

## Development of Carbon Pricing Policies for Creating a Low-Carbon Economy: A Systematic Literature Review Using PRISMA

Anisa Oktaviani Ranteala<sup>1</sup>, Rifqi Ihsan Firdaus<sup>2</sup>, Mohamad Ichsana Nur<sup>3\*</sup>

<sup>1</sup>UIN Sunan Gunung Djati Bandung, Indonesia

<sup>2</sup>UIN Sunan Gunung Djati Bandung, Indonesia

<sup>3</sup>University of Manchester, United Kingdom

How to cite: Ranteala, O. A., Firdaus, I. R., & Nur, M. I. (2024). Development of Carbon Pricing Policies for Creating a Low-Carbon Economy: A Systematic Literature Review Using Prisma. *Jurnal Perpajakan dan Keuangan Publik*, 3(1), 20-28.

### Histori Artikel

Dikirim: 13 Juli 2024

Diterima: 23 Agustus

2024

### Keywords:

Carbon Pricing

Low-Carbon

Economy

Systematic Literature

Review

PRISMA

Climate Policy

### Kata Kunci:

Penetapan Harga

Karbon

Ekonomi Rendah

Karbon

Tinjauan Literatur

Sistematis

PRISMA

Kebijakan Iklim

### ABSTRACT

This article discusses the development of carbon pricing as a strategy to create a low-carbon economy. Carbon pricing is defined as an economic policy that imposes a cost on CO<sub>2</sub> emissions, with several countries, including Japan and Indonesia, having implemented related regulations. The study employs a Systematic Literature Review (SLR) approach using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) methodology. Challenges in implementing carbon pricing include economic distribution issues, political resistance, and the need for international policy harmonization. Given the urgency of addressing climate change, carbon pricing is a crucial policy instrument for transitioning to a low-carbon economy and achieving environmental sustainability. Special support for industries and vulnerable populations, as well as monitoring and evaluating the impact of the policy, is essential to ensure the effectiveness and fairness of carbon pricing strategies.

### ABSTRAK

Artikel ini membahas tentang pengembangan penetapan harga karbon sebagai strategi untuk menciptakan ekonomi rendah karbon. Penetapan harga karbon didefinisikan sebagai kebijakan ekonomi yang mengenakan biaya pada emisi CO<sub>2</sub>, dengan beberapa negara, termasuk Jepang dan Indonesia, telah menerapkan peraturan terkait. Penelitian ini menggunakan pendekatan Tinjauan Literatur Sistematis (SLR) dengan menggunakan metodologi Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). Tantangan dalam penerapan penetapan harga karbon meliputi masalah distribusi ekonomi, resistensi politik, dan perlunya harmonisasi kebijakan internasional. Mengingat urgensi penanganan perubahan iklim, penetapan harga karbon merupakan instrumen kebijakan yang penting untuk transisi ke ekonomi rendah karbon dan mencapai keberlanjutan lingkungan. Dukungan khusus untuk industri dan populasi rentan, serta pemantauan dan evaluasi dampak kebijakan, sangat penting untuk memastikan efektivitas dan keadilan strategi penetapan harga karbon.

## A. INTRODUCTION

Climate change is one of the greatest challenges facing the world today (Dow, 2016). With increasing greenhouse gas emissions, particularly carbon dioxide (CO<sub>2</sub>), the negative impacts on the environment and human life are becoming more pronounced (Wu, Bai, Zhu, Lu, & Zhu, 2023). In an effort to reduce these emissions and promote a low-carbon economy, various countries and international organizations have

implemented a range of policies and mechanisms (Palatnik Rachel et al., 2023). One of the most prominent and effective mechanisms is carbon pricing.

The adoption and implementation of efficient carbon pricing systems is a complex process, with technical, institutional, economic, and political factors limiting the opportunities for comprehensive and coordinated systems (Khan & Johansson, 2022). Carbon pricing is an economic policy that imposes a cost on CO<sub>2</sub> emissions produced from industry, transportation, and other sectors (Consul et al., 2024). Carbon pricing refers to policy tools designed to account for the external costs associated with greenhouse gas emissions, which are typically borne by the public in the form of healthcare costs from droughts and heatwaves, crop damage, property damage from floods, and rising sea levels (Le & Azhgaliyeva, 2023). The primary goal of this policy is to internalize the external costs of carbon emissions, so economic actors (industries, companies, and consumers) consider environmental impacts in their business and consumption decisions. Unlike regulations that prescribe how and where emissions should be reduced, carbon pricing provides an economic signal allowing emitters to choose whether to reduce emissions by altering their operations or to continue emitting CO<sub>2</sub> while paying for the damage caused (Le & Azhgaliyeva, 2023). By pricing carbon emissions, this policy encourages innovation in green technology, energy efficiency improvements, and a shift towards cleaner energy sources.

There are two main approaches to carbon pricing: Emissions Trading Systems (ETS) and Carbon Taxes (Nakano & Washizu, 2022). The Emissions Trading System (ETS), also known as cap-and-trade, sets a maximum cap on the total allowable emissions and allows trading of emission permits among companies (Tamasiga, Onyeaka, Bakwena, & Ouassou, 2024). On the other hand, a Carbon Tax sets a fixed price per ton of CO<sub>2</sub> emitted. Both approaches have their advantages and challenges, but both aim to achieve significant emission reductions in an economical and sustainable manner (Nakano & Washizu, 2022).

The implementation of carbon pricing has shown positive results in some regions. For instance, the European Union's ETS has successfully reduced CO<sub>2</sub> emissions from covered industrial sectors. Similarly, countries like Sweden and Canada have implemented carbon taxes that have helped reduce their national emissions (Berthe, Kubursi, Arain, & Ashley, 2023). In contrast, in Nigeria, income inequality and poverty prevalence continue to rise, and infrastructure levels remain low, with the tax-to-GDP ratio being among the lowest in Africa in 2019. At the same time, Nigeria's greenhouse gas emissions are projected to double by 2035 without additional mitigation efforts. Thus, green fiscal reforms could help address economic and climate targets. However, challenges in carbon pricing implementation still exist, including economic burden distribution, political resistance, and international policy harmonization.

Given the urgent need to address climate change, carbon pricing is becoming an increasingly relevant and important policy instrument. As global awareness of climate action grows, carbon pricing can play a crucial role in transitioning to a low-carbon economy and achieving environmental sustainability (Li & Wang, 2023).

## **B. RESEARCH METHODOLOGY**

This study employs the Systematic Literature Review (SLR) method with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) approach to produce this review (Sarkis-Onofre, 2021). Systematic Literature Reviews

can sometimes have limitations due to the absence of standardized guidelines that make them scientifically reviewable and adequate. PRISMA provides an accepted standard methodology by using several protocols that are strictly followed in this article to contribute to the quality assurance of the review process and its replicability. The authors have established a review protocol outlining article selection criteria, search strategy, data extraction, and data analysis procedures.

### 1. Data Sources and Search Strategy

Systematically, the researchers searched for article data from electronic databases, specifically the Directory of Open Access Journals (DOAJ). Using the keyword "carbon pricing," 112 scientific articles from various countries written in English were identified. The authors downloaded all articles and consolidated them into a single folder for subsequent screening based on the desired criteria.

### 2. Eligibility Criteria

The selection of articles to be reviewed is carried out in three stages. The first round is filtering based on type, because of the 112 articles, other forms were still found, such as books, letters, and others. The second round is filtering articles based on year, namely a time span of two (2) years back, meaning that only articles published in 2022, 2023 and 2024 meet the author's criteria. The last round, the author filters articles based on the keywords "carbon pricing" and "carbon tax". If the article does not contain these words, then the article is not included in the articles reviewed. In the first round, the author managed to filter 49 articles and only 63 articles remained. In the second round, the author filtered again according to the agreed rules until 48 articles remained. In the last stage based on keywords, the author filtered another 20 articles that did not include the desired keywords. In the end, 28 articles remained that met the criteria. All of these articles will be reviewed and analyzed by the researcher (figure1).

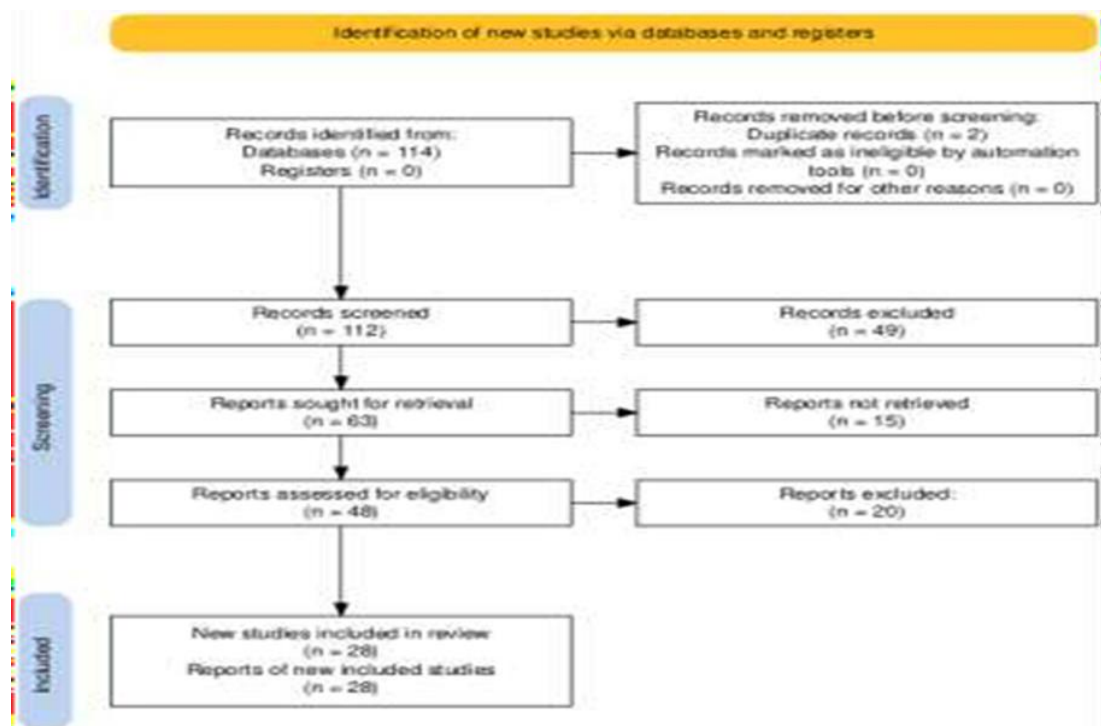


Figure 1. Study Literature Review Report Chart Using PRISMA

### Characteristics of Included Studies

The year with the largest number of studies included in the author's search was 2023, as depicted in Figure 2. The author's results showed a relevant increase in the last 2 years, namely 11 articles in 2021 and an increase of 1 article in 2022 to 12 articles. In 2024, which has only been running for 6 months, there are already 5 articles, which means it is likely to exceed the previous number. Regarding the research methodology, the author found a dominance of quantitative studies totaling 23 articles while qualitative studies totaling 4 articles. After being analyzed, there was one article whose research methodology was unknown. The articles were dominated by quantitative because research related to carbon pricing does require a quantitative type of study (Figure 2).

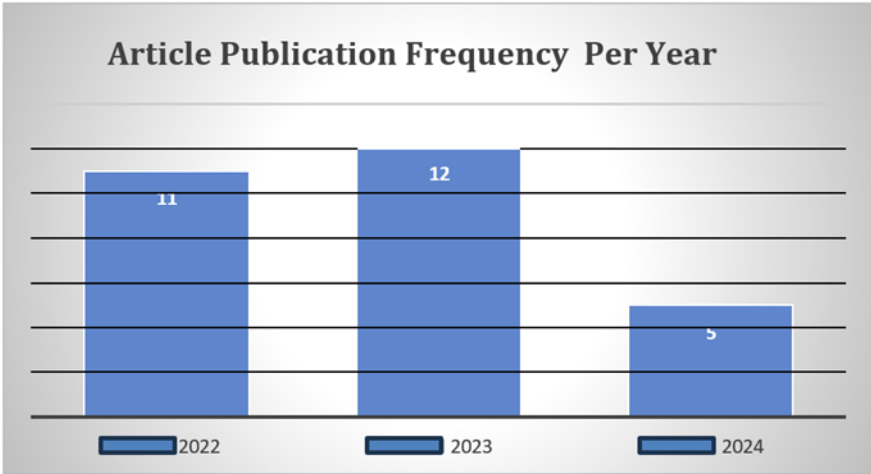
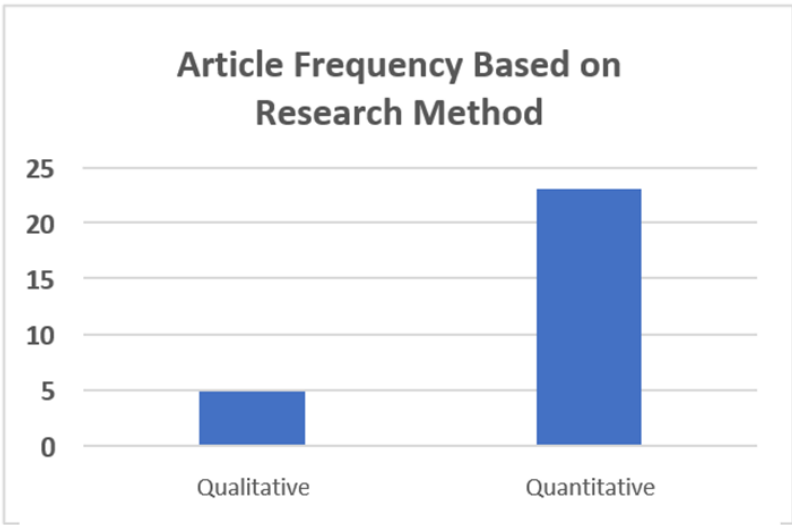


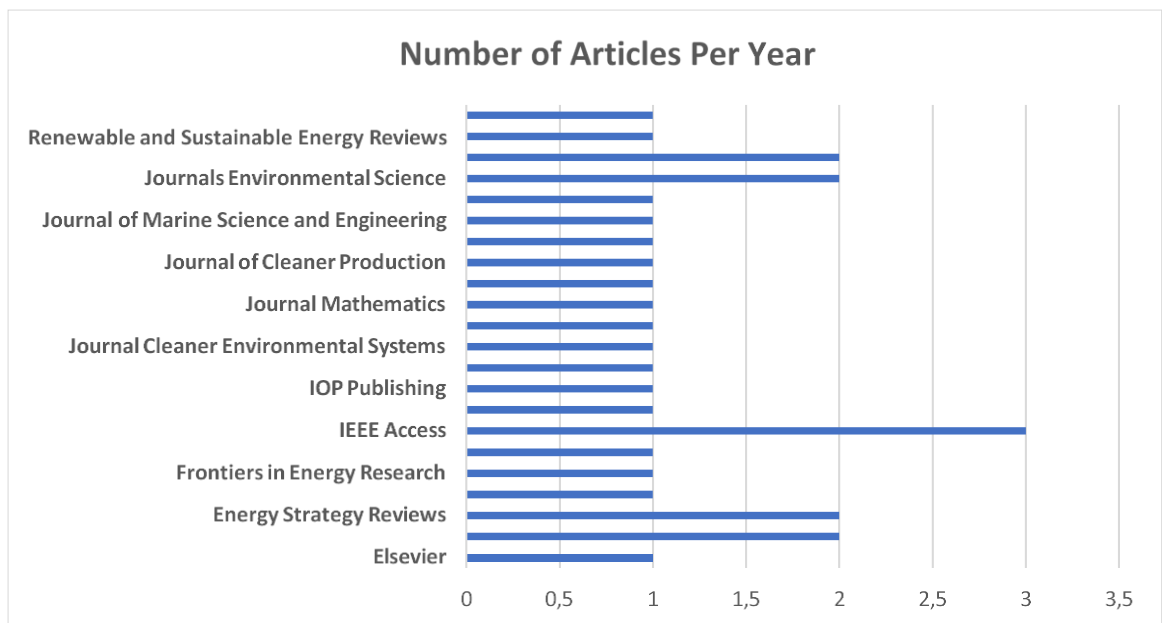
Figure 2. Publication frequency per year

Regarding the research methodology, the author found the dominance of quantitative studies amounting to 23 articles while qualitative studies amounting to 4 articles. After being analyzed, there was one article whose research methodology was unknown. The articles were dominated by quantitative because to research related to carbon pricing, a quantitative study type is indeed needed (figure 3).



**Figure 3. Frequency of Articles Based on Research Method**

Regarding journals that published articles related to carbon pricing, 28 articles were published from a total of 22 journals. The IEEE Access journal ranks first by publishing 3 journals in a period of 2 years. There are two journals that publish their respective articles. The journals are the journal Politik and Governance and Journals Environmental Scie (figure 4).



**Figure 4. Number Article in Journal**

## C. RESULT AND DISCUSSION

### Carbon Pricing

The reviewed articles reveal a common definition of Carbon Pricing. Generally, Carbon Pricing refers to the valuation of greenhouse gas (GHG)/carbon emissions. It is also known as the Economic Value of Carbon (EVC), a form of internalizing the costs of negative externalities from GHG emissions, and a practice of the “polluter pays principle.”

According to Article D1, Japan's energy tax system is considered an enhancement of the global warming countermeasures tax (TGWC) on fossil fuels such as oil and coal. Current energy taxes are designed to impose a relatively heavy burden on the transportation sector, while the reform of taxes on oil and coal may encourage the adoption of energy-efficient and decarbonization technologies across transportation and other sectors, potentially improving tax burden equity among sectors.

In addition to Japan, Article D18 discusses carbon pricing regulations in Indonesia. This article analyzes Indonesia's new carbon pricing framework, specifically Presidential Regulation No. 98 of 2021 on Economic Value of Carbon (Presidential Regulation No. 98/2021). The regulation is assessed based on Law No. 12 of 2011 on the Formation of Legislation. The study finds that although the regulation meets the principles stated in the Law on the Formation of Legislation, many details need further regulation (as required by the Presidential Regulation), and more clarification is needed

regarding the roles of various actors and stakeholders in carbon valuation and how it involves public participation.

### ***Impact on Consumers and Industries***

Carbon pricing has significant impacts on consumers and industries. The summarized findings from the reviewed articles on various aspects are as follows:

#### **a. Impact on Consumers:**

- **Prices of Goods:** Carbon taxes can increase production costs for companies. As a result, the prices of goods and services using carbon-based resources (such as fossil fuels) may rise. Consumers will experience this through higher prices.
- **Purchasing Power:** If prices increase, consumers' purchasing power may be affected. Especially for low-income households, price hikes may limit their access to certain products.

#### **b. Impact on Industries:**

- **Production Costs:** Industries must pay carbon taxes based on their emissions, which can raise production costs and reduce company profits.
- **Energy Efficiency:** Carbon taxes encourage companies to reduce emissions. Some industries may switch to more environmentally friendly technologies or optimize resource use.
- **Innovation:** Carbon taxes can drive innovation in clean technologies and renewable energy. Industries investing in sustainable solutions may reduce the impact of carbon taxes.

### **Mitigation Strategies and Policies**

Carbon pricing policies, such as carbon taxes and Emissions Trading Systems (ETS), are effective in reducing greenhouse gas emissions (Haite, 2018). Academics, the World Bank, and the Organization for Economic Cooperation and Development (OECD) agree that setting a price on CO<sub>2</sub> emissions is crucial for mitigating global warming and promoting a low-carbon economy. This can be achieved by imposing taxes on fossil fuel emissions or through carbon credit auction systems like ETS (Consul et al., 2024).

Carbon pricing also plays a critical role in promoting innovation and investment in clean energy technologies (So, Liu, Hung, & Kuo, 2024). Carbon pricing should be integrated with other mitigation strategies, such as investments in green technologies, tax incentives, and subsidies for renewable energy (Consul et al., 2024). A combination of these policies can help reduce the economic burden of carbon pricing and ensure a fair and sustainable transition to a low-carbon economy. By increasing the costs associated with carbon emissions, this policy encourages the search for more environmentally friendly and efficient alternatives (Cheng, Lo, & Yang, 2023). The use of clean energy technologies not only helps reduce emissions but also creates new economic opportunities and enhances the competitiveness of green technology industries in the global market (Tamasiga et al., 2024).

The distribution of carbon pricing policy impacts on vulnerable populations and incentivizing energy industries should be a priority in policy design. Effective compensation mechanisms, such as redistributing carbon tax revenues to low-income households, can help mitigate negative impacts on vulnerable groups (Cheng, Lo, & Yang, 2023). Additionally, providing specific support to affected industries through subsidies

and incentives can help them remain competitive and adapt to policy changes (Li & Wang, 2023). For instance, training programs and support for workers impacted by the transition to a low-carbon economy are crucial to reduce resistance to policies and ensure that the economic benefits of the transition are felt by all parties.

However, carbon pricing policies also face various challenges and limitations that need to be addressed to ensure effectiveness and fairness. One major challenge is concerns about equity. Carbon pricing can disproportionately impact low-income groups who spend a significant portion of their income on energy (Khan & Johansson, 2022). Therefore, policies must be designed with adequate compensation mechanisms to mitigate negative impacts on vulnerable groups. Competitiveness of industries is also a concern in carbon pricing policies. Energy-intensive industries face higher production costs, which may reduce their competitiveness in international markets. This can lead to carbon leakage, where production shifts to countries with weaker emission regulations (Khan & Johansson, 2022). Some carbon pricing policies include mechanisms such as carbon border adjustments, which impose costs on imports based on their carbon content or provide subsidies and incentives to affected industries to improve energy efficiency and reduce emissions (Nakano & Washizu, 2022).

Moreover, monitoring and evaluating the impacts of carbon pricing policies is essential. Continuous monitoring allows for policy adjustments based on changing economic and social conditions (Karunaratne, Lackruwan, & Jayawickrama, 2023). Impact evaluations can also help identify successes and failures of policies and inform future policy design (Berthe, Kubursi, Arain, & Ashley, 2023).

Political acceptability is also a significant challenge in implementing carbon pricing policies. Although the long-term benefits of these policies are clear, there is often substantial political resistance to their implementation. This resistance is often due to concerns about short-term economic impacts, including rising energy prices and additional burdens on businesses and consumers. Therefore, engaging various stakeholders in the decision-making process is necessary to enhance political support (Sulistiawati & Buana, 2023).

## **D. CONCLUSION**

This paper aims to develop a systematic review of the evolution of carbon pricing towards a low-carbon economy. The primary objective of carbon pricing policies is to internalize the external costs of carbon emissions, ensuring that economic actors (industries, businesses, and consumers) consider environmental impacts in their business and consumption decisions. Out of the 114 articles collected, 2 were excluded due to duplicate content. The remaining articles were filtered in three stages: by type (only articles), by year (within the past two years), and by keywords (including “carbon pricing” and “carbon tax”). This process resulted in 28 selected articles. Carbon pricing generally refers to the valuation of greenhouse gas (GHG) emissions and is considered a form of internalizing the external costs associated with these emissions, in line with the “polluter pays principle.” The implementation of carbon pricing has notable impacts on both consumers and industries: for consumers, it leads to higher prices of goods and potential reductions in purchasing power; for industries, it increases production costs, which can reduce profitability but also drive energy efficiency and innovation towards a cleaner, low-carbon economy. Carbon pricing is a crucial policy tool for reducing greenhouse gas emissions and promoting innovation in the transition to a low-carbon

economy. Effective integration of carbon pricing with other mitigation strategies—such as investments in green technologies, tax incentives, and renewable energy subsidies—is essential to ensure a fair and sustainable transition. Additionally, continuous monitoring and evaluation of carbon pricing impacts are necessary, along with addressing significant challenges such as political acceptability.

## REFERENCES

- Berthe, Kubursi, Arain, and A. (2023). The Comparative Analysis of Carbon Pricing Policies on Canadian Northwest Territories ' Economy under Different Climate Change Scenarios. *Journal Energies*, 16(22). <https://doi.org/10.3390/en16227471>
- Cheng, M., Lo, H., & Yang, C. (2023). Optimizing Pricing , Pre-Sale Incentive , and Inventory Decisions with Advance Sales and Trade Credit under Carbon Tax Policy. *Mathematics*, 11(11). <https://doi.org/10.3390/math11112534>
- Consul, C. C., Souza, A. M. De, Puglieri, F. N., Francisco, A. C. De, Maria, E., & Wilhelm, D. S. (2024). Environmental and Sustainability Indicators Analysis of the relationship between carbon pricing and green innovation: A multidimensional study in 35 countries. *Environmental and Sustainability Indicators*, 22(May), 100402. <https://doi.org/10.1016/j.indic.2024.100402>
- Dow, K., & Downing, T. E. (2016). *The atlas of climate change: mapping the world's greatest challenge*. Univ of California Press.
- Haites, E. (2018). Carbon taxes and greenhouse gas emissions trading systems: what have we learned?. *Climate policy*, 18(8), 955-966.
- Karunaratne, W., Lakruwan, T., & Jayawickrama, T. S. (2023). The prospect of using carbon pricing instruments to reduce energy based emissions of apparel sector in Sri Lanka. *Cleaner Environmental Systems*, 9(March), 100121. <https://doi.org/10.1016/j.cesys.2023.100121>
- Khan, J., & Johansson, B. (2022). Adoption , implementation and design of carbon pricing policy instruments. *Energy Strategy Reviews*, 40(October 2021), 100801. <https://doi.org/10.1016/j.esr.2022.100801>
- Le, H., & Azhgaliyeva, D. (2023). Carbon pricing and firms ' GHG emissions: Firm-level empirical evidence from East Asia. *Journal of Cleaner Production*, 429(June), 139504. <https://doi.org/10.1016/j.jclepro.2023.139504>
- Li, Y., & Wang, J. (2023). Pricing Strategy and Social Welfare in a Supply Chain With Different Rights Structure Under Carbon Tax Policy. *IEEE Access*, 11(July), 65105–65116. <https://doi.org/10.1109/ACCESS.2023.3277631>
- Nakano, S., & Washizu, A. (2022). A Study on Energy Tax Reform for Carbon Pricing Using an Input-Output Table for the Analysis of a Next-Generation. *Energies*, 15(6), 1–20. <https://doi.org/10.3390/en15062162>
- Palatnik Rachel, R., Davidovitch, A., Krey, V., Sussman, N., Riahi, K., & Gidden, M. (2023). Accelerating emission reduction in Israel : Carbon pricing vs . policy standards. *Energy Strategy Reviews*, 45(October 2022), 101032. <https://doi.org/10.1016/j.esr.2022.101032>
- Sarkis-Onofre, R., Catalá-López, F., Aromataris, E., & Lockwood, C. (2021). How to properly use the PRISMA Statement. *Systematic Reviews*, 10, 1-3.
- So, P., Liu, J., Hung, C., & Kuo, H. (2024). Heliyon Impact of carbon pricing on the integrated green supply chain of the semiconductor industry. *Heliyon*, 10(4), e25633.



<https://doi.org/10.1016/j.heliyon.2024.e25633>

Sulistiawati, L. Y., & Buana, L. (2023). LEGAL ANALYSIS OF THE. *Journal of Central Banking Law and Institutions*, 2(1), 179–198. <https://doi.org/10.21098/jcli.v1i2.15>

Tamasiga, P., Onyeaka, H., & Bakwena, M. (2024). Pricing the future : unveiling the effects of carbon pricing on socio-economic outcomes and energy poverty. *International Journal of Sustainable Energy*, 43(1), 1–35. <https://doi.org/10.1080/14786451.2024.2362334>

Wu, K., Bai, E., Zhu, H., Lu, Z., & Zhu, H. (2023). Heliyon A tripartite evolutionary game behavior analysis of the implementation strategy of the internal carbon pricing of enterprises under governments supervision. *Heliyon*, 9(12), e23131. <https://doi.org/10.1016/j.heliyon.2023.e23131>