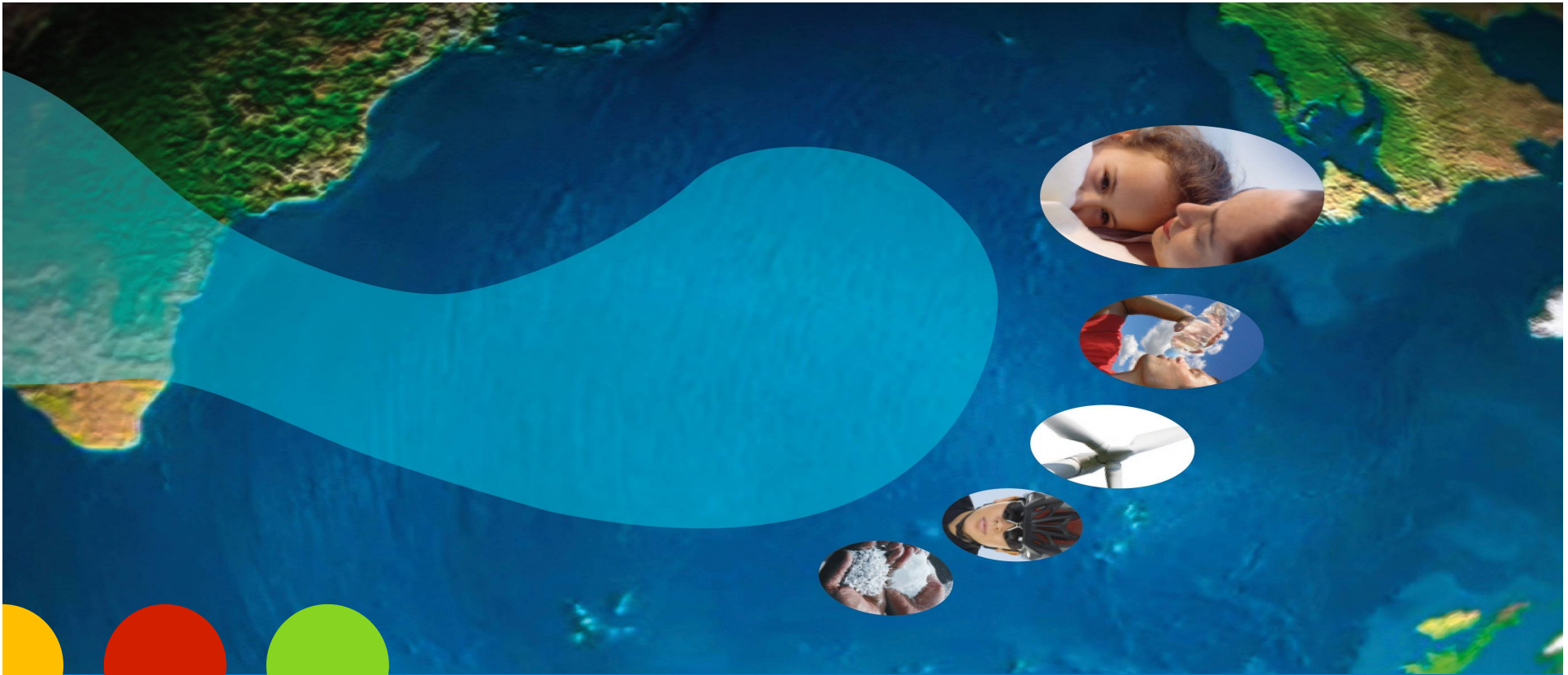


MORNING PROGRAMME

10:00-10:10	Welcome & introduction	Eric Bischof, Covestro, Chair of the ProScale consortium
10:10-10:25	Reconciling risk Assessment & Life-cycle Assessment?	Guy Castelan, PlasticsEurope
10:25-10:55	The ProScale Method – an introduction	Tomas Rydberg, IVL
10:55-11.15	<i>Coffee break</i>	
11:15-11:45	Case Studies: ProScale results	Peter Saling, BASF Tomas Rydberg, IVL
11:45-12:00	Added Value of ProScale relative to PEF, EPD, LCA	Quentin de Hults, BASF
12:00-12:30	Questions & Answers	
12:30-13:30	<i>Lunch</i>	





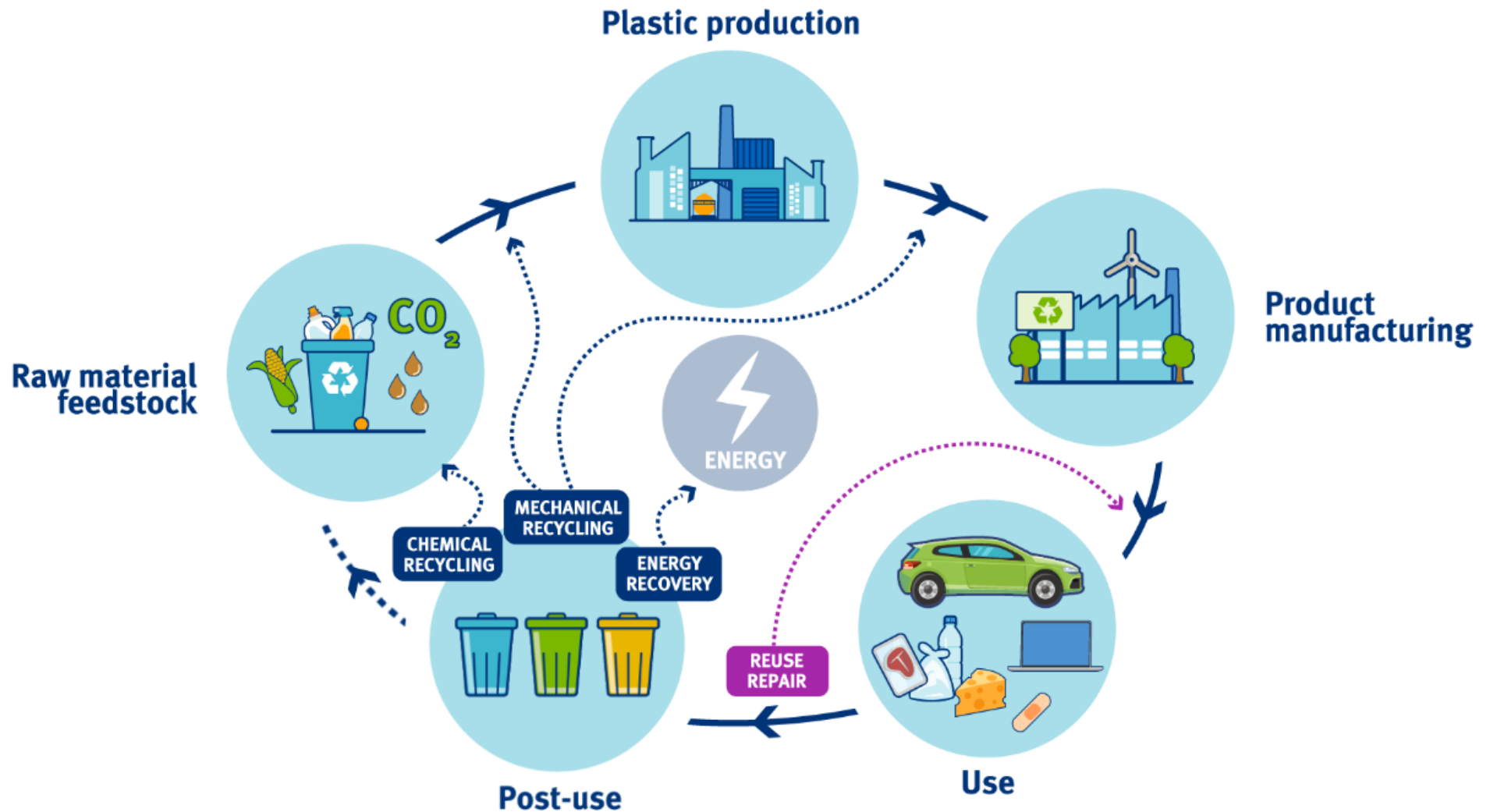
Reconciling RA and LCA

Proscale Conference, Brussels, 5 October 2017

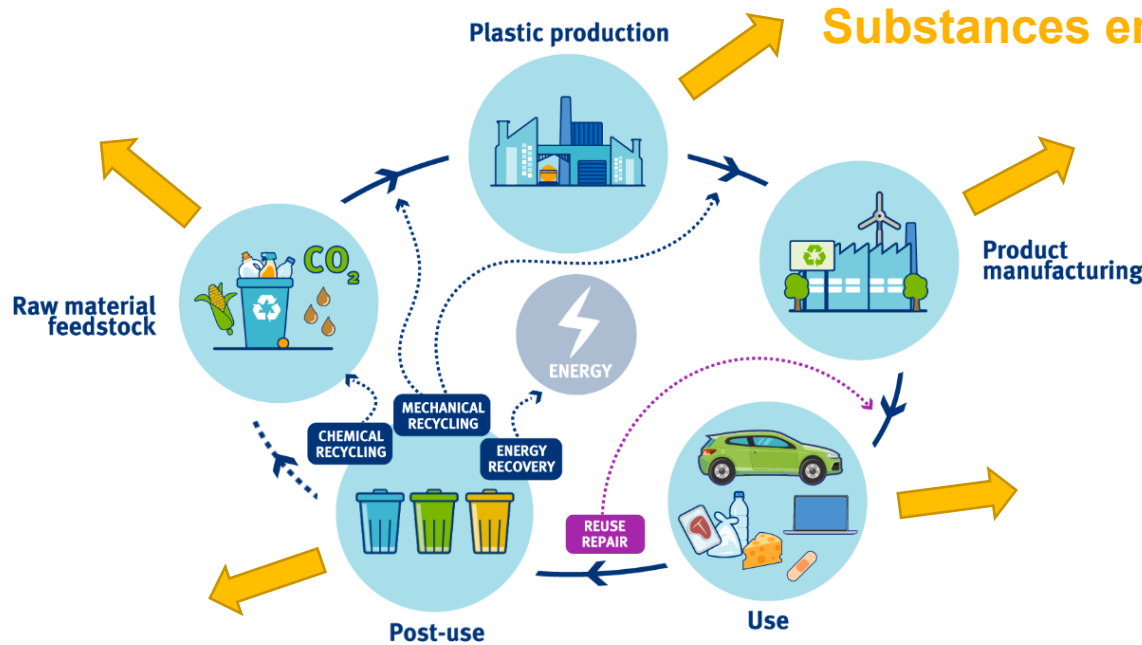
Guy Castelan

PlasticsEurope
Association of Plastics Manufacturers

Let's think life cycle...



The Life Cycle Inventory phase...



Substances emitted to the environment

..compiles the amount of all substances emitted to the Environment along the life cycle...

...per functional unit of the product

Most of emissions data come from databases

Result of LCI

Outputs				
Type Of Flow	Classification	Flow	Variable	Resulting amount
Product flow	Valuable substances / Materials / Plastics	Polystyrene granulate (PS)		1.0 kg (Mass)
Product flow	Deposited goods / Radioactive waste	Highly radioactive waste		8.25064E-7 kg (Mass)
Product flow	Deposited goods / Radioactive waste	Low radioactive wastes		1.02404E-5 kg (Mass)
Product flow	Deposited goods / Radioactive waste	Medium and low radioactive wastes		4.83542E-6 kg (Mass)
Product flow	Deposited goods / Radioactive waste	Radioactive tailings		5.34486E-4 kg (Mass)
Elementary flow	Emissions / Emissions to air / Emissions to air, unspecified	1,2,4-trimethylbenzene		4.77301E-17 kg (Mass)
Elementary flow	Emissions / Emissions to water / Emissions to fresh water	1,2-dibromoethane		1.97856E-17 kg (Mass)
Elementary flow	Emissions / Emissions to air / Emissions to air, unspecified	1,2-dichloroethane		2.88625E-16 kg (Mass)
Elementary flow	Emissions / Emissions to water / Emissions to fresh water	1,2-dichloroethane		4.48745E-16 kg (Mass)
Elementary flow	Emissions / Emissions to water / Emissions to fresh water	1,2-dichloropropane		3.81433E-16 kg (Mass)
Elementary flow	Emissions / Emissions to air / Emissions to air, unspecified	2,3,7,8-tetrachlorodibenzo-p-dioxin		1.36922E-14 kg (Mass)
Elementary flow	Emissions / Emissions to water / Emissions to fresh water	2,3,7,8-tetrachlorodibenzo-p-dioxin		9.81366E-19 kg (Mass)
Elementary flow	Emissions / Emissions to water / Emissions to sea water	acenaphthene		1.42149E-9 kg (Mass)
Elementary flow	Emissions / Emissions to water / Emissions to fresh water	acenaphthene		3.22467E-10 kg (Mass)
Elementary flow	Emissions / Emissions to water / Emissions to sea water	acenaphthylene		5.77856E-10 kg (Mass)
Elementary flow	Emissions / Emissions to water / Emissions to fresh water	acenaphthylene		1.31854E-10 kg (Mass)
Elementary flow	Emissions / Emissions to air / Emissions to air, unspecified	acetaldehyde		1.17488E-6 kg (Mass)
Elementary flow	Emissions / Emissions to air / Emissions to air, unspecified	acetic acid		5.37936E-6 kg (Mass)
Elementary flow	Emissions / Emissions to water / Emissions to fresh water	acetic acid		2.42956E-10 kg (Mass)
Elementary flow	Emissions / Emissions to water / Emissions to sea water	acetic acid		6.11925E-14 kg (Mass)
Elementary flow	Emissions / Emissions to air / Emissions to air, unspecified	acetone		1.17004E-6 kg (Mass)
Elementary flow	Emissions / Emissions to air / Emissions to air, unspecified	acid (as H+)		7.90355E-11 kg (Mass)
Elementary flow	Emissions / Emissions to water / Emissions to fresh water	acid (as H+)		3.86853E-9 kg (Mass)
Elementary flow	Emissions / Emissions to air / Emissions to air, unspecified	acrolein		5.61972E-10 kg (Mass)
Elementary flow	Emissions / Emissions to water / Emissions to fresh water	acrylonitrile		2.36071E-15 kg (Mass)
Elementary flow	Emissions / Emissions to water / Emissions to sea water	adsorbable organic halogen compounds		7.03021E-13 kg (Mass)
Elementary flow	Emissions / Emissions to water / Emissions to fresh water	adsorbable organic halogen compounds		9.85244E-7 kg (Mass)
Elementary flow	Emissions / Emissions to air / Emissions to air, unspecified	aluminium		1.49922E-10 kg (Mass)
Elementary flow	Emissions / Emissions to soil / Emissions to non-agricultural soil	aluminium		3.58767E-9 kg (Mass)
Elementary flow	Emissions / Emissions to water / Emissions to fresh water	aluminium		9.23084E-5 kg (Mass)

Life Cycle Analysis

Outputs				
Type Of Flow	Classification	Flow	Variable	Resulting amount
Product flow	Valuable substances / Materials / Plastics	Polystyrene granulate (PS)		1.0 kg (Mass)
Product flow	Deposited goods / Radioactive waste	Highly radioactive waste		8.25694E-7 kg (Mass)
Product flow	Deposited goods / Radioactive waste	Low radioactive waste		1.02404E-6 kg (Mass)
Product flow	Deposited goods / Radioactive waste	Medium and low radioactive wastes		4.83242E-6 kg (Mass)
Product flow	Deposited goods / Radioactive waste	Radioactive tailings		5.34489E-4 kg (Mass)
Elementary flow	Emissions / Emissions to air / Emissions to air, unspecified	1,2,4-trimethylbenzene		4.77301E-17 kg (Mass)
Elementary flow	Emissions / Emissions to water / Emissions to fresh water	1,2-dibromoethane		1.97856E-17 kg (Mass)
Elementary flow	Emissions / Emissions to air / Emissions to air, unspecified	1,2-dichloroethane		2.88625E-16 kg (Mass)
Elementary flow	Emissions / Emissions to water / Emissions to fresh water	1,2-dichloroethane		4.40745E-13 kg (Mass)
Elementary flow	Emissions / Emissions to water / Emissions to fresh water	1,2-dichloropropane		3.81433E-19 kg (Mass)
Elementary flow	Emissions / Emissions to air / Emissions to air, unspecified	2,3,7,8-tetrachlorodibenzop-dioxin		1.36525E-14 kg (Mass)
Elementary flow	Emissions / Emissions to water / Emissions to fresh water	2,3,7,8-tetrachlorodibenzop-dioxin		9.81305E-19 kg (Mass)
Elementary flow	Emissions / Emissions to water / Emissions to sea water	acenaphthene		1.40149E-6 kg (Mass)
Elementary flow	Emissions / Emissions to water / Emissions to fresh water	acenaphthene		3.22467E-10 kg (Mass)
Elementary flow	Emissions / Emissions to water / Emissions to sea water	acenaphthylene		5.77595E-10 kg (Mass)
Elementary flow	Emissions / Emissions to water / Emissions to fresh water	acenaphthylene		1.31654E-10 kg (Mass)
Elementary flow	Emissions / Emissions to air / Emissions to air, unspecified	acetaldehyde		1.17488E-6 kg (Mass)
Elementary flow	Emissions / Emissions to air / Emissions to air, unspecified	acetic acid		5.37939E-6 kg (Mass)
Elementary flow	Emissions / Emissions to water / Emissions to fresh water	acetic acid		2.42959E-10 kg (Mass)
Elementary flow	Emissions / Emissions to water / Emissions to sea water	acetic acid		6.11925E-14 kg (Mass)
Elementary flow	Emissions / Emissions to air / Emissions to air, unspecified	acetone		1.17004E-6 kg (Mass)
Elementary flow	Emissions / Emissions to air / Emissions to air, unspecified	acid (as H+)		7.90355E-11 kg (Mass)
Elementary flow	Emissions / Emissions to water / Emissions to fresh water	acid (as H+)		3.86683E-9 kg (Mass)
Elementary flow	Emissions / Emissions to air / Emissions to air, unspecified	acrolein		5.01972E-10 kg (Mass)
Elementary flow	Emissions / Emissions to water / Emissions to fresh water	acrylonitrile		2.39071E-15 kg (Mass)
Elementary flow	Emissions / Emissions to water / Emissions to sea water	adsorbable organic halogen compounds		7.03021E-13 kg (Mass)
Elementary flow	Emissions / Emissions to water / Emissions to fresh water	adsorbable organic halogen compounds		9.85244E-7 kg (Mass)
Elementary flow	Emissions / Emissions to air / Emissions to air, unspecified	aluminium		1.46622E-10 kg (Mass)
Elementary flow	Emissions / Emissions to soil / Emissions to non-agricultural soil	aluminium		3.5797E-9 kg (Mass)
Elementary flow	Emissions / Emissions to water / Emissions to fresh water	aluminium		9.23084E-5 kg (Mass)
Elementary flow	Emissions / Emissions to water / Emissions to sea water	aluminium		9.03221E-11 kg (Mass)
Elementary flow	Emissions / Emissions to water / Emissions to fresh water	americium-241		2.25533E-8 kBq (Radioactivity)
Elementary flow	Emissions / Emissions to air / Emissions to air, unspecified	ammonia		2.19774E-6 kg (Mass)
Elementary flow	Emissions / Emissions to soil / Emissions to non-agricultural soil	ammonia		7.27379E-8 kg (Mass)
Elementary flow	Emissions / Emissions to water / Emissions to sea water	ammonia		2.44725E-11 kg (Mass)
Elementary flow	Emissions / Emissions to water / Emissions to fresh water	ammonia		3.0563E-5 kg (Mass)
Elementary flow	Emissions / Emissions to air / Emissions to air, unspecified	ammonium		1.48784E-10 kg (Mass)
Elementary flow	Emissions / Emissions to water / Emissions to fresh water	ammonium		7.20484E-14 kg (Mass)

Tox and ecotox impact assessment model is applied on this whole list

USETOX

Sum

Amount of each substance emitted to air/water/soil

*

Environmental Fate Factor

*

Human Exposure Factor

*

Dose Response Factor

*

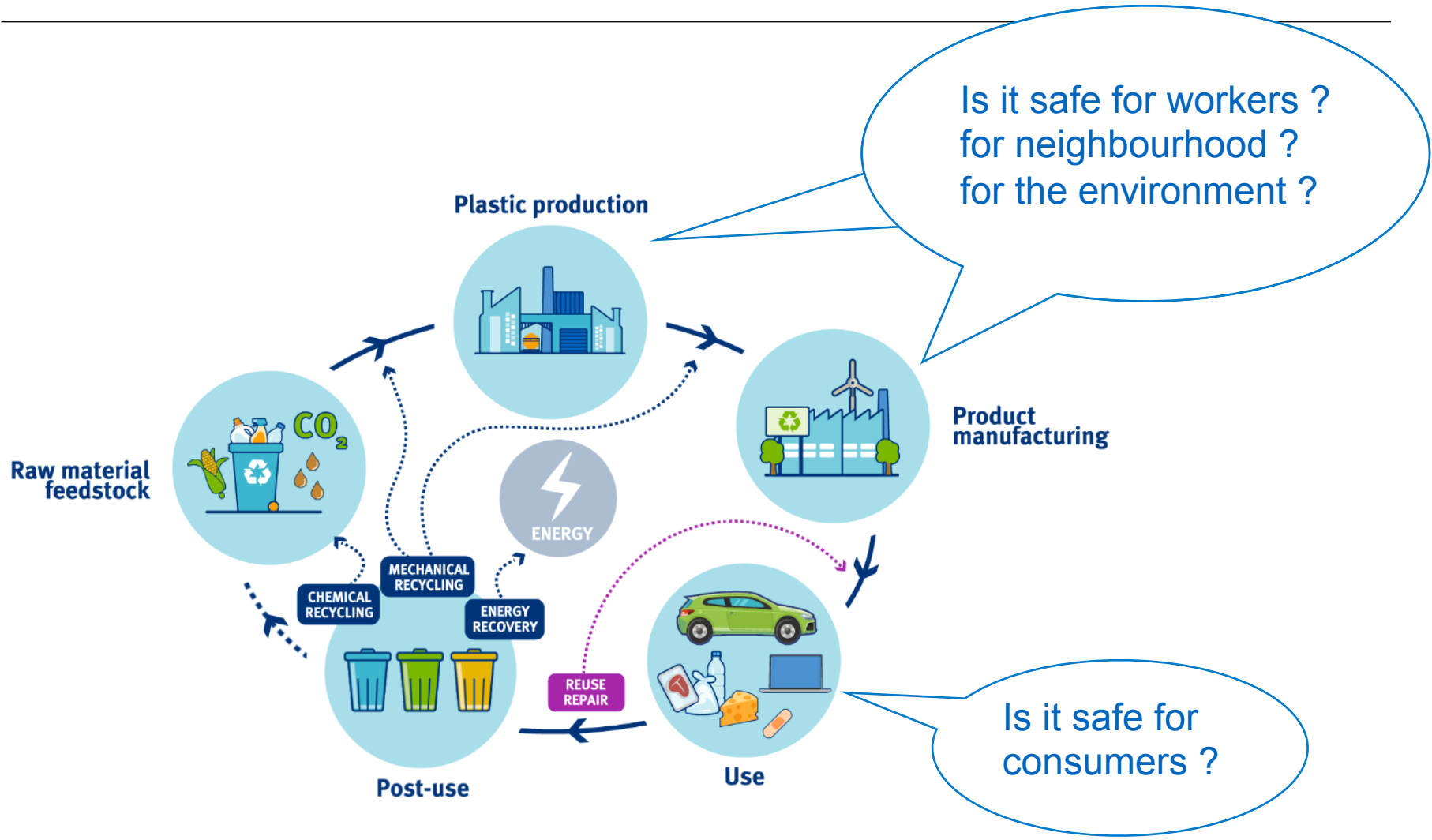
Human Health Severity Factor

- **It does not (want to) say if the product is safe**
 - It is potential emissions and impacts (most of data comes from generic database)
 - The inventory is built relative to the functional unit and does not say how much a worker, a user... is exposed to a substance and how much exposure is admissible

- Interesting to
 - Priorize substances in the result of inventory
 - Address Hot-Spot

- Is it mature for comparison of products ?
 - Interpret with prudence
 - Take care of artefacts from database

So how do we know about safety ?

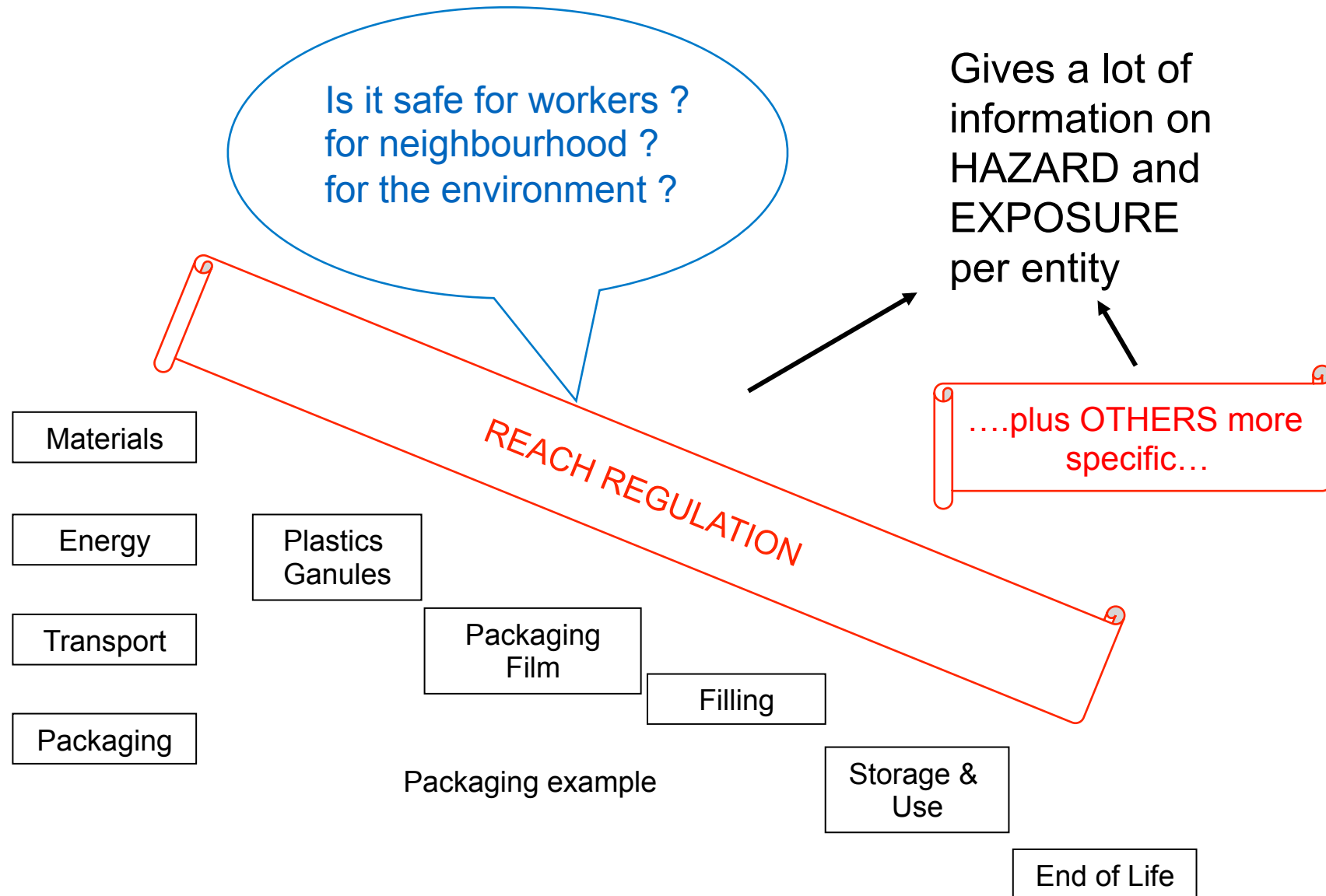


Answering these questions uses **Risk Assessment**

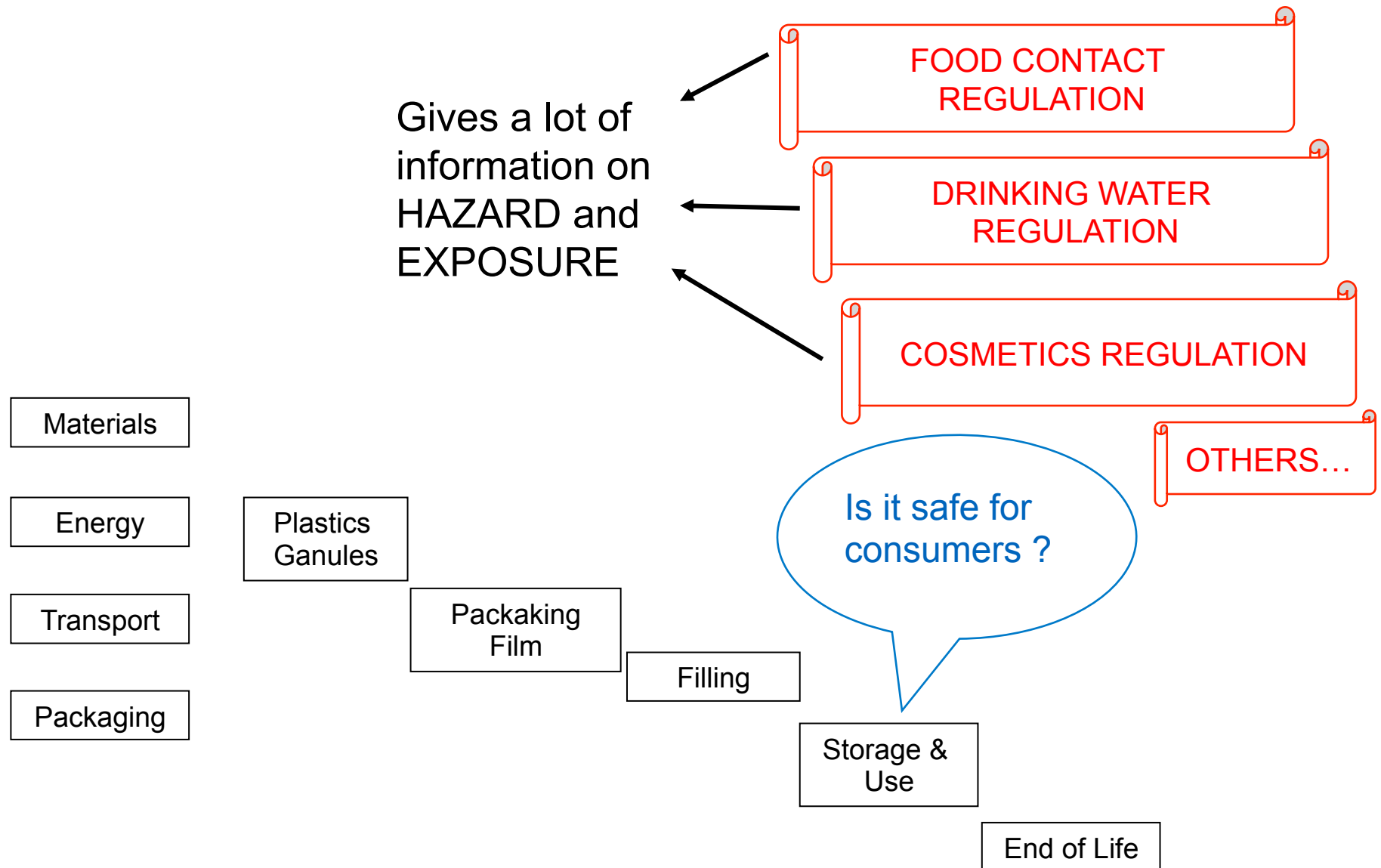
- Risk is a function of HAZARD and EXPOSURE to a substance
- HAZARD is an intrinsic property of a substance
- EXPOSURE to a substance is assessed from the perspective of the exposed category
 - Workers
 - Consumers
 - Environment...taking into account the context of application, protection measure, physico-chemical properties...
- For a given substance risk is characterised by comparing the estimated exposure to the maximum admitted exposure

- The way RA is done is framed by REGULATION
- The acceptable level of risk is given by REGULATION

EU Regulations along life cycles

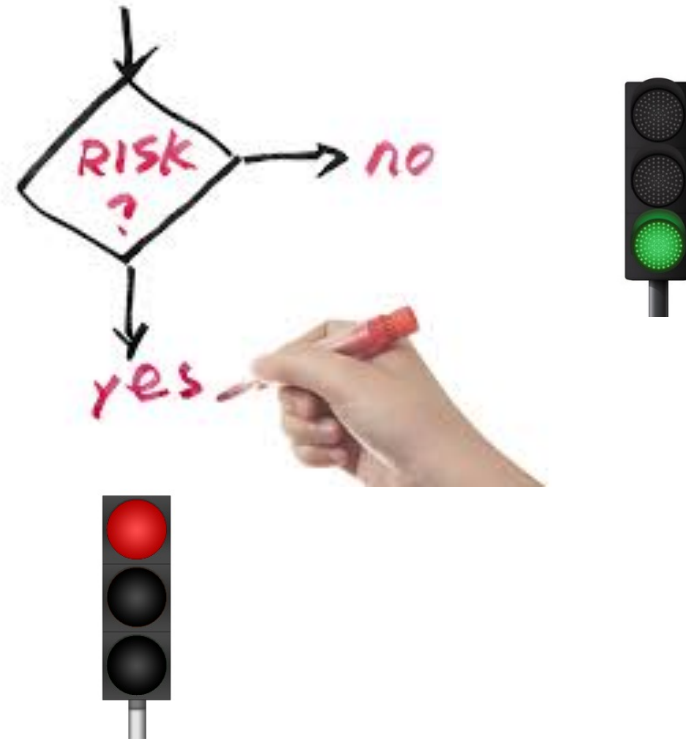


EU Regulations along life cycles



- RA is instructed

for a **PASS/FAIL...**



...but this knowledge could be exploited further

There is a demand to reduce hazard and exposure of products

- Along with the environmental performance where LCA is acknowledged
- Beyond compliance with regulation

➤ **Proscale uses the strength of each method**

- Life Cycle perspective of products
- Abundance of information on risk brought by REACH

to compare hazard and exposure along the life cycle of products

A chance to improve products basing on a risk metric