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# THE EU CARBON BORDER ADJUSTMENT MECHANISM AND ITS INFLUENCE ON STEEL IMPORTS FROM TAIWAN

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**Abstract.** *In order to avoid carbon leakage, the EU decided to introduce the Carbon Border Adjustment Mechanism to put a fair price on embedded carbon emissions of products imported into the EU. Once the CBAM is operational, importing companies will have to declare the embedded emissions for their products and surrender the corresponding amount of CBAM certificates.*

*Taiwan is an important trade partner of the EU, especially for electronic components, and also for base metals like Iron & Steel or Aluminium. The industrial manufacturing for base metals yields high Scope 1 greenhouse gas emissions; additionally, power generation in Taiwan relies heavily on fossil fuels.*

*This paper identifies the Iron & Steel product flows from Taiwan to the EU. It describes the CBAM requirements and the potential impact on Taiwanese Iron & Steel exports, pointing out challenges and opportunities. It intends to support Taiwanese companies to prepare for CBAM rules both during the transition phase and once the system is fully active.*

**Keywords:** CBAM, Carbon Border Adjustment Mechanism, Emission Intensity, Emission Trading Scheme, EU, EU-ETS, Imports, Iron, Steel, Taiwan, TCSE

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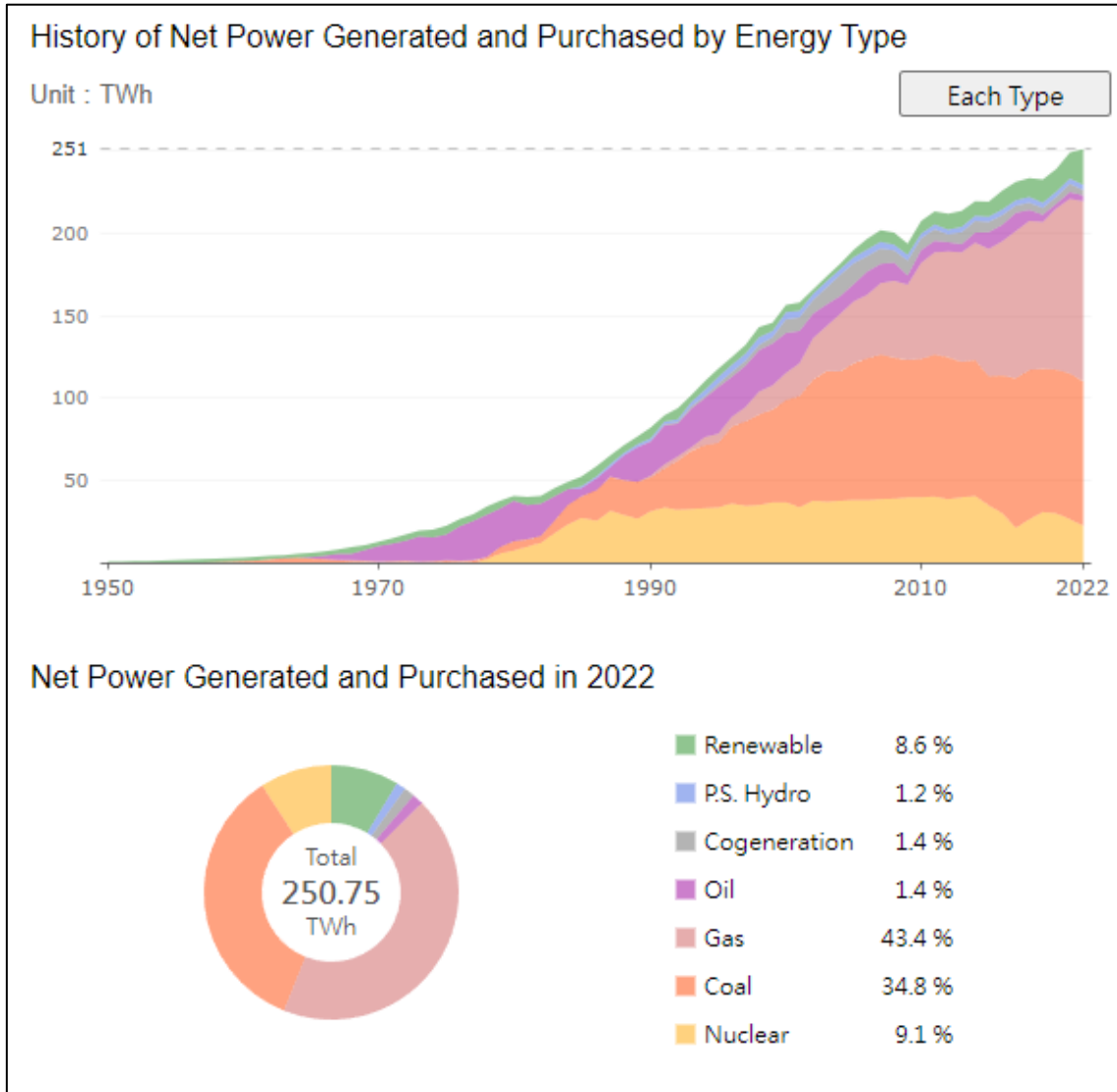
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The author declares that there are no conflicts of interest regarding the publication of this manuscript.

## 1. INTRODUCTION

Taiwan has emerged as a global manufacturing hub for Parts of Electronic Products, especially Integrated Circuit Boards. Among the developed countries, Taiwan is one of the fastest growing economies in the world, with an average growth rate of 3.9% (2000 – 2021).<sup>1</sup> Electric Power in Taiwan (generated and purchased) is still mainly generated by use of fossil fuels. In 2022, Gas, Coal and Oil accounted for 43.4%, 34.8%, and 1.4% respectively, adding up to 79.6%.<sup>2</sup>



**Figure 1. Power Generation in Taiwan 1950 - 2022<sup>3</sup>**

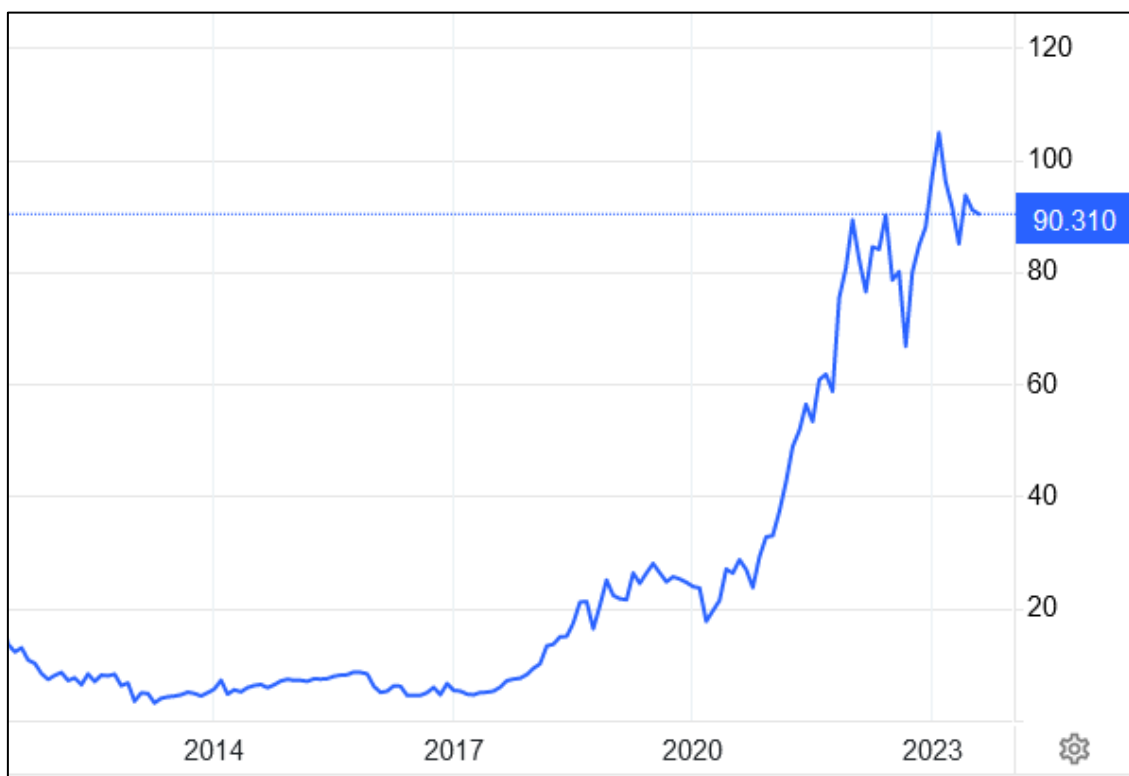
Consequently, Taiwan's greenhouse gas emissions rose steadily and Taiwan's carbon footprint is substantial. Total emissions were at 290 Mt in 2022, per capita emissions at 12.3 t / in 2022.<sup>4</sup> This makes the country vulnerable to potential implications arising from the European Union (EU) Carbon Border Adjustment Mechanism (CBAM).

The EU is the fourth biggest trading partner of Taiwan, after Mainland China & Hong Kong, ASEAN, and the U.S.A, receiving roughly 8.6% of the country's exports in 2022<sup>5</sup>. Key exports include Parts of Electronic Products, Information and Communication products, but also more basic products like Base Metals, Machinery, Plastics, Chemicals and Mineral Products.<sup>6</sup> Taiwan is the biggest supplier of Processors and Electronic Integrated Circuits of the EU.<sup>7</sup>

In its “Fit for 55” program, the European Union integrates several instruments in order to achieve climate neutrality by 2050. One of the cornerstones of the program is the EU Emissions trading system (EU-ETS), which levies a price on CO<sub>2</sub> and other greenhouse gas emissions. This price corrects a market failure in the following ways:

- Internalizing external costs from greenhouse gas (GHG) emissions
- Creating fairer competition between carbon intensive industries, thereby
- Incentivizing sustainable production and investment and
- Efficiently distributing the remaining greenhouse gas budget via a cost-effective, market-oriented mechanism.

Even though the carbon price was below 10 EUR / t between 2012 and 2017, it has risen significantly since the beginning of 2018, even surpassing 100 EUR / t shortly in February 2023 (Figure 2). We do not expect the price to sink significantly anymore since the EU has decided to cut emissions to 62% by 2030, from 2005 levels.<sup>8</sup> Additionally, it has rendered more than 2.5 billion certificates from the Market Stability Reserve invalid as of January 01, 2023.<sup>9</sup>



**Figure 2.** Price development of EU-ETS1 allowance auctions since 2013<sup>10</sup>

The carbon price, however, is currently only valid for companies located in the EU. Imported products thereby achieve a cost advantage over products produced within the scope of the EU-ETS. This leads to competitive pressure on EU-ETS companies and increases the risk that these companies will move supply or even production outside the scope of the EU-ETS, a phenomenon known as “carbon leakage”.<sup>11</sup> The decision to move existing production capacity outside the EU is not a simple one, however. The cost of dismantling production facilities within the EU and setting them up in foreign countries is significant; therefore, the costs and benefits involved need to be compared. A significantly higher risk arises when the decisions concern additional capacities; in this case, the decision to build new production facilities outside the EU is not (or is less) impacted by already existing structures.

## 2. THE EU CARBON BORDER ADJUSTMENT MECHANISM

In order to avoid carbon leakage, the EU issues free allowances to companies in high-risk sectors.<sup>12</sup> This assures competitiveness, but does not foster climate neutrality and is incompatible with the European Union's long-term climate targets. In December 2022, an EU Trilogue agreed to introduce the CBAM to put a fair price on greenhouse gases emitted from the manufacturing of products entering the EU.<sup>13</sup> The CBAM will go into effect in a transitional phase on October 01, 2023, and is expected to be operational by January 2026. The transitional phase will be a reporting phase; importing companies will be required to report the embedded GHG emissions for their products. Once the CBAM is fully active, importing companies will have to declare the embedded emissions of their products and surrender the corresponding amount of allowances. The price of the allowances will be tied to the EU-ETS1 allowance price, averaged on a weekly basis. In the beginning, CBAM will only apply to selected industrial products and precursors whose production is carbon intensive and have the highest risk of carbon leakage. By 2035, CBAM will affect all imports with a value above 300 EUR. In order to avoid double counting, carbon prices already imposed in the exporting country can be deducted from the CBAM allowances.

## 3. PRODUCTS COVERED BY CBAM

During the introduction phase, CBAM will only apply to certain carbon intensive products. The exact categories and sub-categories are sorted by the Combined Nomenclature (CN) codes of the EU.<sup>14</sup> The CBAM relevant product categories with the export volumes in € from Taiwan into the EU are displayed in Table 1:

Product category	Imports into the EU from Taiwan [€]	
	2021	2022
<b>Iron &amp; Steel</b>	<b>1,943,106,844</b>	<b>3,269,655,185</b>
Aluminium	21,506,519	40,508,524
Fertilizers	4,018,542	4,576,640
Cement	3,961	6,588
Chemicals (Hydrogen)	-	-
Electricity	-	-

**Table 1.** Exports from Taiwan into the EU by CBAM relevant product category 2021 and 2022<sup>15</sup>

As can be seen in Table 1, the product categories “Iron & Steel” and “Aluminium” represent by far the biggest share of imports. However, sufficient data was not available for the Taiwanese Aluminium sector. The analysis must therefore focus on Iron & Steel production. We will restrict ourselves to the raw Iron & Steel production (CN category 72 with the exception of 7202 and 7204), again for the reason of limited data availability when it comes to processed products.

#### 4. POTENTIAL EFFECTS OF CBAM ON TAIWANESE COMPANIES

The implementation of the CBAM will pose both challenges and opportunities for Taiwan's trade competitiveness. In order to get to assess the impacts, we compare the average emissions from Iron & Steel of Taiwanese manufacturers with those of European manufacturers. Table 2 shows the average emission intensity of one ton of steel for the EU and Taiwan in 2021:

Iron & Steel	Emission intensity (t CO <sub>2</sub> / t steel)		
	Scope 1 & Upstream	Scope 2	Total
EU	1.04	0.11	1.15
Taiwan	1.23	0.18	1.41
Taiwan / EU	18%	64%	22%

**Table 2.** Average emission intensity of one ton of steel<sup>16</sup>

Even though the average emission intensity of Taiwanese steelmakers decreased significantly – from around 1.6 t CO<sub>2</sub> / t steel in 2014<sup>17</sup> to 1.41 t CO<sub>2</sub> / t steel in 2021 - Table 2 shows that the average emission intensity of Scope 1 & Upstream emissions is around 18% higher in Taiwan than in the EU. The average emission intensity of Scope 2 emissions is around 64% higher in Taiwan than in the EU, which is due to the high share of fossil fuels in electricity generation. The weighted average shows that total emission intensity is around 22% higher in Taiwan than in the EU. The CBAM relevant export volumes in tons from Taiwan for Iron & Steel in 2021 and 2022 are shown in Table 3:

Iron & Steel	Export to the EU from Taiwan	
	2021	2022
Amount [tons]	1,721,579	2,172,311
Volume [€]	1,807,772	3,296,655

**Table 3.** CBAM relevant imports into the EU from Taiwan 2021 and 2022 in tons.<sup>18</sup>

The average CO<sub>2</sub> prices of EU-ETS allowances in 2021 and 2022 amounted to 52.50 €/t CO<sub>2</sub> and 80.32 €/t CO<sub>2</sub> respectively.<sup>19</sup> Using the intensity factors presented above, the average additional cost for Taiwanese products would have amounted to the following:

2021						
		Emission Intensity [t CO <sub>2</sub> / t Steel]		Cost of Allowances [€/ t Steel]		Additional cost Taiwan [€/ t Steel]
	CO <sub>2</sub> price [€/ t CO <sub>2</sub> ]	Europe	Taiwan	Europe	Taiwan	$\Delta$ Europe / Taiwan
Iron & Steel	52.50	1.15	1.41	60.38	74.03	13.35

2022						
		Emission Intensity [t CO <sub>2</sub> / t Steel]		Cost of Allowances [€/ t Steel]		Additional cost Taiwan [€/ t Steel]
	CO <sub>2</sub> price [€/ t CO <sub>2</sub> ]	Europe	Taiwan	Europe	Taiwan	$\Delta$ Europe / Taiwan
Iron & Steel	80.32	1.15	1.41	92.37	113.25	20.88

**Table 4.** Additional CBAM cost for Iron & Steel from Taiwan 2021 and 2022

Multiplied by the imported amount of Iron & Steel in tons, the CBAM would have yielded the values in Table 5 below, where the percentages are given with respect to the total imported volume in €:

Additional Cost of CBAM allowances				
	2021	%	2022	%
Iron & Steel	23,499,551 €	1.30%	45.364.814 €	1.46%

**Table 5.** Additional CBAM cost for Iron & Steel from Taiwan in € and %

This means that if CBAM CO<sub>2</sub> prices had applied, the cost of the exports of Taiwanese Iron & Steel raw products for EU customers would have been 1.3% and 1.46% higher in 2021 and 2022 respectively. The reason for these small changes implications result from

- the rather small difference in average CO<sub>2</sub> intensity between Taiwanese and European producers and
- the relatively high price per ton of steel as compared to the carbon price per ton of steel.

It must be stated clearly here that the above calculations are only approximate, using average CO<sub>2</sub> intensity values for all products within Iron & Steel category, instead of precise values. The expected implications can be clustered into the following challenges and opportunities:

#### 4.1. Challenges

*a) Increased Costs and Trade Barriers:* The CBAM is certainly going to increase the cost of imports from Taiwan into the EU, adversely affecting their price competitiveness in the European market. This, in turn, may result in reduced demand for Taiwanese goods, negatively impacting Taiwan's export-oriented industries. The carbon pricing imposed will thus put pressure on sales prices and production costs for Taiwanese steelmakers.

**b) Price Pressure:** Increasing cost for the importers within the EU, in combination with increasing steelmaking capacities worldwide<sup>20</sup>, will probably lead to an increasing pressure on prices. Since the CBAM will be valid for imports from all countries, Taiwan is not especially exposed. The importers are certainly going to try to add the additional costs to the product prices. It is to be expected, however, that they are also going to negotiate to try to decrease purchasing cost.

**c) Shifts in Global Supply Chains:** The CBAM could influence global supply chains by incentivizing steelmakers with high emissions to sell their products to other non-EU countries. Such shifts may disrupt existing supply chains and potentially lead to reduced demand for Taiwanese products in global value chains.

Given the rather small additional cost that CBAM imposes on Taiwanese steel, we do not deem the challenges a) and b) to be too high for the Taiwanese steelmakers. There are several other competing countries with a much higher emission intensity, e.g. India, Mainland China, Russia or Ukraine<sup>21</sup>, which will be more severely affected, which will open up the threat of c).

## 4.2. Opportunities

**a) Stimulus for Green Transition:** The CBAM could be an additional building block for Taiwan's transition to a low-carbon economy. To maintain competitiveness in the EU market, Taiwanese industrial companies would be encouraged to invest in cleaner technologies and adopt sustainable practices. Since the emissions are mainly Scope 1, which the individual company can reduce itself, CBAM could foster innovation, enhance energy efficiency, and promote the development of green products and services. Scope 2 emissions can hardly be influenced by the companies themselves; it is up to the Taiwanese government to decrease the share of fossil fuels and increase the share of renewable energies in power generation, ultimately benefitting Taiwan's long-term economic and environmental goals.

**b) Strengthening the Partnership:** Companies who proactively provide their importing partners with extensive and detailed required information will achieve competitive advantage compared to suppliers who do not. They will help their importers to facilitate the processes of declaring the embedded emissions.<sup>22</sup> This should lead to an improved partnership and higher trust between the business partners.

**c) Preparing for Domestic Decarbonisation:** Taiwan inaugurated the Taiwan Carbon Solution Exchange (TCSE) on Aug. 07, 2023.<sup>23</sup> Companies listed in Taiwan with paid-in capital of US\$10 billion will have to disclose their greenhouse gas emissions of Scope 1 and Scope 2 (starting in 2024). The TCSE will be extended to companies with paid-in capital of US\$5 billion or more in 2025.<sup>24</sup> Following CBAM requirements will simplify the transition to the TCSE.

**d) Increased Income for the Taiwanese Government:** If the Taiwanese government continues its plans to introduce a carbon fee scheme, at least part of the CBAM fees will be retained within Taiwan instead of going to the EU.

## 5. MITIGATION OF ADVERSE CBAM EFFECTS

To mitigate the potential adverse effects of the CBAM on Taiwan's trade, it is important for the Taiwanese industry, but also the government to proactively adopt appropriate strategies and policies. From both an environmental and cost perspective, reducing CO<sub>2</sub> emissions should be given highest priority.

### 5.1 Key considerations for the Taiwanese government

**a) Strengthening Domestic Climate Policies:** By implementing robust domestic climate policies, Taiwan can reduce its carbon intensity and enhance its competitiveness in the global market. This includes investing in renewable energy sources, promoting energy efficiency, and encouraging sustainable practices across industries. The proposed TCSE could thus accomplish three objectives. First, the carbon price of the TCSE would immediately reduce the cost of CBAM allowances. Second, the revenues from carbon pricing would stay within the country, as opposed to purchasing CBAM allowances, in which case the revenue would benefit the EU. Third, the TCSE would incentivize Taiwanese companies to invest more in low-emission production technologies. In the steel industry, the likely solution to reduce Scope 1 emissions from high process temperatures is green hydrogen, which requires emission-free electricity for the



electrolysis. Scope 2 emissions can only be reduced by using of emission free electricity. Of utmost importance is thus the availability of emission-free renewable energy, both for electricity and process heat. Strong policies with the goal of expanding renewable energies would therefore benefit both Taiwanese companies and help the Taiwanese government reach its climate goals.

**b) Promoting Bilateral and Multilateral Dialogues:** The Taiwanese government should engage in constructive discussions with the EU and other trading partners to address concerns and explore avenues for cooperation on climate change mitigation. By actively participating in multilateral forums, Taiwan can advocate for fair and equitable trade policies that consider the unique challenges faced by the global community in the combat against global warming. Several countries are planning or have already started a climate club; co-founding or joining a regional climate could might be a possibility for Taiwan to strengthen international cooperation.

**c) Facilitating Technological Collaboration:** Collaboration on research and development, technology transfer, and capacity building can accelerate Taiwan's transition to a low-carbon economy. Encouraging partnerships with European counterparts and leveraging international funding mechanisms can facilitate access to clean technologies and expertise.

## 5.2 Key considerations for Taiwanese companies

**a) Short term:** In order to remain suppliers to the EU, Taiwanese steelmakers need to prepare for the new CBAM regulations. Importers will very likely demand information on embedded GHG emissions from their suppliers. Either Taiwanese companies will provide information on their Product Carbon Footprints (PCF), or their products will be burdened with default values as described in ANNEX III of the CBAM regulation.<sup>25</sup> Taiwanese companies can minimize their burden by calculating PCFs, comparing them with the default values and choosing the lower value.

To ensure maximum comparability of the carbon footprint compared to other manufacturers and lend credibility to the emission study, it is advisable to choose a standard that currently has broad recognition and application. The most commonly used and cited standards for calculating the Product Carbon Footprint are the GHG Protocol - Product LCA and Reporting Standard, PAS 2050, and DIN EN ISO 14067.

**b) Mid-term:** Taiwanese steelmakers will need to invest in carbon-free technologies in order to reduce their carbon footprint. Because of their high Scope 1 emissions, steelmakers have the ability to influence their emissions directly. The technically proposed solution to achieve the necessary process temperatures is green hydrogen. Switching the melting processes to hydrogen is a very complex venture which cannot be rushed, but trials should be started as soon as possible. Steelmakers can either directly invest in the necessary electrolyzers or search for suitable suppliers. Companies can only influence their Scope 2 (and Scope 3) emissions via their selection of suppliers. Therefore, companies falling under CBAM regulations should at least demand the required information for Scope 2 emissions from their suppliers.

## 6. CONCLUSIONS

The EU CBAM mechanism will affect Taiwanese industry in the short run mainly in the Iron & Steel and Aluminium Industries. The Taiwanese Iron & Steel industry shows a higher emission intensity on average than European steelmakers and is thus vulnerable to high CBAM fees, which could potentially weaken Taiwan's competitiveness in the EU. Necessary short-term measures include: companies calculating their individual PCFs and, if possible, reducing Scope 1 emissions. The Taiwanese government can support their industries by accelerating the decarbonization of the power sector, strengthening climate goals, or joining an international or regional climate club. Imposing a national TCSE would allow Taiwan to keep the revenues from carbon pricing in the country while simultaneously approaching its emissions reduction goals.

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