

Methodology Main Model - Co Data

There are two threads of data that is taken from Co Data and that is used for feeding the output of the model

- 1) The data that belongs to "Representative Company" Analysis
- 2) "Prices" or Total Production values

We will treat these points separately

1) Representative Companies Analysis:

The process is the same as Unido (see "Methodology Main Model-UNIDO"), but focused only in the MSR restricted to Cobalt treatment. So, we will focus on the main differences and not on the details about calculation that are performed the same as Unido.

a. Getting the information from CO_MSR:

The information is collected by description and year from sheet CO_MSR, based on the Region selected. It is collected also in the sheet "Footprint - Sectoral analysis" for same indicators calculations. The main differences from Unido's data processing are next:

1. For CO_MSR, we have only the information restricted to Cobalt, and not to economic sector. For example, if we focus on Output or total production value, when we talk about "Mining", for CO_MSR this represents the mining production value of Cobalt, and for Unido, this represents the total mining production value of any primary product.
2. We consider R&D indicator from CO_MSR. For Unido, we don't have it
3. Because we have historical data and projection for Cobalt information (we have data from 2010 until 2030), the process gets this projection data in place of complete future years information performing the "Gap Filling" (this is how it works for Unido)
4. We can visualize the indicators' value of each Refining final product. Because this is focused in Cobalt production, we have this information splitted, and also, we can use the filter in the initial settings for filtering just one product

| Socio-Economic Contribution of the Value Chain First Use Applications of Cobalt | | Eurostat sheet UNIDO variable | | | | (1) (2) (3) (4) (5) | | | | |
|--|-------------------------|---|---------------------|----------------------------|--|--|------|------|------|------|
| Segment | | Socio-Economic Parameters | | | | Establishments Establishments Establishments Establishments Establishments | | | | |
| | Applicable NACE Code | UNIDO SIC Code | UNIDO SIC WEIGHT | OECD Codes Descriptions | | | | | | |
| | | | | | | 2010 | 2011 | 2012 | 2013 | 2014 |
| Mining, Smelting, Refining | | Mining and quarrying of ores, Smelting & Refining | B | 100% | | 59 | 67 | 80 | 84 | 84 |
| Mining of metal ores | | Smelting & Refining | Mining | 100% | 00708: Mining and quarrying of non-energy producing products | 1 | 1 | 1 | 1 | 1 |
| Smelting & Refining | | Metal products | Smelting, Refining | 100% | 024: Basic metals | 59 | 66 | 79 | 83 | 83 |
| Graphite | | Graphite | Smelting, Refining | 100% | | 11 | 12 | 14 | 16 | 15 |
| Cathode | | Graphite | Smelting, Refining | 100% | | 4 | 4 | 5 | 6 | 5 |
| Fine Powder | | Fine Powder | Smelting, Refining | 100% | | 7 | 8 | 8 | 10 | 10 |
| Chemical | | Chemical products | Smelting, Refining | 100% | 02021: Chemicals and pharmaceutical products | 47 | 54 | 66 | 67 | 66 |
| Sulphate | | Sulphate | Smelting, Refining | 100% | | 13 | 17 | 22 | 18 | 21 |
| Chloride | | Chloride | Smelting, Refining | 100% | | 6 | 6 | 7 | 8 | 8 |
| Tetroxide | | Tetroxide | Smelting, Refining | 100% | | 13 | 15 | 17 | 19 | 19 |
| Other | | Other | Smelting, Refining | 100% | | 15 | 16 | 20 | 22 | 20 |

DATA IS
TAKEN FROM
SHEET
CO_MSR

b. Gap Filling:

There aren't any differences between this process and the Unido "Gap Filling". For more details, see the sheet "Methodology Main Model-UNIDO".

c) Calculating the final averaged indicators for MSR:

Basically, the main differences between this process and Unido are the following

1. Because we have data projected until 2030, the filters that applied for calculating the Average of Total Production, Value Added, Employees, Personnel Cost and R&D are "FROM PERIOD" and "TO PERIOD" filters (item 7 of filter image). So, in this case, the process calculates the average considering the years filtered by these filters.

Because of that, if we want to emulate Main model output with out a forecasting component, we have to set these filters to historical data. For example, the image below shows a configuration taking historical data from 2015 to 2021

Database and Evaluation Tool

Select Region / Country: **China**

Cobalt value used: **Base product value + value addition**

For end manufacturing: **Include value addition at first use**

First use mode: **Average**

Include end sectors: **Yes**

Include income effects: **Yes**

From period: **2015**

Until period: **2021**

From period UNIDO: **2015**

Until period UNIDO: **2021**

Use MINSTAT REV 4 for UNIDO: **Yes**

Smelting and Refining Products: **All Products**

RUN PROCESS

2. The final indicators are the same than in Unido, but it is an additional indicator for R&D calculated like:

R&D (USD/mill USD revenue):

It represents R&D per million of USD over the total Production or Output. It is calculated like the average of R&D divided by the average of Total Production, multiplied by 1.000.000 (in Million of USD)

2) "Prices" or Total Production Value:

This is already explained in the section "MSR" of the sheet "Methodology Forecast & Scenario". For the sake of simplicity, we will copy the same description in that section (in italics)

With this settings, the model calculates the new prices for each scenario for MSR, First Use, End Use and Recycling, that will feed the Roskill model for spitting the output for each scenario. The methodology for each of the application categories is next:

Basically, there will be two cases:

- a) The data which source is CO_MSR that belongs to the "Representative Companies" Analysis
b) The data which source is UNIDO that belongs to the "Sectorial Analysis"

So for the case (a), it already exists a forecasting component until 2030. So, in this case, we have to calculate in some way the scenario's final prices.

In the case (b), there aren't any forecast and scenario prices. Because of that, it is necessary to calculate a forecast price before applying the modification factor applied to case (a)

The calculation is like:

1. a) The models calculates the average prices of each scenario (rows 44, 55 and 66), considering the forecasting periods filtered (example, from 2022 to 2030)
1. b) The models calculates the average prices of the base scenario (row 55), considering the forecasting periods filtered (example, from 2022 to 2030)
1. c) The models calculates a factor for each scenario like (1.a) divided by (1.b)
2. a) The models calculates the average prices of the base scenario (row 55), considering the forecasting periods filtered (example, from 2022 to 2030)
2. b) The models calculates the average prices of the base scenario (row 55), considering the historical periods filtered (example, from 2010 to 2021)
2. c) The models calculates a forecasting factor like (2.a) divided by (2.b)
3. a) In the case the data belongs to "Company Analysis" vision (case (a)), the models apply the factor calculated in 1. c to the CO₂ MSR final price for completing the prices of each scenario of all the MSR application
3. b) In the case the data belongs to "Sectorial Analysis" vision (case (b)), the models apply the factor calculated in 1. c and 2. c to the UNID0 Data final price for completing the prices of each scenario of all the MSR application