

Evolution on organic waste treatment

Closing the Organic Loop in the organic waste treatment sector

A short review of the past three decades

Gödöllő, 12. October 2023

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Evolution on waste streams

World population	1990	2000	2010	2023	2050
	5,3 bn	6,1 bn	7,0 bn	8,1 bn	estim 9,7 bn
		2,0 bn t waste			estim 3,4 mrd tpy

Income Level Average MSW Generation (kg/cap/day):

Low-Income 0.6 – 1.0

Middle-Income 0.8 – 1.5

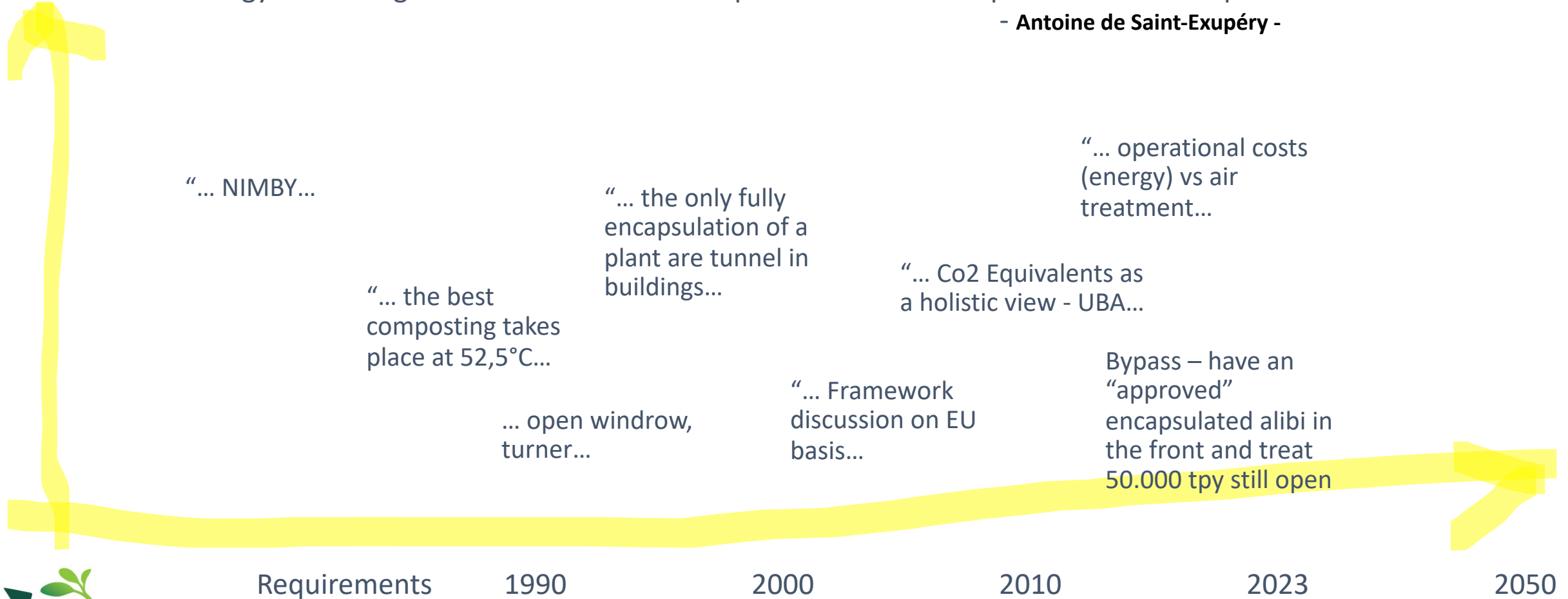
High-Income 1.1 – 4.5

- In 2020, 2.24 billion tons of solid waste were produced worldwide, which equates to a footprint of 0.79 kilograms per person per day. With rapid population growth and urbanization, annual waste generation is expected to increase by 73% to 3.88 billion tons by 2050 1.
- Every year we **dump a massive 2.12 billion tons** of waste. If all this waste was put on trucks they would go around the world **24 times** **40.000** km. This stunning amount of waste is partly because 99 percent of the stuff we buy is trashed within 6 months.” “
www.theworldcounts.com “

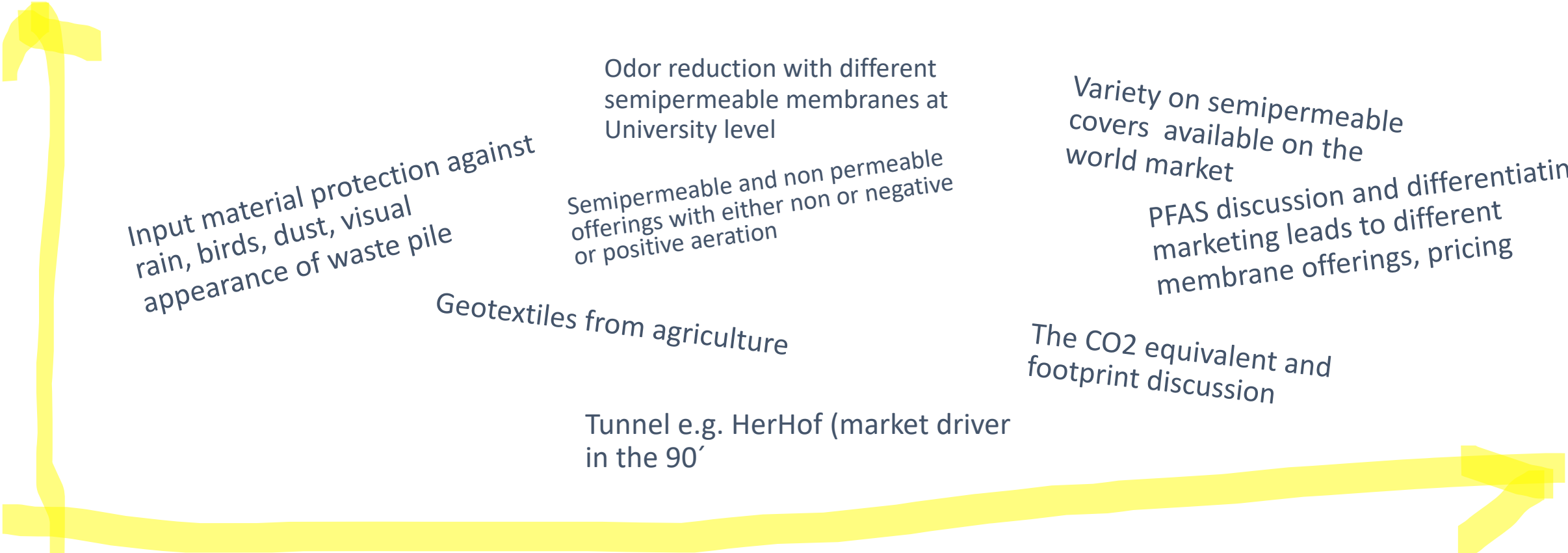
Evolution on waste treatment

“Technology is evolving more and more from the primitive to the complicated to the simple.”

- **Antoine de Saint-Exupéry** -



Evolution on covering the waste - encapsulation



Requirements 1990

2000

2010

2023

2050

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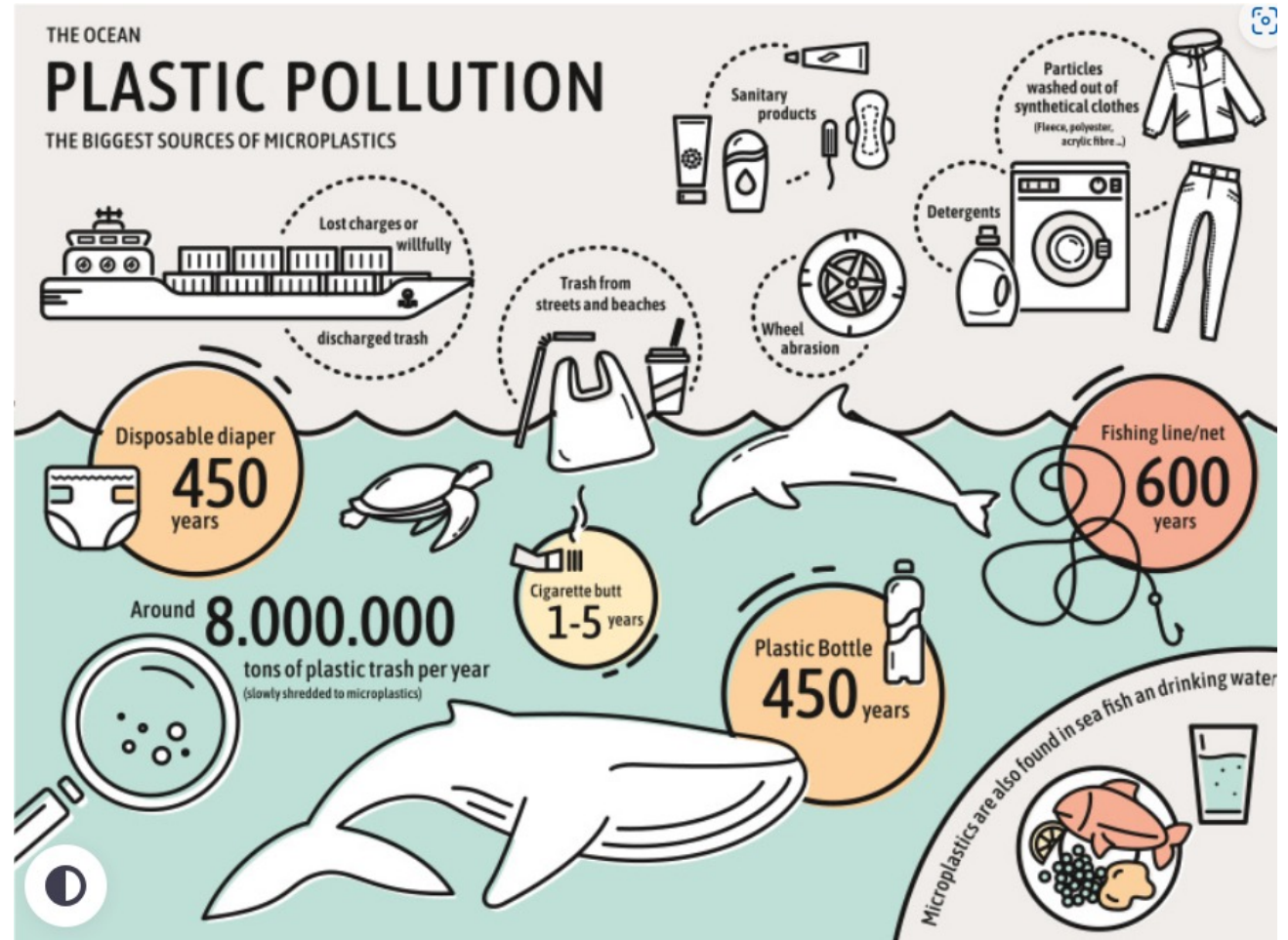
Evolution on waste “stream”

„...An initial estimate of the global input of plastic waste into the oceans has calculated an amount of 4.8 to 12.7 million tons per year. That's the equivalent of a truckload per minute.

Recent calculations, which include lakes, rivers and seas, assume an input of 19 to 23 million tonnes into these ecosystems...”

Source: www.wwf.de

... that is up to 4-5 truckloads per minute...!



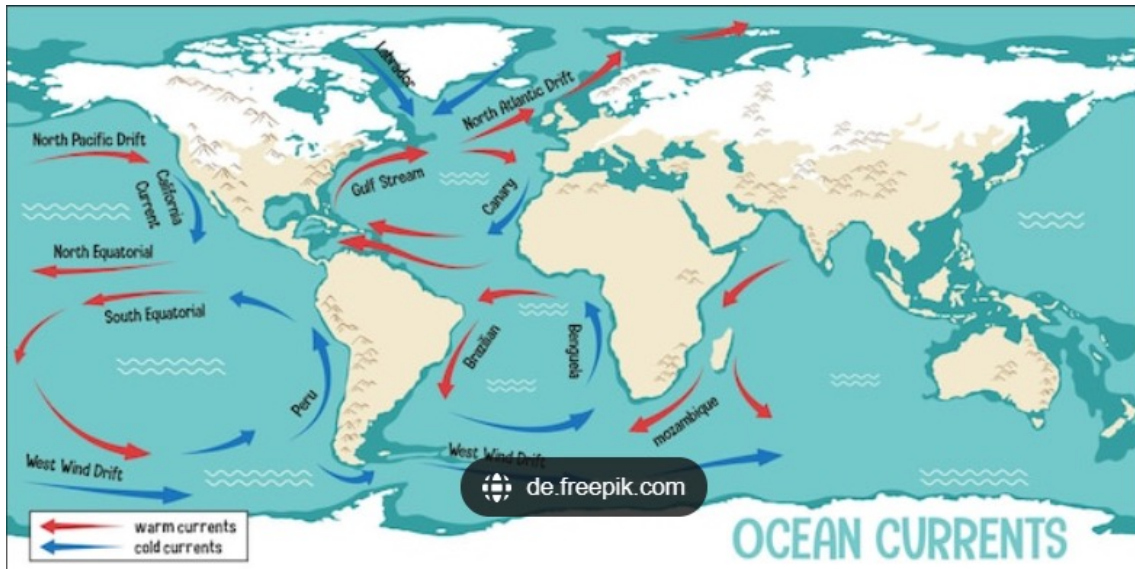
Source: Plastic Pollution & Microplastics by Stefanie Bendfeldt on Dribbble

Evolution on waste streams

Without organized MSW collection...



Jakarta's main river, (Plastic Disclosure Project photo)



De.freepick.com



(simple-green-living.com) whale span coast 2018 netzfrauen.com

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Evolution – get the waste into the loop



Evolution on landfilling

**Odour,
CH₄**

Intergenerational
problem for
the next 300+
years?

LEACHATE



Recycling WTE?

Source: ProfiKomp

Evolution – get the waste into the loop



Evolution – Landfilling alternatives



Evolution on MSW landfill criterias



AT₄ measurement

Target: for example <math><10 \text{ mg O}_2/\text{g d.m.}</math>

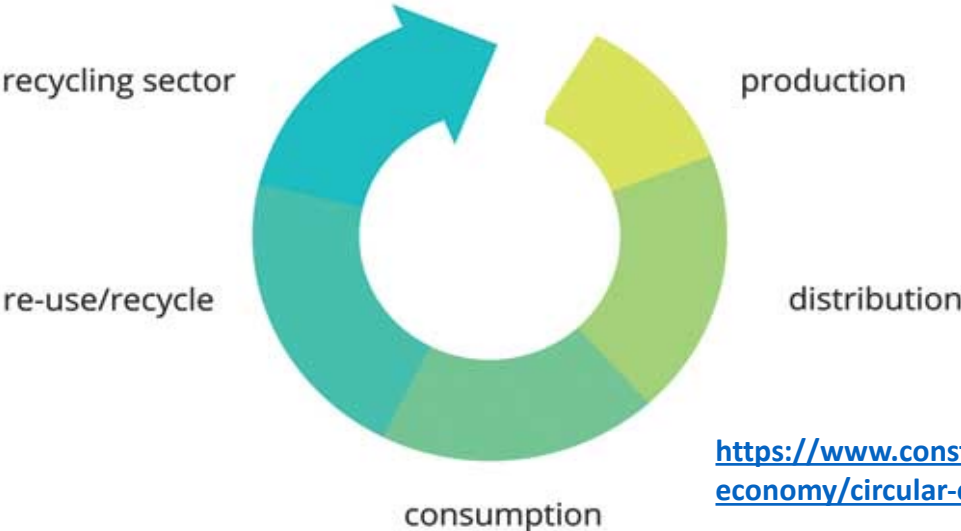
AUT 7, GER 5, POL 10, SLO 10, ISR 10...

Path from Linear to Circular Economy

LINEAR ECONOMY



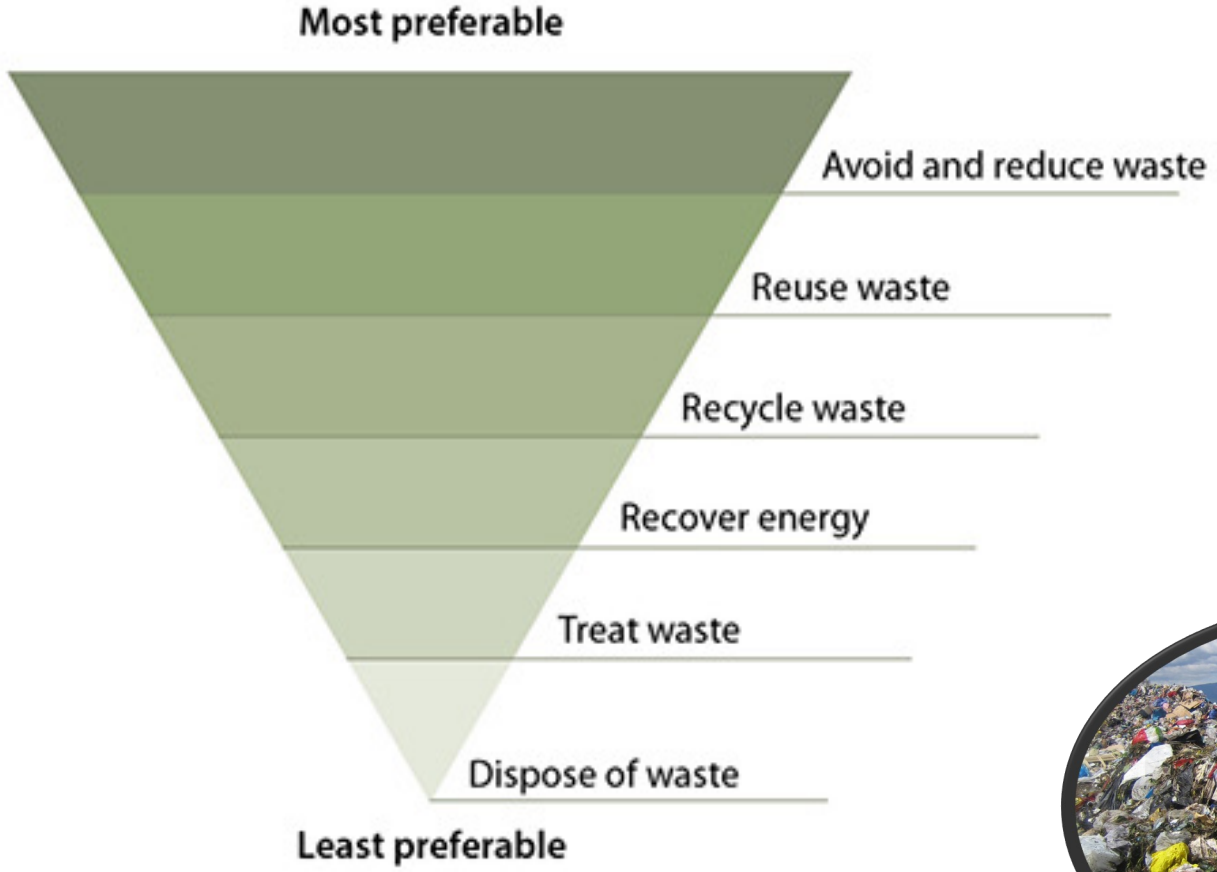
CIRCULAR ECONOMY



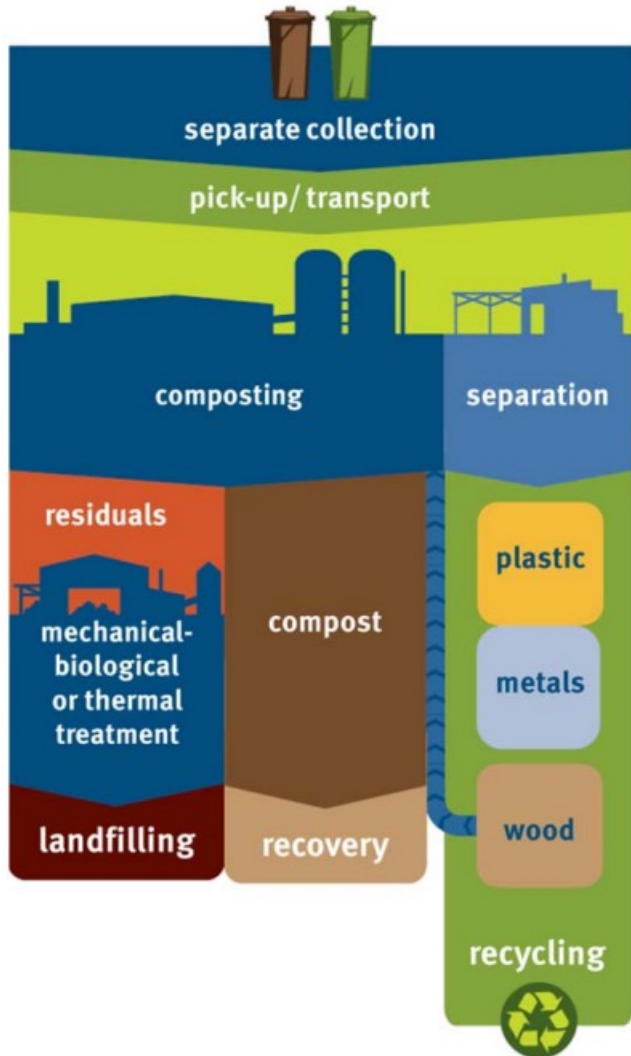
https://www.constructionspecifier.com/the-circular-economy/circular-economy_graphic/



Evolution on composting



Evolution on source separation for composting



Installations and applications for biowaste composting exist everywhere in the world. Germany counted 915 composting plants in the year 2010. The arrangements used by these plants for the main rotting phase was of the following division:

Table 5: Methods resp. technical arrangements used for rotting and at the composting plants in Germany (Data source: UBA: Handbuch Bioabfallbehandlung)

Container/Box	Tunnel	Trapezoid windrow	Triangular windrow	Semipermeable cover	Other forms
13 %	9 %	40 %	26 %	4 %	8 %

Source: Best Practice Municipal Waste Management (umweltbundesamt.de) 2015

Evolution on source separation for composting

- Open composting, w/o aeration, turner, windrow, trapezoid
- ASP w/o covers from geotextiles to compost layers in some countries to membranes to pvc covers...
- Tunnel and any kind of building like structure (container, garage, bunker...) by definition closed or encapsulated
- Fermentation

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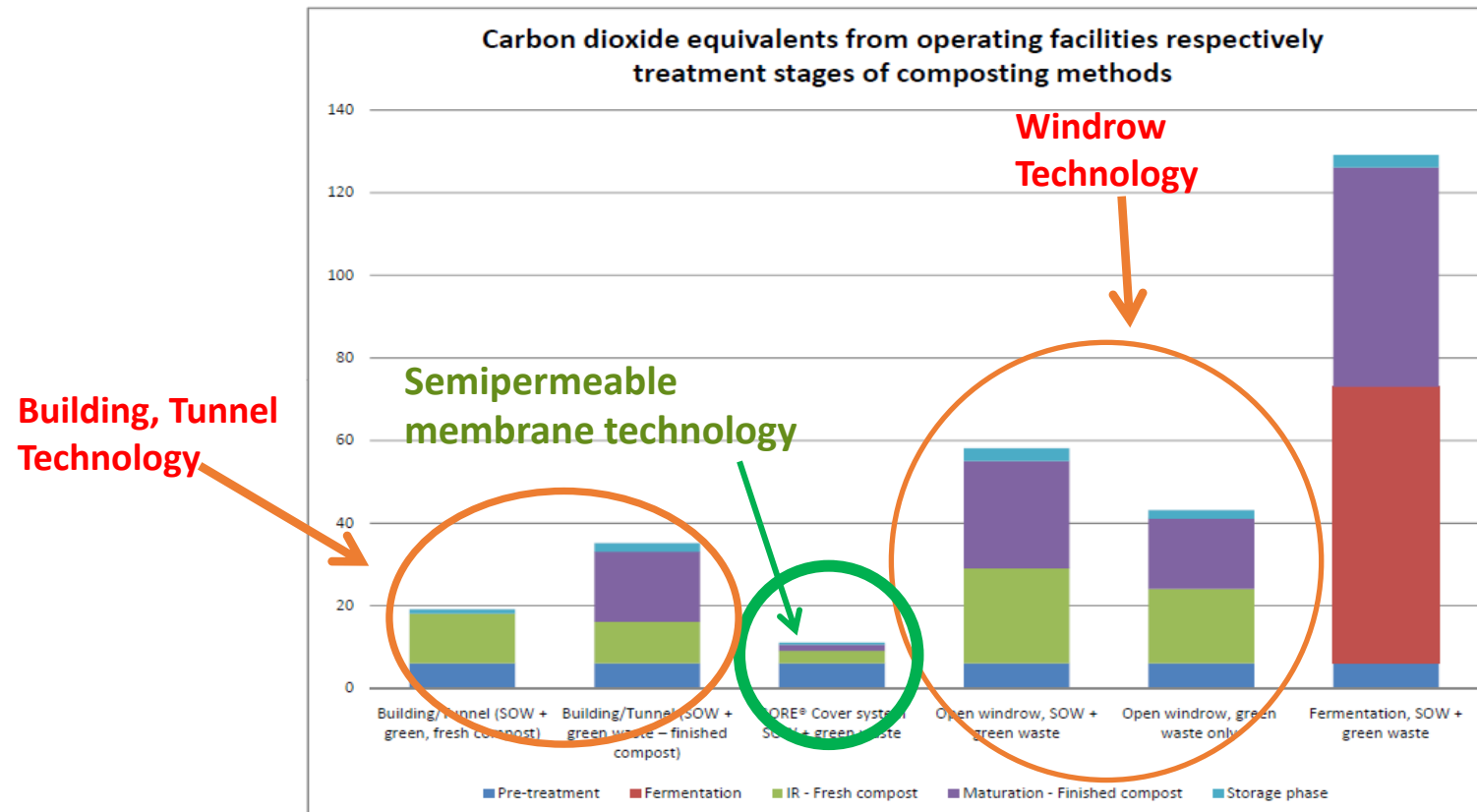
Thresholds – CO2 equivalent – established technologies

Tabelle 7-1: Emissionsfaktoren für den Behandlungsprozess bei der Verwertung von Bio- und Grünabfällen in Abhängigkeit von dem Verfahrenstyp

Verfahrenstyp:		KOA g (FrischK)	KOA g (FertigK)	KOA tg	KOA sM	KOA o (Bio+Grün)	KOA o (Grün)	VA	VA + NR g	VA + NR o
CH ₄ , g/Mg	Min	150	50	830	200	730	540	63	190	2.100
	Max	1.500	11.000	4.800	500	5.500	12.000	3.200	5.600	16.000
	Mittelwert	630	2.500	3.000	300	2.700	4.300	910	2.600	7.400
	Median	450	790	1.200	300	1.800	2.400	460	2.000	6.200
NH ₃ , g/Mg	Min	15	3	16	5	12	1	3	20	31
	Max	120	93	61	50	1.400	340	10.000	600	2.300
	Mittelwert	60	32	38	10	450	170	780	140	480
	Median	42	15	23	10	370	170	18	76	86
N ₂ O, g/Mg	Min	18	8	43	10	2	17	1	25	21
	Max	200	300	150	50	270	60	69	350	170
	Mittelwert	87	77	92	16	79	31	15	66	75
	Median	79	41	62	16	53	24	10	43	74

Summary: the more controlled, aerated, encapsulated the process, the higher beneficial small emission also on the post treatment emission factors - treatment time, energy consumption, space, quality...

Evolution on thresholds – CO2 equivalent – established technologies

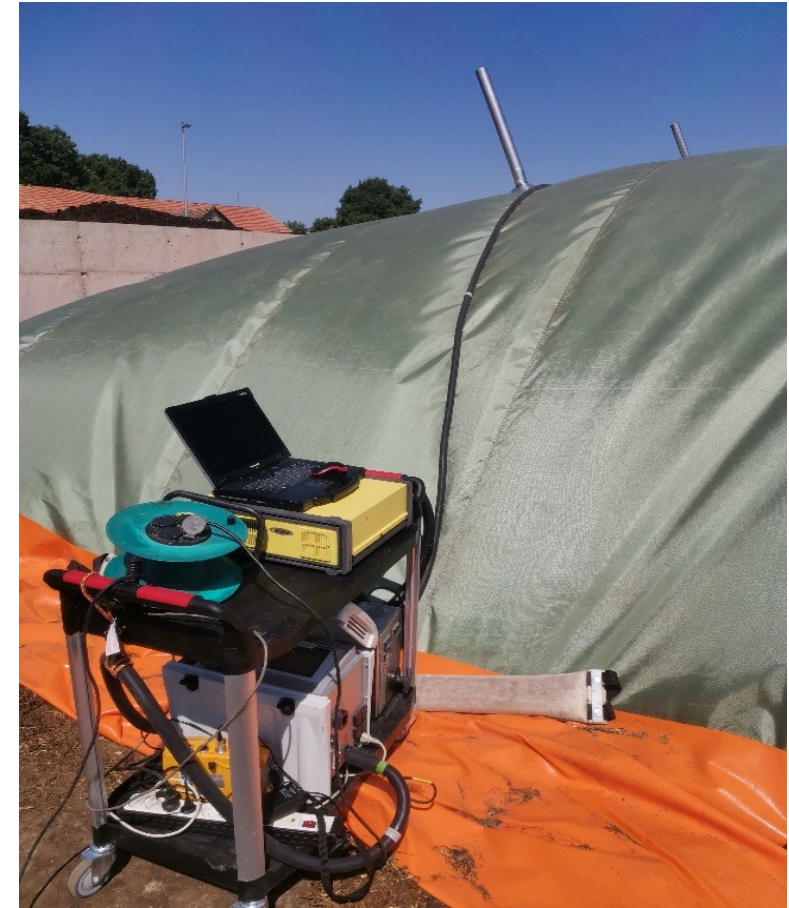


Summary:

47 kg Co2 equivalents per ton as the industrial average but
12 kg Co2/ton of input material with membrane technology



Evolution on thresholds – CO2 equivalent



[Source: ProfiKomp® Hungary](#)

Evolution on thresholds – CO2 equivalent

From the early 90'

to

ProfiCover® NH₃, VOC and Odor Reduction

Input material protection against rain, birds, dust, visual appearance of waste piles

- Geotextiles from agriculture
- Garage system HerHof (market driver in the 90')
- Semi permeable membrane
- The “fancy” footprint discussion
- Ptfе Membranes and alternatives that perform same

Measure state ¹	Ammonia, NH ₃ (ppm)	NMETVOC (mgC/m ³)	Odor OU/m ³ exhaust air
ProfiCover®	569.45	12.14	332.0
Uncovered, open	11,589.7	187.97	3866
= Performance or Reduction when covered with ProfiCover®	95.1 %	93.5 %	91.4%

Norms

ASTM D6348-3

EN 12619:2013

EN 13725

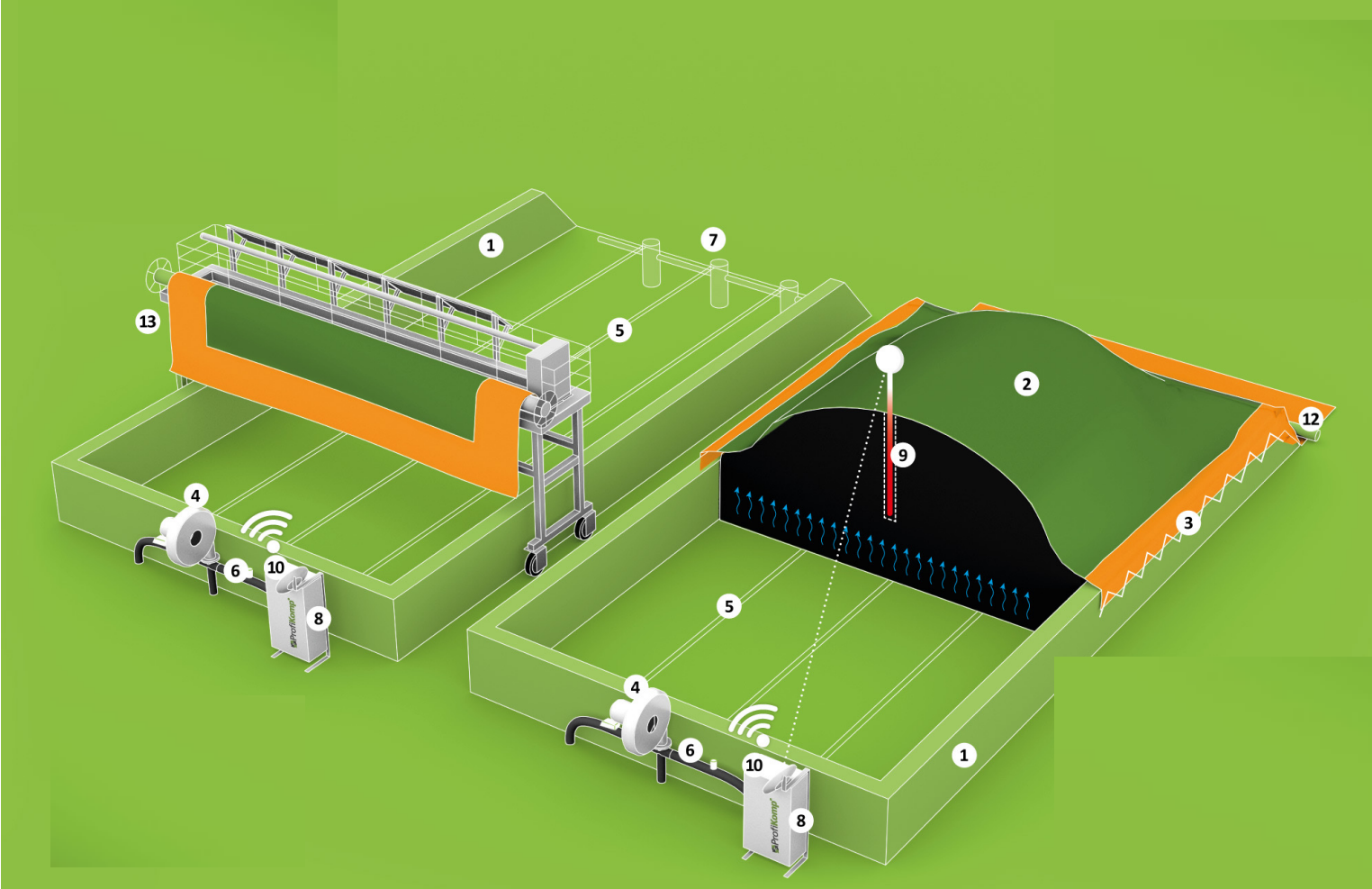
Evolution on covers



Evolution on composting – copy nature



Evolution on composting – copy nature



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[Biowaste Magazine - ProfiKomp \(wsg.hu\)](http://Biowaste Magazine - ProfiKomp (wsg.hu) 10.2023)

Organic process to CloseTheOrganicLoop



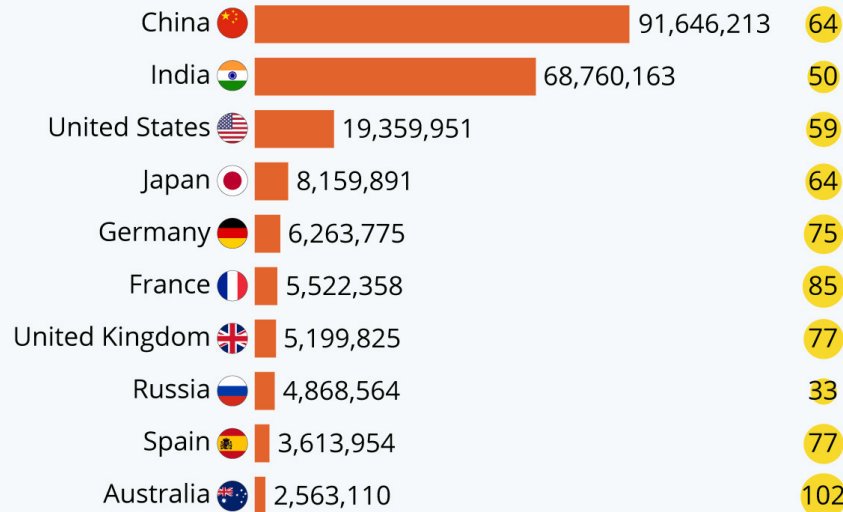
Organic process to CloseTheOrganicLoop

The Enormous Scale of Global Food Waste

Total annual household food waste produced in selected countries*



- Total food waste per year (tonnes)
- Estimated food waste per capita (kg)



* UNEP estimates with high or medium confidence
Source: UNEP Food Waste Index Report 2021

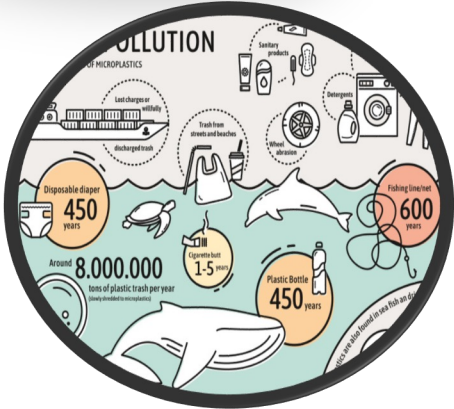


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- Antoine de Saint-Exupéry -



Evolution to CloseTheOrganicLoop



Evolution – non stop



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Nagyon köszönöm

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