Plastic Toolkit Application and Demonstration

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https://www.imperial.ac.uk/news/200553/ocean-plastic-triple-2040-immediate-action/

Overview of Plastic Toolkit

Plastic POM

Parameters in the Toolkit

Plastic content

Polymer composition

Data collection from existing statistics

Trade statistics (HS code)

Domestic production statistics (CPC code)

Plastic-KEYs

Parameters in the Toolkit

Lifetimes

Plastic waste generated

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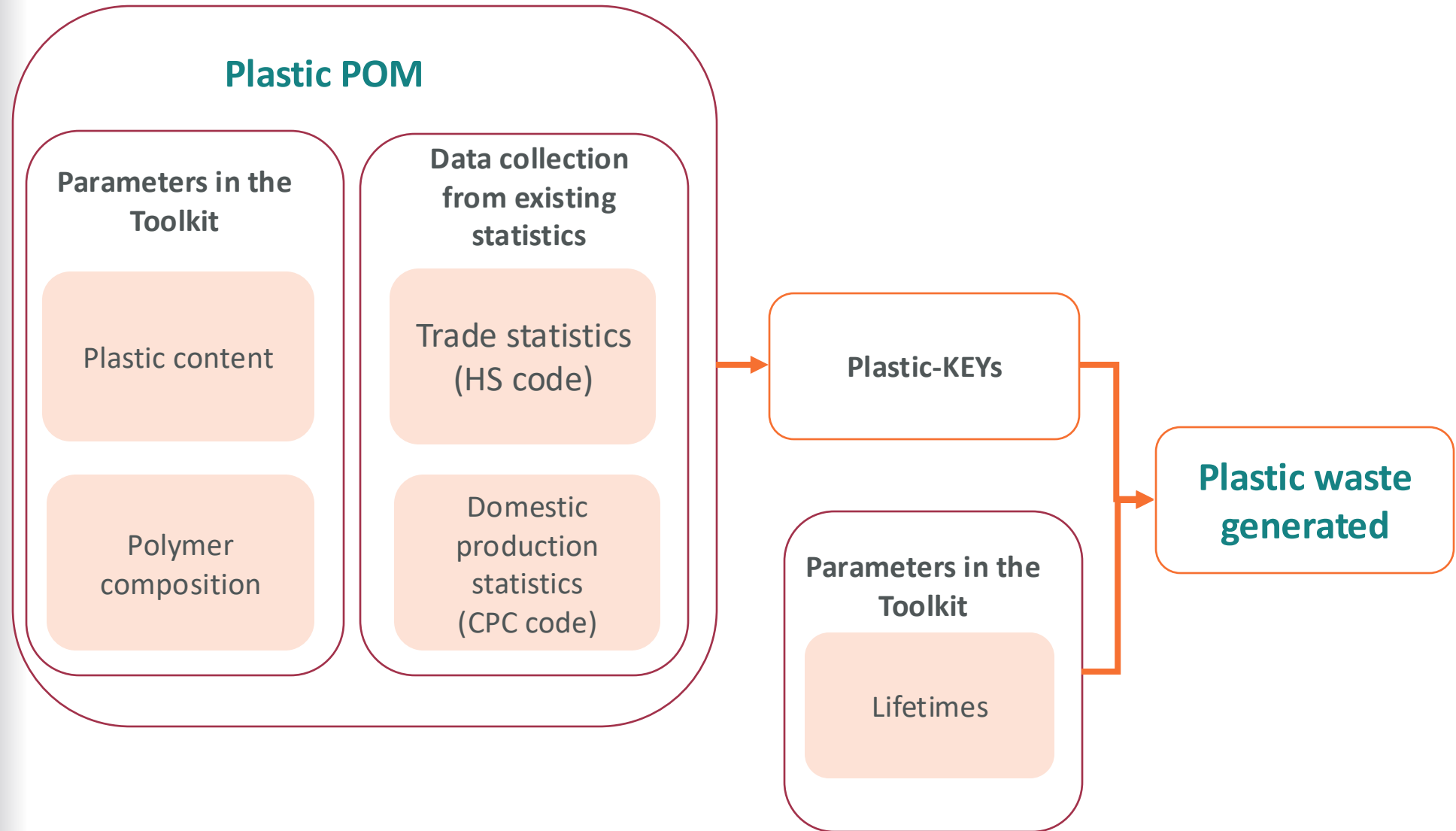
Plastic Calculation Toolkit

Plastic Put on the Market (POM) Tool

Plastic Waste Generated (WG) Tool

- Tips:
  - Time series (preferably 20 or a minimum of 10 years)
  - Aggregate information by year (annual data)

Example of application

Plastic put on the market in country A

P501 Household articles and toilet articles, of plastics
HS code 3924.10; Plastic content =1

year 2011-2020

	Import (kg)	Export (kg)	Production (kg)	POM (kg)
2011	3040	1413	5723	7350
2012	3513	1547	6201	8167
2013	4033	1546	5809	8297
2014	4585	1847	6360	9098
2015	6973	2094	8351	13229
2016	8787	2431	7997	14354
2017	9836	2679	8612	15770
2018	9852	2554	8585	15884
2019	12734	3313	9817	19238
2020	12520	3182	9613	18951

Example of application

Plastic waste generated from P502

	POM (kg)	Plastic waste generated (kg)
2011	7350	134.91
2012	8167	1014.04
2013	8297	3325.52
2014	9098	5948.19
2015	13229	7475.56
2016	14354	8272.96
2017	15770	9318.07
2018	15884	11221.78
2019	19238	13323.30
2020	18951	14856.18

Sectors	μ (mean, in years)	σ (standard deviation in years)
Consumer and Institutional Products	3	1

Example of application
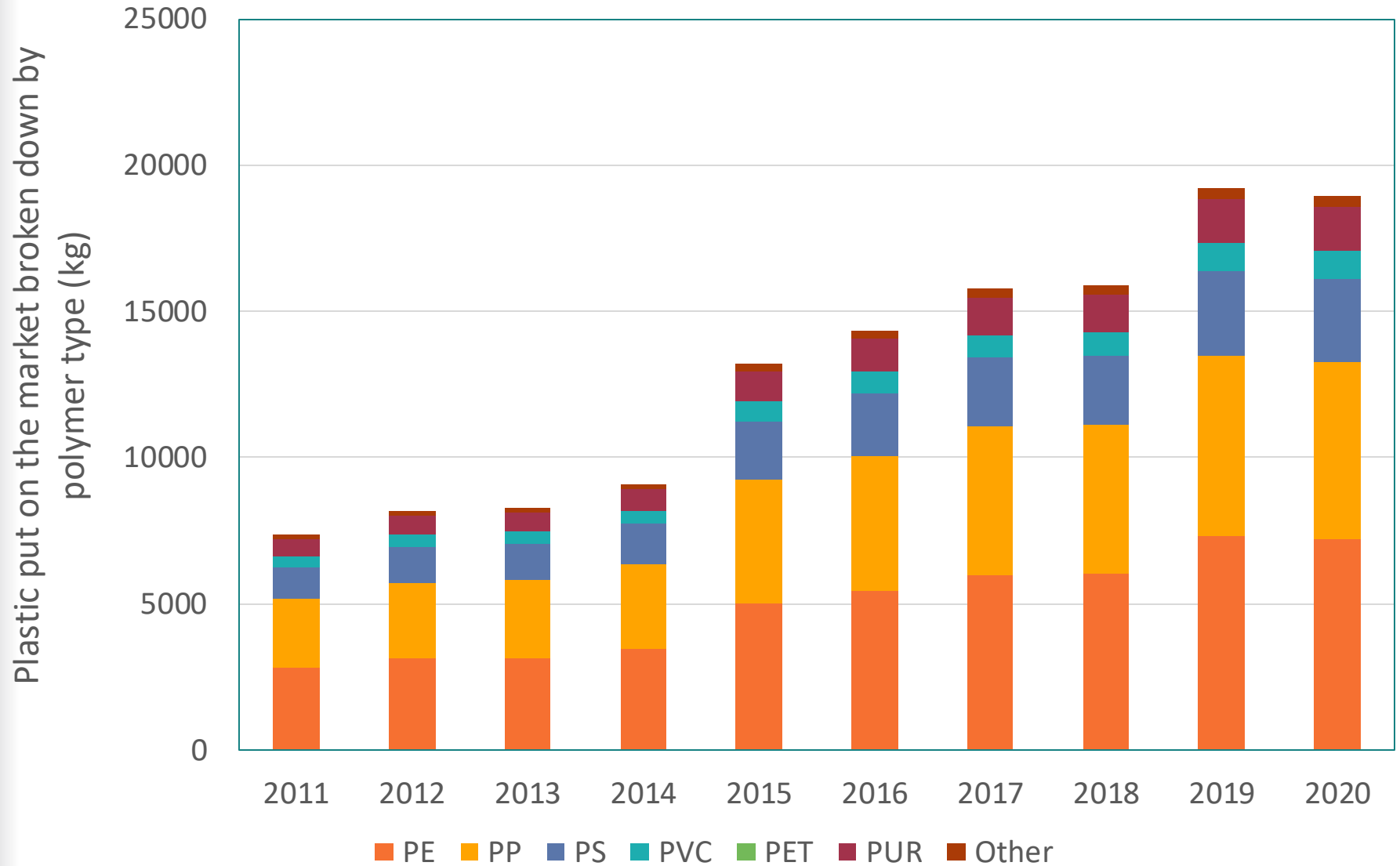
Example of application
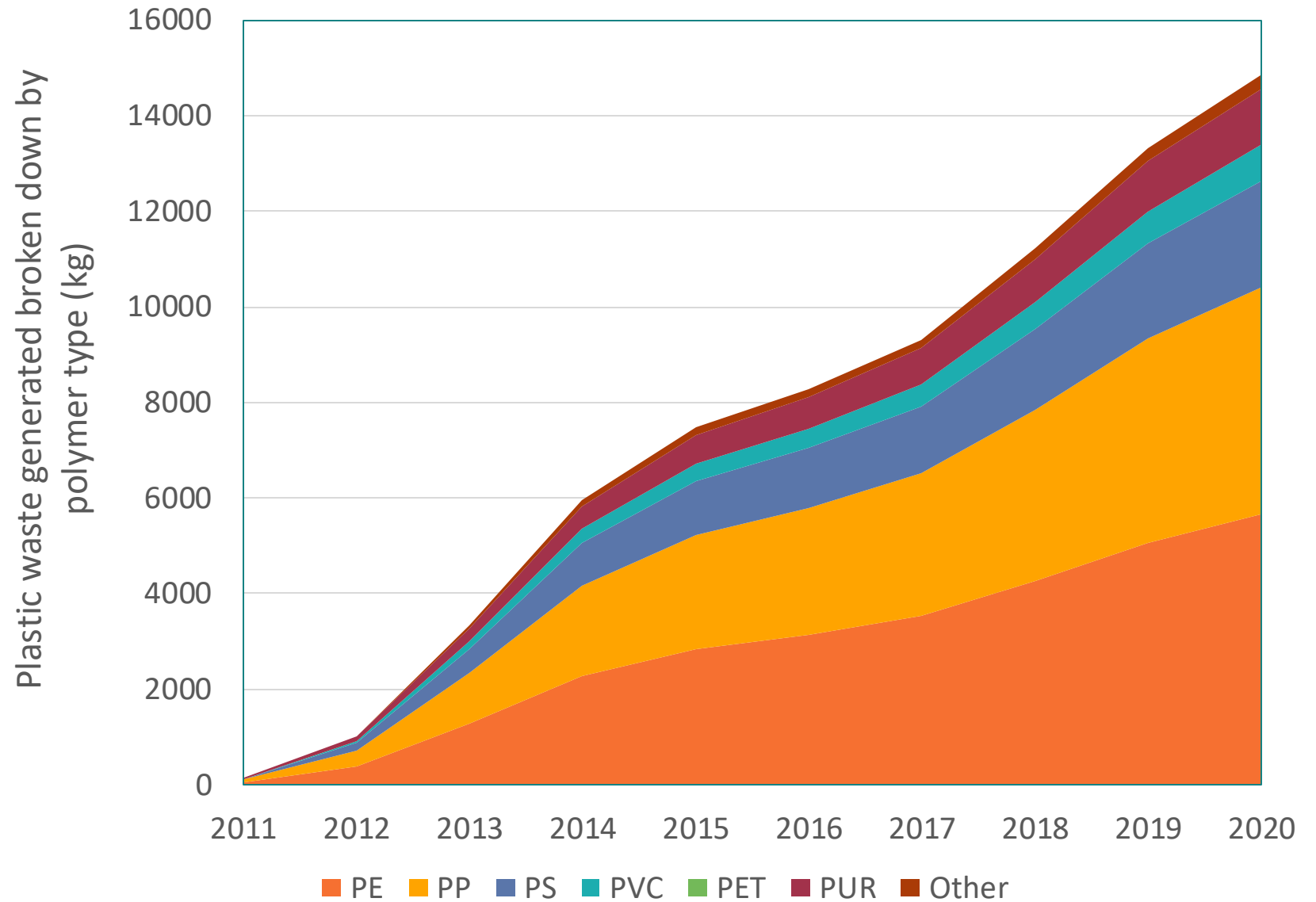
Plastic Toolkit Demonstration

Plastic Embedded POM Tool:

Name of the sheet in Plastic Embedded POM Calculation Tool	Description
FrontPage	User interface
POM_APP_CONS_PEM	Time series (1980-2030) put on market data per PlasticKEY
POM_to_Tool_imputations	The substitution of estimated values for missing or inconsistent data items
POM_to_Tool	The final calculation results of POM POM_to_Tool is the input sheet to Plastic Waste Generated Tool.
POM_by sector by polymer	Plastic embedded POM by polymer in different economic sectors
The following sheets are hidden, it can be made visible by clicking on the "show sheets" button.	
HS_PlasticKEY	Correspondence tables of HS codes and PlasticKEYs, and CPC codes and PlasticKEYs
Input_HScode	Sheet used for entering plastic import, and export data based on the HS codes of a country under investigation
Weight_Year_HS	Average weight (and plastic fraction for PEM POM calculation tool) of plastic product per HS code for chosen year A sheet for converting plastic import and export in "piece/unit" or "kg" to tonnes
Input_CPCcode	Sheet used for entering plastic domestic production data based on the CPC codes of a country under investigation
Weight_Year_CPC	Average weight (and plastic fraction for PEM POM calculation tool) of plastic product per CPC code for chosen year A sheet for converting plastic domestic production in "piece/unit" or "kg" to tonnes
Import_timeseries_PEM	Time series import data per HS code
Export_timeseries _PEM	Time series export data per HS code
CPC_timeseries_PEM	Time series domestic production data per CPC code
CPC_PlasticKEY_PEM	Time series domestic production data per PlasticKEY
Import_PlasticKEY_PEM	Time series import data per PlasticKEY
Export_PlasticKEY _PEM	Time series export data per PlasticKEY
PlasticKEY by sector by polymer	Polymer composition of each PlasticKEY for chosen years

Plastic Embedded POM Tool:

Plastic Embedded POM Tool:

Filling in import and export data

Plastic Embedded POM Tool:

Input trade data according to HS Codes for the year 2022

	HS	Full name	IMPORT	EXPORT	UNIT (fro	Possible Units			Plastic-KEY	CONVERTED UNITS (t)	
										IMPORT	EXPORT
7	392310	Boxes, cases, crates and similar articles for the conveyance or packaging of goods, of plastics			kg	p/unit or kg			P101	0	0
8	392330	Carboys, bottles, flasks and similar articles for the conveyance or packaging of goods, of plastics			p/unit	p/unit or kg			P101	0	0
9	392321	Sacks and bags, incl. cones, of polymers of ethylene			kg	p/unit or kg			P102	0	0
10	392329	Sacks and bags, incl. cones, of plastics (excl. those of polymers of ethylene)			kg	p/unit or kg			P102	0	0
11	200911	containing added sugar or other sweetening matter (excl. containing spirit)			kg	p/unit or kg			P103	0	0
12	200912	20¬∞C, whether or not containing added sugar or other sweetening matter (excl. containing spirit and frozen)			kg	p/unit or kg			P103	0	0
13	200919	added sugar or other sweetening matter (excl. containing spirit, frozen, and of a Brix value <= 20 at 20¬∞C)			kg	p/unit or kg			P103	0	0
14	200921	Grapefruit juice, unfermented, Brix value <= 20 at 20¬∞C, whether or not containing added sugar or other sweetening matter (excl. containing spirit)			kg	p/unit or kg			P103	0	0
15	200929	Grapefruit juice, unfermented, Brix value > 20 at 20¬∞C, whether or not containing added sugar or other sweetening matter (excl. containing spirit)			kg	p/unit or kg			P103	0	0
16	200931	at 20¬∞C, whether or not containing added sugar or other sweetening matter (excl. containing spirit, mixtures, orange juice and grapefruit juice)			kg	p/unit or kg			P103	0	0
17	200939	at 20¬∞C, whether or not containing added sugar or other sweetening matter (excl. containing spirit, mixtures, orange juice and grapefruit juice)			kg	p/unit or kg			P103	0	0
18	200941	Pineapple juice, unfermented, Brix value <= 20 at 20¬∞C, whether or not containing added sugar or other sweetening matter (excl. containing spirit)			kg	p/unit or kg			P103	0	0
		Pineapple juice, unfermented, Brix value > 20 at				p/unit or kg					

Continue

Cancel

Plastic Embedded POM Tool:

Filling in import and export data

Unit:

      prefilled unit ---Column E

      possible units ---Column G and I

Calculation at the background:

      conversion to tonne   HS code

      conversion to tonne   Plastic-KEY

Be aware of the different units of measurement

Change the unit in Column E when necessary

Success

Data has been stored

Cancel   OK

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Plastic Embedded POM Tool:

Filling in production data

Plastic Embedded POM Tool:

Input of production data according to CPC Codes for the year 2022

Continue

Cancel

	Code No.	Description	DOMESTIC PRODUCTION	UNIT	Possible Units		CONVERTED UNITS (t) Domestic production
7	36490	Other articles for the conveyance or packing of goods, of plastics; stoppers, lids, caps and other closures, of plastics		p/unit	p/unit	or kg	0
8	36410	Sacks and bags, of plastics		kg	p/unit	or kg	0
9	21321	Tomato juice		kg	p/unit	or kg	0
10	21329	Other vegetable juices		kg	p/unit	or kg	0
11	21431	Orange juice		kg	p/unit	or kg	0
12	21432	Grapefruit juice		kg	p/unit	or kg	0
13	21433	Pineapple juice		kg	p/unit	or kg	0
14	21434	Grape juice		kg	p/unit	or kg	0
15	21435	Apple juice		kg	p/unit	or kg	0
16	21439	Other fruit juices, n.e.c.		kg	p/unit	or kg	0
17	17300	Steam and hot water		kg	p/unit	or kg	0
18	24410	Bottled waters, not sweetened or flavoured		l	l	or kg	0
19	24490	Other non-alcoholic caloric beverages		l	l	or kg	0
20	49511	Rail locomotives powered from an external source of		p/unit	p/unit	or kg	0
21	49512	Diesel-electric locomotives		kg	p/unit	or kg	0
22	49519	Other rail locomotives; locomotive tenders		p/unit	p/unit	or kg	0
23	49520	Self-propelled railway or tramway coaches, vans and trucks (except maintenance or service vehicles)		p/unit	p/unit	or kg	0
24	49531	Railway or tramway maintenance or service vehicles, whether or not self-propelled		p/unit	p/unit	or kg	0
25	49532	Railway or tramway passenger coaches, not self-propelled; luggage vans, post office coaches and other special-purpose railway or tramway coaches, not self-propelled (except		p/unit	p/unit	or kg	0
26	49533	Railway or tramway goods vans and wagons, not self-		p/unit	p/unit	or kg	0

Plastic Embedded POM Tool:

Filling in production data

Unit:

      prefilled unit ---Column D

      possible units ---Column F and H

Calculation at the background:

      conversion to tonne   CPC code

      conversion to tonne   **Plastic-KEY**

Be aware of the different units of measurement

Change the unit in Column D when necessary

CONVERTED UNITS (t)
Domestic production
1.55
5
0.1
0.1
0.1
0.1
0.1
#VALUE!
0.1
0.1

If it shows #VALUE! in Column J, please
1. assume an average weight (average weight per unit);
2. calculate accordingly: total weight=average weight * the amount of units (or liter or square meter, etc.);
3. fill in **the total weight (kg) in Column C** and **kg in Column D** for that code

Plastic Embedded POM Tool:

Calculation of POM

$$Plastic\ Embedded\ POM = f_{HS} * Import - f_{HS} * Export + f_{CPC} * Production$$

When there is no domestic production:

$$Plastic\ Embedded\ POM = f_{HS} * Import - f_{HS} * Export$$

Plastic Embedded POM Tool:

Results

Plastic Embedded POM Calculation Tool:

- **"POM_to_Tool" sheet:** POM calculation results of plastic embedded in products. The sheet should be copied and pasted directly to "POM" sheet in Plastic Waste Generated Tool.

- "POM_by sector by polymer" sheet: Plastic embedded POM by polymer in different economic sectors.

Plastic Waste Generated Tool

Name of the sheet	Description
FrontPage	User interface
Indicators	A table displaying a summary of the quantities for each indicator (POM and Plastic waste generated).
POM	A table is used to insert a country's plastic POM, copied from "POM_to_Tool" from Plastic Embedded POM Calculation Tool
POM_Plastic_Sector	Plastic Embedded POM by polymer type
WG_Plastic_Sector	Plastic waste generated by polymer type
GraphPOM_Plastic_Sector	A graph illustrating plastic POM for a specific country per market sector
GraphPOM_type_of_plastic	A graph illustrating the POM for a specific country by polymer type
Graph_WG_Plastic_Sector	A graph illustrating plastic waste generation for a specific country per market sector
Graph_WG_type_of_plastic	A graph illustrating the plastic waste generated for a specific country by polymer type
The following sheets are hidden, it can be made visible by clicking on the "show sheets" button.	
Plastic Waste Generated	Calculation results of plastic waste generated per PlasticKEY
GraphLifespan	Graph illustrating the lifetime of the PlasticKEY groups
mean	Mean parameter used in the Gauss distribution for the calculation of a country plastic waste generated (per plastic key) (Do not modify)
std dev	Standard deviation parameters are used in the Gauss distribution for the calculation of a country plastic waste generated (per plastic key) (Do not modify)
Gauss	Gauss distribution for the calculation (Do not modify)
POM_copy	Copy of the original POM data in the POM sheet (Do not modify)
Mean_copy	Copy of the original Mean parameters included in the Mean sheet (Do not modify)
std dev_copy	Copy of the original Standard deviation parameters included in the Std_dev sheetb(Do not modify)
conversion	Polymer composition of PlasticKEY groups (Do not modify)

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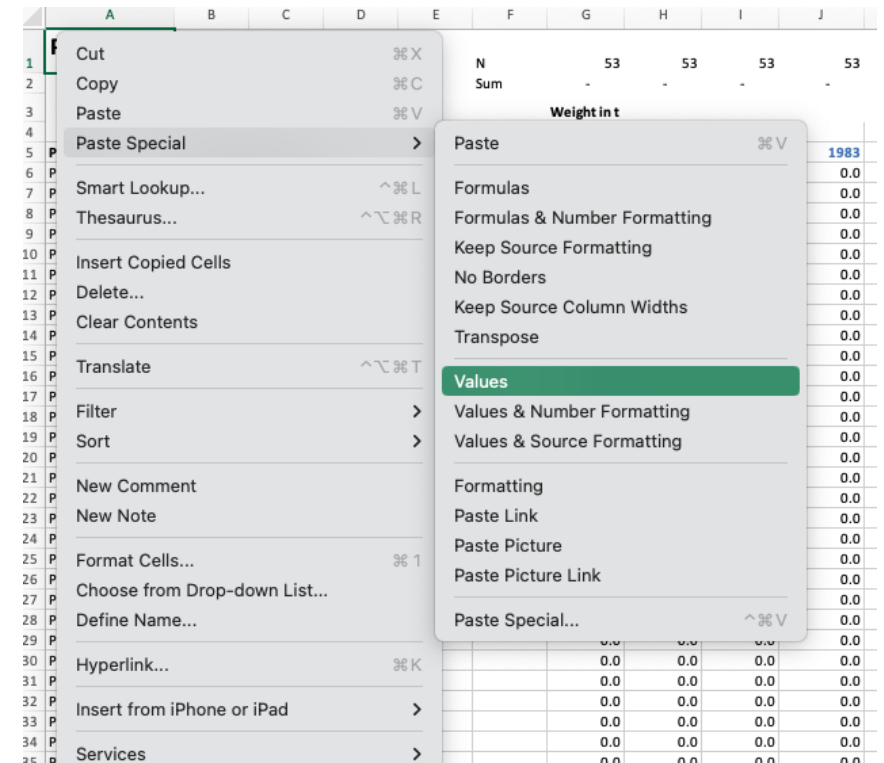
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Plastic Waste Generated Tool

Filling in the results from Plastic Embedded POM Tool

Copy **"POM_to_Tool" sheet** in Plastic Embedded POM Tool

Paste it to **"POM" sheet** in Plastic Waste Generated tool

Paste Special ----- Values

Plastic Waste Generated Tool

Plastic Waste Generated Tool

Results

$$Plastic\ Waste\ Generated\ (n) = \sum_{t=t_0}^{n} f * Apparent\ Consumption(t) * L^p\ (n - t)$$

As tables:

- "POM_Plastic_Sector " sheet
- " WG_Plastic_Sector" sheet

As figures:

- "GraphPOM_Plastic_Sector" sheet
- "GraphPOM_type_of_plastic" sheet
- "Graph_WG_Plastic_Sector" sheet
- "Graph_WG_type_of_plastic" sheet

Plastic Waste Generated Tool

2	3	Building and	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	4	Consumer &	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	5	Textiles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	6	Others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6																		
7	TOTAL		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

WG_Plastic_Sector | POM_Plastic_Sector | Sheet5 | Graph_WG_type_of_plastic | Graph_WG_Plastic_Sector | GraphPOM_type_of_plastic | GraphPOM_Plastic_Sector