and goes through a verification process by the parties third For ensure that subtraction emission is real and possible reliable.
2. Joint Implementation (JI):
    a. JI is similar mechanism with CDM, but focuses on projects subtraction emissions carried out in industrialized countries that have obligation emission based on Kyoto Protocol.
    b. JI project produces Emission Reduction Units (ERUs), which can used by reducing countries emission they based on JI agreement for fulfil obligation emission them.
3. Emission Reduction Purchase Agreements (ERPAs):
    a. ERPAs are agreement between buyers and sellers arrange purchase credit carbon. Buyer in matter This Can become committed countries for reduce emission or company private sector who wish balance emission them.
    b. ERPAs can covers various type project subtraction emissions, including project energy renewable, efficiency energy, management forest, and lots of it again.
4. Voluntary Carbon Markets:

   a. Carbon market volunteer is a place where companies and individuals buy credit carbon in a way volunteer for balance or reduce emission them. This is not related with obligation emissions regulated by the agreement international.
   b. Certificate carbon voluntary measures, such as Verified Carbon Units (VCUs) or Voluntary Emission Reductions (VERs), can used in this market.
5. Carbon Offset Programs:
   a. Carbon offset program is a program that makes it possible individual or company for compensate emission they with support reducing projects on- site emissions other. This can including planting tree, generator electricity power solar, or projects efficiency energy.
6. Cap and Trade Schemes:
   a. Some countries and regions have adopt a "cap and trade" scheme that limits total GHG emissions and allows company For trade permission emissions (certificate carbon) for achieve their targets.

Mechanism credit carbon is tool important in global effort to overcome change climate and encouraging subtraction GHG emissions by effective. However, they also need it strict supervision and verification for ensure that subtraction emissions produced is real and measurable.

There are several efforts made public international in protection environment life moment this , that is effort repressive and preventive . Preventive measures taken through subtraction activities that produce house gases glass (GHG) and reduction use material destroyer ozone. Guard existence area open green, use guard existence area water absorption as well absorbent carbon ; increase awareness to environmental data life sea , land and air ; carry out arrangement a blending space arrangement room aquatic , coastal and land as well as increase awareness public to effort prevent escalation global warming . Whereas effort repressive that can be done among others , with repair facilities and infrastructure prevention floods and droughts ; rehabilitate land degraded with method promote planting trees (reforestation) as an effort to absorb carbon gas , and increase availability water reserves ; enhancement handling to environment coastal life and habitat ; Community Health services .

Forests play a major role in setting the CO2 levels in the atmosphere through carbon sequestration. Carbon markets are one of the most innovative and cost-effective means of creating a market pull for forestry credits generated through afforestation and conservation activities. Due to increase in quantum of carbon trading over last few years, various issues related to price dynamics of carbon markets have arisen in the recent past. First, carbon markets have emerged at regional, national and international levels and are governed by specific demand and supply patterns. There is a need to unify these markets to increase overall carbon market efficiency. Second issue relates to understanding of short-run volatility of carbon markets, as forecasts of carbon price volatility could be important inputs into macro-econometric models and market risk assessment calculations like value at risk and; for the choice of a carbon policy instrument. Third, carbon markets consist of various heterogeneous agents such as greenhouse gas emitters, agriculturists, foresters and individual market investors. These agents interact with each other and with the overall trading-environment to evolve the emergent behavior of these markets. Traditional approach for study of price dynamics in such markets is through use of analytical models that assume completely rational agents. This causes biased results and lesser forecast accuracy. To improve forecast accuracy, there is a need to carry research on incorporating agent heterogeneity and limited rational behavior[16].

India for instance, is the country that contributes the third largest carbon emissions in the world, emitting 2407 million tons of CO2 as of 2015, estimated to contribute 6% of the world's total carbon emissions in 2020 (IETA, 2015). India signed and ratified the KP following the implementation of carbon trading in August 2002 [17]. India's legal basis for environmental policy is based on the National Action Plan on Climate Change (NAPCC) in 2008 which set eight national goals centered on improving energy efficiency, solar technology, habitat sustainability, water, the Himalayan ecosystem, green India, agriculture and environmental education. . Even though

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[16] Tajinder Pal Singh Bhatia, Economic Analyses Of World's Carbon Markets, *Thesis*, Faculty of Forestry and Centre for Environment University of Toronto, (2012), pp. 96-98

[17] Paul, A. *Carbon Credit and Carbon Trading In India: Overview.* Research scholar, Department of Commerce University of Calcutta,2010, 136

there is a NAPCC determination, however, because one third of India's population lives on less than 1 dollar per day, the main goal of India's national policy is towards economic development [18]. To synergize the environment and the economy, India encourages sustainable development as a solution to poverty and environmental problems. India considers climate change to be a problem caused by developed countries, this is related to India's actions in refusing to take mandatory action to reduce emissions.

International markets are seen as a cost-effective way of reducing GHG emissions. The market mechanisms in Article 6 of the Paris Agreement are still under nego- tiation, but existing markets have linked up. Examples include the EU and Swiss ETS systems, and the Western Climate Initiative, covering markets in California, Nova Scotia, and Quebec. China's ETS, as the largest emis- sions trading programme in the world, will be pivotal in any international market. Indeed, there is interest in linking with China. Since 2016, China has participated in trilateral talks with Japan and South Korea on a linked East Asian market[19], although little has materialized as yet. Furthermore, the EU, which devoted nearly €3 million to the EU–China Clean Development Mechanism Facilitation Project 2007–2010, has been keen to ensure the success of China's ETS[20], and research has studied poten- tial effects of linking the Chinese and EU markets[21].

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[18] Zeni Novitasari; Bagus Sigit Sunarko; Honest Dody Molasy, Peningkatan Emisi Karbon Pasca Penerapan Program Carbon Trade di India, *e-SOSPOL* Vol.8, No. 3, 2021, pp. 120-128

[19] World Bank. (2016). Exploring East Asian cooperation on carbon markets. https://www.worldbank.org/en/news/feature/2016/06/16/exploring-east-asian-cooperation-on-carbon-markets

[20] Biedenkopf, K., Van Eynde, S., & Walker, H. (2017). Policy infusion through capacity building and project inter- action: Greenhouse gas emissions trading in China. *Global Environmental Politics,* 17(3), 91–114. https://doi.org/10.1162/GLEP_a_00417

[21] Li, M., Weng, Y., & Duan, M. (2019). Emissions, energy and economic impacts of linking China's national ETS with the EU ETS. *Applied Energy*, 235, 1235–1244. https://doi.org/10.1016/j.apenergy.2018.11.047

Hongqiao[22]highlights that in 2013-2021, China's carbon trading pilots in six cities that involved nearly 3,000 entities/companies have traded a cumulative 440MtCO2 of allowances. However, that many allowances were only worth 10.47bn yuan ($1.6bn) in China's carbon trading pilots, which is pale to the EU's €19.2bn (around 150bn yuan) revenue from carbon credit in 2020 alone. Another critical factor to consider about the emergence of carbon trading in China is 'efficiency gains'. This assumption works just like how business is being run by turning GHG into a global market commodity. China has become a crucial player because the Kyoto Protocol has underlined that it does not matter where the emission cuts were made in the world, as long as the cuts are done. For example, in terms of efficiency cost, China has been considered cheaper in labor costs than the US, which has contributed to the concentration of CDM projects in China[23].

When China's carbon trading fully auctions the allocation of carbon credits to companies, all industries covered by the Chinese emission trading are predicted to suffer higher profit losses. Hübler, Voigt, & Löschel[24] pointed out that model simulations for climate policy-induced welfare loss in China for 2020 are about 1% in 2020 if the emissions cut per GDP in 2020 is set to be 45% lower than 2005 emissions level. The welfare loss will climb to about 2% in 2030 if China requires the emissions target fixed at the 2020 level.

Wisely, Chinese officials have stated that China is currently more concerned with its domestic market than with linking[25]. As discussed in Heggelund[26], linkage at some point in the future seems more feasible. Future international markets will not depend solely on China: Several

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[22] Hongqiao, L. (2021). *In-Depth Q&A: Will China's Emissions Trading Scheme Help Tackle Climate Change*? Retrieved from https://www.carbonbrief.org/in-depth-qa-will-chinas-emissions-trading-schemehelp-tackle-climate-change

[23] Böhm, S., & Dabhi, S. *Upsetting the Offset: The Political Economy of Carbon Markets.* London: MayFlyBooks (2009), p. 23.

[24] Hübler, M., Voigt, S., & Löschel, A. (2014). Designing an Emissions Trading Scheme for China-An up-to Date Climate Policy Assessment. *Energy Policy,* 75, 57–72. https://doi.org/10.1016/j.enpol.2014.02.019

[25] Timperley, J. (2018, January 29). Q&A: How will China's new carbon trading scheme work? *Carbon Brief.* https://www.carbonbrief.org/qa-how-will-chinas-new-carbon-trading-scheme-work

[26] Heggelund, G. (2021). China's climate and energy policy: At a turning point? *International Environmental Agreements: Politics, Law and Economics,* 21, 9–23.

other factors are cru- cial for making linked markets. The uniform carbon price and reduced carbon leakage offer advantages for cost-effective emissions reduction and levelling the play- ing field for industries cross-nationally, but there are chal- lenges as well. The economic and political costs can be high. Power distribution among the linked authorities may be imbalanced, in turn affecting operation of the linked markets. China is a major country, also in terms of its ETS. Countries differ in their purchasing power, so linking may entail strong distributional effects. As an ETS is usually not the only mitigation policy, other regula- tions such as taxes and subsidies may impede the level- ling of the playing field that linkage provides. Creating an ETS is complicated—linking two or more markets is an even more complex endeavour. Here, China's domestic process can offer lessons. China's ETS has been 10 years in the making, with emphasis on internal learning, time, and communication; likewise, learning between the markets' governments is a condition for successful linking. Such a learning period should include surveys of other relevant policies of the participating countries, discus- sions of distributional effects, and how to deal with future possible challenges.

Conclusion

In conclusion, the paradigm shift associated with the "polluter pays principle" marks a pivotal concept acknowledging the responsibility of entities or individuals who pollute the environment to bear the costs of their actions. This principle urges a transformation in cost allocation for production and activities that generate pollution, thereby mitigating negative impacts on the environment. This shift is particularly pronounced in tandem with an increased understanding of the environmental repercussions of human activities, coupled with evolving regulations and policy approaches to address environmental challenges.

Within this evolving landscape, the carbon market ecosystem emerges as a crucial player in fostering a new paradigm of sustainable development. By providing economic incentives for reducing greenhouse gas emissions and addressing climate change, it offers a potential solution. However, the carbon market is not without its

criticisms and challenges, including speculation risks, efficacy concerns, and social justice issues. Thus, while the carbon market holds promise as a valuable tool for sustainable development, careful design and vigilant implementation are essential to achieve the desired results. China's rigorous policy experiments in carbon trading showcase significant potential, given its status as a major emitter and the scale of its industries. Yet, uncertainties persist due to internal obstacles like a historically weak environmental enforcement system and challenges in accurate emissions reporting. Strict supervision and verification mechanisms are imperative to ensure the credibility of emissions reduction efforts. In navigating these complexities, China's progress in establishing carbon trading systems serves as a notable success, but continued attention to challenges is essential for realizing the full potential of carbon trading in the country's journey towards sustainability.

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