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# **Emissions-Weighted Carbon Price: Sources and Methods**

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# Abstract

This note describes the sources and methods used to calculate the emissions-weighted carbon price (ECP), the average price applied to CO<sub>2</sub> emissions across all sources of emissions within a territorial jurisdiction, so it provides a transparent summary of the stringency of carbon pricing mechanisms in force within a given jurisdiction and allows for a straightforward comparison of that stringency across jurisdictions.

# Contents

1. Introduction	1
2. Description	2
2.1 Scope	2
2.2 Variables	2
3. Methodology	5
3.1 Sectoral Scope and Prices	5
3.2 GHG Inventory and Emissions Shares	5
3.3 Total Coverage and Average Emissions-Weighted Price	6
3.3.1 Coverage	6
3.3.2 ECP	7
4. Sources	8
4.1 Sectoral Coverage and Prices	8
4.1 GHG Inventory	8
5. Continuing Update and Future Extensions	9
6. Conclusion	10
7. References	11
Appendix	12
A.1 Dataflow Representation	12
A.2 Coverage Factors	12
A.3 Overlap	13

# 1. Introduction

Carbon pricing has become a central instrument of several national and subnational jurisdictions' climate change mitigation strategies. Today, 43 national and 32 subnational jurisdictions have a carbon pricing mechanism. However, a standardized and centralized record of the sectors covered, prices applied to CO<sub>2</sub> emissions by these mechanisms and a metric summarizing their stringency consistently across jurisdictions are lacking.

This note describes the data and methods used to calculate the emissions-weighted carbon price (ECP),<sup>1</sup> a sector or economy-wide average price on CO<sub>2</sub> emissions.<sup>2</sup> A major benefit is that it provides a methodology to measure sector- or economy-level average prices consistently across jurisdictions. To the best of our knowledge, the ECP data constitute the first centralized and systematic assessment providing a consistent description of carbon prices that simultaneously includes price level information disaggregated at the sector(-fuel) level, extends back to 1990 to include price information for the earliest carbon tax policies, and accounts for as many sector (-fuel) exemptions as accurately possible. It is calculated for 37 national and 31 subnational jurisdictions (13 Canadian provinces and territories, 11 US states, and 7 Chinese provinces) over 1990–2020.<sup>3</sup>

This version of the dataset is an extension of a data curation effort undertaken while pursuing my PhD within the EPRG at the University of Cambridge. Its existence owes much to support from EPRG, the Cambridge Judge Business School, and the UK Economic and Social Research Council. The current extension was supported by Resources for the Future.

The source code, written in Python 3, raw data files, formatted dataset files, and scripts are available at <https://github.com/g-dolphin/ECP> under a **Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License**.

The remainder of this technical note is organized as follows. Section 2 describes the database scope and content. Section 3 presents the methodology, and Section 4 discusses the data sources. Section 5 presents future extensions and Section 6 concludes.

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<sup>1</sup> A standardized and centralized assessment is provided through the World Carbon Pricing Database, which is described in a companion technical note. This note presents data and methodology pertaining to the ECP.

<sup>2</sup> The current version of the ECP only accounts for prices applied to CO<sub>2</sub> emissions. Accounting for prices on other greenhouse gases (GHG) will be part of an update to the dataset (see section 5).

<sup>3</sup> The methodology and data currently available allow to readily expand the calculation to new national or subnational jurisdictions, should some of their emissions become subject to a carbon pricing mechanism.

## 2. Description

### 2.1 Scope

**Jurisdictions and time span:** The dataset contains data on 189 national and 94 subnational (50 US states, 13 Canadian provinces and territories, 31 Chinese provinces, autonomous regions and municipalities) jurisdictions from 1990 to 2020.

**IPCC source categories:** All IPCC source categories are included.

**Greenhouse gases (GHG):** The ECP currently exclusively addresses prices on CO<sub>2</sub> emissions. This reflects both historical policy developments (the first carbon pricing mechanisms applied to CO<sub>2</sub> emissions only) and data constraints (cross-jurisdiction consistent emissions inventories for non-CO<sub>2</sub> GHG are not always available at the required level of sectoral disaggregation).<sup>4</sup>

### 2.2 Variables

**Coverage** The database contains jurisdiction-level coverage data in the file `total_coverage.csv`, which offers aggregate jurisdiction-level coverage of carbon pricing mechanisms for 1990–2020. The methodology is described in section 3.3. This file presents, for each jurisdiction, the share of emissions covered by (i) carbon taxes, (ii) emissions trading systems (ETSs), or (iii) the combination of both. For each of these instruments, the coverage figures are calculated as a share of (i) total GHG and total CO<sub>2</sub> emissions and (ii) total jurisdiction or total world emissions. Furthermore, for subnational jurisdictions, emissions as a share of the relevant national jurisdiction are also calculated. This yields 18 variables.

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<sup>4</sup> However, this does not constitute a significant limitation, as most existing carbon pricing mechanisms apply exclusively to CO<sub>2</sub> emissions. Only some mechanisms, such as the EU ETS and the Spanish tax on HFCs, do not. A future iteration will account for prices applied to other Kyoto gases (see section 5), using data from the Emissions Database for Global Atmospheric Research (EDGAR) and provided by the Joint Research Centre of the European Commission (European Commission, 2016).

**Table 1. Description of Coverage Variables**

<b>Variable Name</b>	<b>Description</b>
cov_tax_CO2_jurCO2	CO <sub>2</sub> emissions covered by a carbon tax as a share of jurisdiction total CO <sub>2</sub> emissions.
cov_tax_CO2_jurGHG	CO <sub>2</sub> emissions covered by a carbon tax as a share of jurisdiction total GHG emissions.
cov_tax_CO2_wldCO2	CO <sub>2</sub> emissions covered by a carbon tax as a share of world total CO <sub>2</sub> emissions.
cov_tax_CO2_wldGHG	CO <sub>2</sub> emissions covered by a carbon tax as a share of world total GHG emissions.
cov_tax_CO2_supraCO2	CO <sub>2</sub> emissions covered by a carbon tax as a share of national jurisdiction total CO <sub>2</sub> emissions.
cov_tax_CO2_supraGHG	CO <sub>2</sub> emissions covered by a carbon tax as a share of national jurisdiction total GHG emissions.
cov_ets_CO2_jurCO2	CO <sub>2</sub> emissions covered by an ETS as a share of jurisdiction total CO <sub>2</sub> emissions.
cov_ets_CO2_jurGHG	CO <sub>2</sub> emissions covered by an ETS as a share of jurisdiction total GHG emissions.
cov_ets_CO2_wldCO2	CO <sub>2</sub> emissions covered by an ETS as a share of world total CO <sub>2</sub> emissions.
cov_ets_CO2_wldGHG	CO <sub>2</sub> emissions covered by an ETS as a share of world total GHG emissions.
cov_ets_CO2_supraCO2	CO <sub>2</sub> emissions covered by an ETS as a share of national jurisdiction total CO <sub>2</sub> emissions.
cov_ets_CO2_supraGHG	CO <sub>2</sub> emissions covered by an ETS as a share of national jurisdiction total GHG emissions.
cov_all_CO2_jurGHG	CO <sub>2</sub> emissions covered by either a carbon tax or an ETS as a share of jurisdiction total GHG emissions.
cov_all_CO2_jurCO2	CO <sub>2</sub> emissions covered by either a carbon tax or an ETS as a share of jurisdiction total CO <sub>2</sub> emissions.
cov_all_CO2_wldGHG	CO <sub>2</sub> emissions covered by either carbon taxes or an ETS as a share of world total GHG emissions.
cov_all_CO2_wldCO2	CO <sub>2</sub> emissions covered by either carbon taxes or an ETS as a share of world total CO <sub>2</sub> emissions.
cov_all_CO2_supraCO2	CO <sub>2</sub> emissions covered by either carbon taxes or an ETS as a share of national jurisdiction CO <sub>2</sub> emissions.
cov_all_CO2_supraGHG	CO <sub>2</sub> emissions covered by either carbon taxes or an ETS as a share of national jurisdiction GHG emissions.

Note: total emissions used to calculate emissions shares exclude those from Land Use and Land Use Change and Forestry.

**ECP** The file `eCP.csv` contains the jurisdiction-level average carbon price. Following from the calculation of coverage shares as presented, the ECP is calculated separately for carbon taxes and ETSs and the combination of both. It is also calculated using GHG and CO<sub>2</sub> shares. The methodology is presented in section 3.3.

<b>Variable Name</b>	<b>Description</b>
<code>eCP_ets_jurCO2</code>	Emissions-weighted average price on emissions covered by an emissions trading system (ETS). <i>Weights</i> : share of jurisdiction total CO <sub>2</sub> emissions.
<code>eCP_tax_jurCO2</code>	Emissions-weighted average price on emissions covered by a carbon tax. <i>Weights</i> : share of jurisdiction total CO <sub>2</sub> emissions.
<code>eCP_all_jurCO2</code>	Emissions-weighted average price on emissions covered by either a carbon tax or an ETS. <i>Weights</i> : share of jurisdiction total CO <sub>2</sub> emissions.
<code>eCP_ets_jurGHG</code>	Emissions-weighted average price on emissions covered by an ETS. <i>Weights</i> : share of jurisdiction total GHG emissions.
<code>eCP_tax_jurGHG</code>	Emissions-weighted average price on emissions covered by a carbon tax. <i>Weights</i> : share of jurisdiction total GHG emissions.
<code>eCP_all_jurGHG</code>	Emissions-weighted average price on emissions covered by either a carbon tax or an ETS. <i>Weights</i> : share of jurisdiction total GHG emissions.

## 3. Methodology

To compute the ECP, the following information, disaggregated at the sector(-fuel) level, is used: (1) scope of existing carbon pricing mechanisms; (2) the nominal price of emissions (/tCO<sub>2</sub>) associated with each mechanism; (3) verified CO<sub>2</sub> emissions data.

We proceed with the calculation of the ECP in three steps.

1. Collect and record data on the sectoral scope and prices of all carbon pricing mechanisms in force within each jurisdiction.
2. Collect and standardize data on jurisdictions' GHG emissions (disaggregated by IPCC sector and fuel type) and calculate emissions shares.
3. Calculate jurisdiction-level coverage and ECP as per the formulas in section 3.3.

The source code executing those steps is available as an iPython notebook. However, the emissions data used in the calculations is not made available, as some of it is proprietary.

### 3.1 Sectoral Scope and Prices

The data on the sectoral scope and prices of carbon pricing mechanisms (by jurisdiction) is part of a companion dataset (the World Carbon Pricing Database). The methodology used to collect, structure, and encode the data is described in the associated technical note *World Carbon Pricing Database: Sources and Methods*.

The prices used to calculate the ECP are total price including any potential rebate. Prices in the World Carbon Pricing Database are expressed in current local currency units (LCUs). All prices in this dataset are expressed in 2019USD/tCO<sub>2</sub>e. The conversion from current LCUs uses the 2019 LCU/USD exchange rate and the jurisdiction-specific cumulative rates of inflation (based on the GDP deflator of each jurisdiction). Exchange rates and GDP deflators are obtained from [the World Bank Development Indicators](#). For subnational jurisdictions, national-level inflations rates are used.

### 3.2 GHG Inventory and Emissions Shares

We collect CO<sub>2</sub> emissions data for all national and subnational jurisdictions in the dataset and combine it into a single, standardized inventory for each jurisdiction. Since we use data from various sources<sup>5</sup>—and because these sources do not all follow

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<sup>5</sup> For details on data sources, see section 4.2.

the same structure or sectoral nomenclature—we construct correspondences that map the data in each one onto our standardized structure.<sup>6</sup>

We use verified emissions data to calculate the shares of sector (or sector-fuel)-level in total jurisdiction (national or subnational) and world CO<sub>2</sub> and GHG emissions. For subnational jurisdictions, we also calculate the share of emissions of each sector in total emissions of the relevant national jurisdiction, allowing us to calculate national coverage and average price figures arising from subnational pricing mechanisms.

### 3.3 Total Coverage and Average Emissions-Weighted Price

We calculate total coverage at the jurisdiction level by combining sectoral coverage and price data with emissions shares. Both datasets are disaggregated at the IPCC sector level, which allows for a one-to-one linking using IPCC sector codes as the linking key.

#### 3.3.1 Coverage

To calculate coverage, we combine data on the sectoral scope of carbon pricing mechanisms with inventory emissions data. The total coverage is calculated as the sum of sector (*k*) and, for IPCC categories 1A, sector(*k*)-fuel (*j*) level data. It is expressed as a share of a jurisdiction’s total emissions. Formally, the total emissions covered by all carbon pricing mechanisms in force in jurisdiction *i* in year *t* is given by

$$Coverage_{i,t} = \sum_{k,j,m} S_{i,t,k,j,m} - \omega_{i,t,k,j}$$

where

$S_{i,t,k,j,m}$  is the sector(-fuel) specific coverage by pricing mechanism *m*, expressed as a share of total emissions, and

$\omega_{i,t,k,j}$  is denotes the (share of) emissions covered by more than one carbon pricing mechanism (i.e., the overlap).

$$S_{i,t,k,j,m} \equiv I_{i,t,k,j,m} \times \frac{e_{i,t,k,j}^{ghg} \times cf_{i,t,k,m}}{e_{aggregate}^{ghg}} \text{ where } I_{i,t,k,j,m} \text{ is an indicator variable taking value 1}$$

if fuel *j* in sector *k* of jurisdiction *i* in year *t* is subject to pricing mechanism *m*,  $e_{i,t,k,j}^{ghg}$  is emissions from fuel *j* in sector *k* of jurisdiction *i* in year *t*,  $e_{aggregate}^{ghg}$  is total jurisdiction emissions and  $cf_{i,t,k,m}$  is the mechanism-specific coverage factor.

<sup>6</sup> For subnational jurisdictions, inventories do not include a breakdown by fuel type within each IPCC source category. As a result, we adjust the structure of the carbon pricing data to match that of the inventory.

The coverage factor accounts for scope exemptions of emissions within sectors, i.e., the fact that some pricing mechanisms cover less than 100 percent of emissions from a given IPCC source category. Such exemptions include emissions/plants excluded due to (i) compliance thresholds or (ii) coverage by another pricing mechanism.<sup>7</sup>

We also account for overlapping coverage of emissions by multiple mechanisms. To that end, we maintain a list of carbon pricing mechanisms that overlap with each other at the IPCC sector level (see appendix A.3). This allows us to calculate the portion of emissions, within each sector, that is covered by multiple mechanisms ( $\omega_{i,t,k,j}$ ) and subtract that portion of emissions from the sectoral total.

### 3.3.2 ECP

The ECP is the emissions-weighted average of sector(-fuel) level carbon prices. Its calculation entails (1) calculation of (mechanism-specific) aggregation weights ( $w$ ); (2) multiplication of the aggregation weights by the price ( $p$ ) applied to emissions by a given mechanism; (3) summation over all mechanisms; (4) aggregation at sector or jurisdiction level.

Formally, the calculation of the ECP of jurisdiction  $i$  in year  $t$  can be expressed as

$$ECP_{i,t} = \sum_{k,j,m} p_{i,t,k,j,m} \times w_{i,t,k,j,m}$$

where

- $p_{i,t,k,j,m}$  is the price applicable to sector  $k$  by mechanism  $m$ ;
- $w_{i,t,k,j,m}$  is the sector(-fuel) specific aggregation weight and is defined as  $w_{i,t,k,j,m} \equiv S_{i,t,k,j,m}$ .

Notes:

- $w_{i,t,k,j,m}$  can be calculated using aggregate CO<sub>2</sub> or GHG emissions, yielding average CO<sub>2</sub> or average CO<sub>2</sub>e prices.<sup>8</sup>
- The ECP is computed at the economy-wide level. In addition, for IPCC Energy sectors, a sector-level average of fuel-level prices is also be computed. In that case, the weights are the shares of sector-fuel emissions in total sector GHG or CO<sub>2</sub> emissions.
- The ECP can be calculated using time-varying or fixed-year weights. For the former, coverage data is matched with emissions shares using jurisdiction, year, sector (and product) as keys. This implies that emissions shares vary in each year. For the latter, a reference year is selected (e.g., 2019) and the

<sup>7</sup> Calculation or encoding of these coverage factors is described in the appendix A.2.

<sup>8</sup> Given that the current version of the ECP does not account for prices on non-CO<sub>2</sub> greenhouse gases, average CO<sub>2</sub>e prices may underestimate the actual average price on CO<sub>2</sub>e.

corresponding emissions dataframe is matched with scope and price data using jurisdiction, sector (and product). The same emissions shares apply across all years.<sup>9</sup>

- If a subnational jurisdiction implements a carbon pricing mechanism but no national mechanism exists, we compute national averages of subnational prices.

## 4. Sources

### 4.1 Sectoral Coverage and Prices

Information about the mechanisms' sectoral coverage and prices has been collected as part of a separate effort and is available through the World Carbon Pricing Database (<https://github.com/g-dolphin/WorldCarbonPricingDatabase>). This information is collected at the sector-fuel level. The sectoral disaggregation follows the guidelines of the International Panel on Climate Change (IPCC, 2006). The full dataset is available [here](#), and the methodology used to compile the dataset is described in a companion technical note.

### 4.1 GHG Inventory

Disaggregated verified data on total CO<sub>2</sub> emissions in each jurisdiction is obtained from various sources. To ensure (methodological) consistency across years and jurisdictions, we prioritize sources that provide data for the largest possible number of jurisdictions and the longest period. For national jurisdictions, the main sources are the **International Energy Agency's CO<sub>2</sub> Emissions from Fuel Combustion and the Emissions Database for Global Atmospheric Research (EDGAR)** provided by the Joint Research Centre of the European Commission. Both sources have an extensive sectoral coverage. However, the former provides a more granular disaggregation of 1A Energy emissions—specifically, (i) a higher sectoral granularity and (ii) a breakdown of emissions by fuel type—whereas the latter provides more detailed information for source categories 2.<sup>10</sup>

For subnational jurisdictions, emissions data is taken from various sources. For consistency with the carbon price data and the national jurisdictions emissions data,

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<sup>9</sup> An additional possibility, explored as part of academic work but not reported as part of this dataset, is to use emissions data of the year preceding the introduction of the policy to calculate the emissions shares. This ensures that the computed ECP levels are not affected by interannual changes in CO<sub>2</sub> emissions that may be a consequence of the carbon pricing policy itself.

<sup>10</sup> IEA data follows IPCC 2006 sectoral disaggregation but does not provide IPCC source category codes. Hence, we create a mapping between IEA sectors (flows) and IPCC categories.

we prioritize sources that follow the IPCC sectoral disaggregation. Most of these sources only include sector names (not IPCC category codes). To create a single inventory for subnational jurisdictions, we create a mapping from category name to IPCC category code for each source.

In most cases, the last year for which GHG inventory data is available is 2018. Coverage and price calculations for years 2019 and 2020 use 2018 emissions data but year-specific scope and price data.

**Table 2. GHG Inventory Data Sources**

<b>IPCC Categories</b>	<b>National Jurisdictions</b>	<b>Subnational</b>
1A Energy categories	International Energy Agency CO2 emissions from fuel combustion (IEA)	United States: Rhodium Group Climate Deck
2 Industrial Processes and Product Use	Emissions Database for Global Atmospheric Research (EDGAR)	Canada: Environment and Climate Change Canada
Other IPCC categories	EDGAR	China (CO2): Carbon Emission Accounts and Datasets (CEADs)

## 5. Continuing Update and Future Extensions

The dataset is under continuous development. Suggestions for and contributions to the extension of the dataset to other features of carbon pricing mechanisms are welcome. The next update of the dataset will focus on the following:

1. update data to the latest year to reflect institutional design and price changes pertaining to mechanisms and information on mechanisms established since the last release.
2. calculate coverage and ECP figures for two Japanese municipalities: Saitama and Tokyo.
3. adjust the methodology and emissions data to account for prices on non-CO<sub>2</sub> greenhouse gases.

## 6. Conclusion

Over the last three decades, several jurisdictions have introduced carbon pricing mechanisms aiming at reducing GHG emissions. As the world continues to strengthen its policy response, more mechanisms are likely. However, a standardized and consistent assessment of these mechanisms across jurisdictions has so far been missing. This project aims to make such an assessment possible. We develop a methodology to calculate emissions coverage and average (explicit) carbon prices across 189 national and 94 subnational jurisdictions over 1990–2020.

The coverage and price data and Python scripts implementing the methodology are provided on the GitHub repository <https://github.com/g-dolphin/ECP>.

## 7. References

Carbon Emission Accounts and Datasets (CEADS). Provincial CO<sub>2</sub> emission inventory (by IPCC Sectoral Approach),

[https://ceads.net/data/province/by\\_sectoral\\_accounting/Provincial/](https://ceads.net/data/province/by_sectoral_accounting/Provincial/)

Environment and Climate Change Canada (ECCC). National GHG Inventory Report,

<https://open.canada.ca/data/en/dataset/779c7bcf-4982-47eb-af1b-a33618a05e5b>

European Commission, Joint Research Centre (JRC)/Netherlands Environmental Assessment Agency (PBL). Emission Database for Global Atmospheric Research (EDGAR), release

version 4.3.1 <http://edgar.jrc.ec.europa.eu/overview.php?v=431>, 2016.

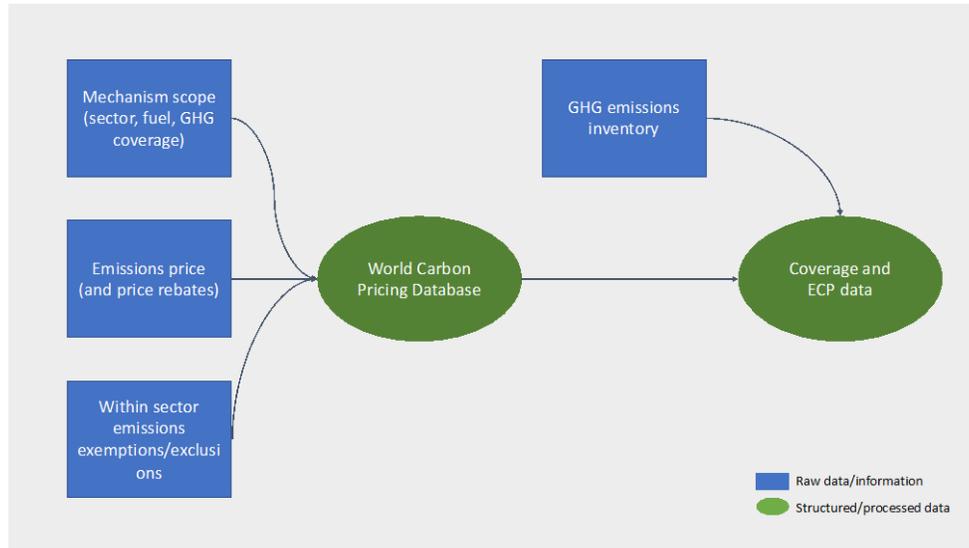
International Energy Agency. 2019. *CO<sub>2</sub> emissions from fuel combustion* database.

<https://www.iea.org/data-and-statistics/data-product/greenhouse-gas-emissions-from-energy>.

Rhodium Group. US GHG Emissions Inventories, [https://rhg.com/data\\_story/climate-deck/](https://rhg.com/data_story/climate-deck/).

# Appendix

## A.1 Dataflow Representation



## A.2 Coverage Factors

Our assessment of emissions covered by carbon pricing mechanisms within each jurisdiction is based on inventory data, which, in theory, includes *all* emissions of a given sector. However, some emissions of specific sectors may be excluded from the scope of a given carbon pricing mechanism. To account for such exclusions, we calculate or encode sector-specific coverage factors.

This coverage factor is an initial attempt to account for all exemptions that allow firms in specified sectors or meeting certain conditions within those sectors to exempt part of their emissions from the tax or waive their obligation to surrender allowances for these emissions. This includes, for instance, compliance thresholds above which firms (or plants) become liable for the carbon tax or must surrender emissions allowances or outright waivers on some proportion of emissions within a sector. The latter occurs when the emissions might be covered by two mechanisms and the liability is waived for one of the two.

See section 4.1.4 of *World Carbon Pricing Database: Sources and Methods* for further details.

## A.3 Overlap

Within a jurisdiction, two mechanisms typically do not apply to the same sectors; that is, they have no sectoral overlap in coverage. Mechanisms do sometimes overlap at the sectoral level, but this overlap does not extend to actual emissions within those sectors, as the mechanisms are designed to apply to different emissions within them. For instance, for countries participating in the EU ETS, their national carbon tax is designed to cover only emissions from installations that are not participating in the EU ETS.

However, an overlap sometimes exists. Overlap between carbon pricing mechanisms is accounted for by maintaining a `CSV` file recording the bilateral overlap between mechanisms, at the sector level.

