Methodology Main Model - UNIDO

Calculating the Unido averaged indicators:

The sheet "Footprint - Sectoral analysis" is where the Unido data is collected to calculate the average of the main indicators. Basically, we can see the next 3 steps:

a) Getting the information from Unido:

The information is collected by ISIC number and year for MSR, First and End Use applications, and Recycling(*), based on the Region selected. Basically, in the next image, we can see (from left to right):
1. the Segment or description of the application
2. the NACE code (it is not used)
3. the UNIDO ISIC Code: the process uses this code to looks for it inside the sheets relative to UNIDO data (it depends on the selection of the Source as UNIDO or UNIDO2)
4. the UNIDO Weight: Is a multiplier factor applied to the number from UNIDO. It is used becasuse some ISIC codes are not 100% representative of the application or Segment
5. OECD Codes and Descriptions: Used for getting some information from OECD about taxes

Segment	Socio-Economic Parameters				
	Applicable NACE Code		UNIDO ISIC Code	UNIDO ISIC WEIGHT	OECD Codes and Descriptions
	C2052	Manufacture of glues	2029	20%	
	C2211	Manufacture of rubber tyres and tubes	2211	100%	
Batteries	C2720	Manufacture of batteries and accumulators	2720	100%	D27: Electrical equipment
Biotech – animal feed and fertiliser	C1091	Manufacture of prepared feeds for animals	1080	100%	D10T12: Food products, beverages and tobacco
Biotech – biogas production	Combination			100%	D35T39: Electricity, gas, water supply, sewerage, waste and
	D3521	Manufacture of gas	352	100%	
	D3821	Treatment and disposal of non-hazardous waste	382	100%	
Biotech - fermentation, biotech processes, health and medicine	C2120	Manufacture of pharmaceutical preparations	2100	100%	D20T21: Chemicals and pharmaceutical products
Carbide Diamond Tools	C2573	Manufacture of tools	2593	45%	D25: Fabricated metal products
Catalysts – used as catalyst precursor	C2059	Manufacture of other chemical products, n.e.c.	2029	35%	D20T21: Chemicals and pharmaceutical products
Catalysts – used as oxidation catalyst/for PTA and IPA	C2059	Manufacture of other chemical products, n.e.c.	2029	45%	D20T21: Chemicals and pharmaceutical products
Driers / paints	C2030	Manufacture of paints, varnishes and similar coatings, printing ink and mastic	2022	100%	D20T21: Chemicals and pharmaceutical products
Electronics	C2611	Manufacture of electronic components	2610	100%	D26: Computer, electronic and optical products
Magnetic alloys	C2599	Manufacture of other fabricated metal products	2599	100%	D25: Fabricated metal products
Metallurgical alloys	C2445	Other non-ferous metal production	2420	100%	D24: Basic metals
Pigments (inc. decolourising (glass))	C2012	Manufacture of dyes and pigments	2011	75%	D20T21: Chemicals and pharmaceutical products
Surface treatment	C2561	Treatment and coating of metals	2592	100%	D25: Fabricated metal products
Others	Average of others used				Average of others used
Bespoke/Niche Applications	Average of others used				Average of others used

Finally, as a first step, the Unido data is getting looking for in the Pivot tables by ISIC Unido Code and year. Also, the Unido ISIC Weight is applied to the number to get the final value for each Application and Year (see image below).

Socio-Economic Contribution of the Value Chain
First Use Applications of Cobalt

	Segment	# of companies															
		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Mining, Smelting, Refining		0	16,818	17,134	17,711	16,249	14,479	12,546	11,046	0	0	0	0	0	0	0	0
DATA IS TAKEN FROM UNIDO	Mining of metal ores	0	5,594	5,574	5,722	5,314	4,482	3,533	2,980	0	0	0	0	0	0	0	0
	Mining of other non-ferrous metal ores	0	2,321	2,318	2,363	2,218	2,044	0	0	0	0	0	0	0	0	0	0
	Manufacture of basic metals	18,998	18,127	18,585	19,097	18,522	17,555	18,059	19,111	20,266	21,456	0	0	0	0	0	0
	Manufacture of basic precious and other non-ferrous metals	6,801	6,461	6,832	7,181	7,195	7,050	7,264	7,700	8,170	8,658	0	0	0	0	0	0
	Other non-ferrous metal production	6,801	6,461	6,832	7,181	7,195	7,050	7,264	7,700	8,170	8,658	0	0	0	0	0	0
First Use Applications																	
	Relevant Segments Data according to NACE																
	Adhesion (inc. rubber adhesion agent)																
		1,834	1,743	1,823	1,936	1,965	1,973	2,033	2,155	2,287	2,423	0	0	0	0	0	0
		547	521	559	579	560	536	552	585	621	658	0	0	0	0	0	0
	Batteries	1,102	1,188	1,137	1,239	1,351	1,301	1,347	1,427	1,515	1,605	0	0	0	0	0	0
	Biotech – animal feed and fertiliser	3,522	3,592	3,518	3,812	4,069	4,217	4,522	4,824	5,182	5,493	0	0	0	0	0	0
	Biotech – biogas production	0	439	495	566	654	708	0	0	0	0	0	0	0	0	0	0
		0	878	990	1,132	1,308	1,416	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Biotech - fermentation, biotech processes, health and medicine	6,341	6,288	6,700	7,141	7,484	7,707	8,382	8,848	9,365	9,943	0	0	0	0	0	0

(*) About Recycling, we have to considerer an special treatment for regions North America and China, because there is not data for Output and Value Added for any single year between 2010 and 2030.
In this case, the process considers the region as Global, and it applies a factor that is setted in the sheet "Auxiliary", "Coefficients for Recycling by Region" (column "O") for each region. This solves the problem of the lack of data for these two special cases.

b) Gap Filling:

After the process collects the data from Unido, there is another sub process that completes the years between 2010 and 2030 following the next criteria:
1. If there is a value > 0 for the application and year (basically, if it has come some value from Unido), then this is the final value for that year and application
2. If not happens 1., then the process chooses the most recent value (last year) that has a value > 0 for that application.

Because for all combination of Region, application and years between 2010 and 2021 (historical data) we have at least a value > 0, then the Gap Filling will assure that we have a value > 0 for all the years between 2010 and 2030 (see image below)

Socio-Economic Contribution of the Value Chain
First Use Applications of Cobalt

	Segment	Gap filling	# of companies															
			2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Mining, Smelting, Refining			16,818	16,818	17,134	17,711	16,249	14,479	12,546	11,046	11,046	11,046	11,046	11,046	11,046	11,046	11,046	11,046
DATA IS TAKEN FROM UNIDO	Mining of metal ores		5,594	5,594	5,574	5,722	5,314	4,482	3,533	2,980	2,980	2,980	2,980	2,980	2,980	2,980	2,980	2,980
	Mining of other non-ferrous metal ores		2,321	2,321	2,318	2,363	2,218	2,044	2,044	2,044	2,044	2,044	2,044	2,044	2,044	2,044	2,044	2,044
	Manufacture of basic metals		18,998	18,127	18,585	19,097	18,522	17,555	18,059	19,111	20,266	21,456	21,456	21,456	21,456	21,456	21,456	21,456
	Manufacture of basic precious and other non-ferrous metals		6,801	6,461	6,832	7,181	7,195	7,050	7,264	7,700	8,170	8,658	8,658	8,658	8,658	8,658	8,658	8,658
	Other non-ferrous metal production		6,801	6,461	6,832	7,181	7,195	7,050	7,264	7,700	8,170	8,658	8,658	8,658	8,658	8,658	8,658	8,658
First Use Applications																		
	Relevant Segments Data according to NACE																	
	Adhesion (inc. rubber adhesion agent)																	
			1,834	1,743	1,823	1,936	1,965	1,973	2,033	2,155	2,287	2,423	2,423	2,423	2,423	2,423	2,423	2,423
			547	521	559	579	560	536	552	585	621	658	658	658	658	658	658	658
	Batteries		1,102	1,188	1,137	1,239	1,351	1,301	1,347	1,427	1,515	1,605	1,605	1,605	1,605	1,605	1,605	1,605
	Biotech – animal feed and fertiliser		3,522	3,592	3,518	3,812	4,069	4,217	4,522	4,824	5,182	5,493	5,493	5,493	5,493	5,493	5,493	5,493
	Biotech – biogas production		439	439	495	566	654	708	708	708	708	708	708	708	708	708	708	708
			878	878	990	1,132	1,308	1,416	1,416	1,416	1,416	1,416	1,416	1,416	1,416	1,416	1,416	1,416

c) Calculating the final averaged indicators for each application:

The final part of the Unido processing. Basically, the process calculates each indicator used for calculating the output of the model as follows:

1. Average of Total Production: The process calculates an average of Production per year, considering only the years filtered by "FROM PERIOD UNIDO" to "TO PERIOD UNIDO" selection filters (item 8 of filter image).
2. Average of Value Added: The process calculates an average of Value Added per year, considering only the years filtered by "FROM PERIOD UNIDO" to "TO PERIOD UNIDO" selection filters (item 8 of filter image).
3. Average of Employees: The process calculates an average of the quantity of employees per year, considering only the years filtered by "FROM PERIOD UNIDO" to "TO PERIOD UNIDO" selection filters (item 8 of filter image).
4. Average of Personnel Cost: The process calculates an average of Wages and Salaries per year, considering only the years filtered by "FROM PERIOD UNIDO" to "TO PERIOD UNIDO" selection filters (item 8 of filter image).

The final indicators used for feeding the model are the next:

1. Labour cost (mill USD per mill USD revenue):
It represents the Labour cost in million of USD over the total Production or Output. It is calculated like (4) divided by (1), multiplied by 1.000.000 (in Million of USD)

2. Value added (mill USD per mill USD revenue)
It represents the Value Added in million of USD over the total Production or Output. It is calculated like (2) divided by (1), multiplied by 1.000.000 (in Million of USD)

3. Employees (# per mill USD revenue)
It represents the quantity of employees over the total Production or Output. It is calculated like (3) divided by (1)

4. Taxes (mill USD per mill USD revenue)
For taxes, the process takes the data from OECD data. Basically, it takes, depending on the OECD setted (see point a.5), it looks for the next indicators:
(+) Taxes less subsidies on intermediate and final products
(+) Taxes on Production
(+) Estimated corporate Tax
The final indicator is calculated like the sum of the upper items, divided by OECD total Output or Production, and multiplied by 1.000.000 (in Million of USD)