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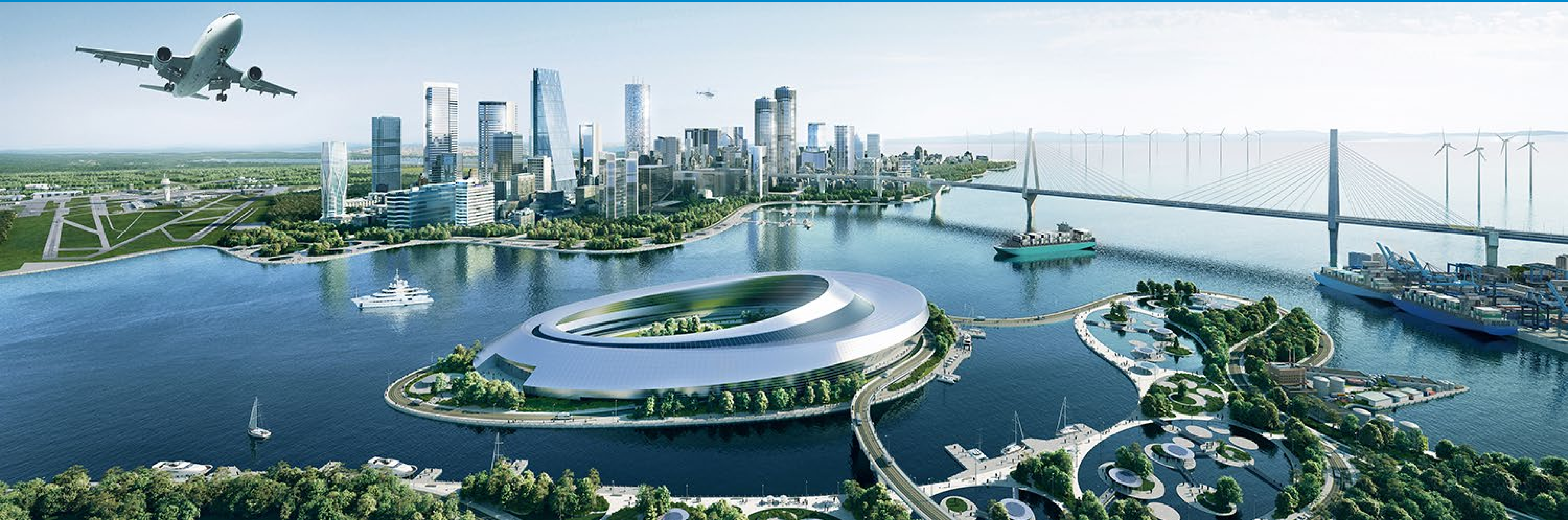

Material flows to identify and address exposure throughout the supply chain

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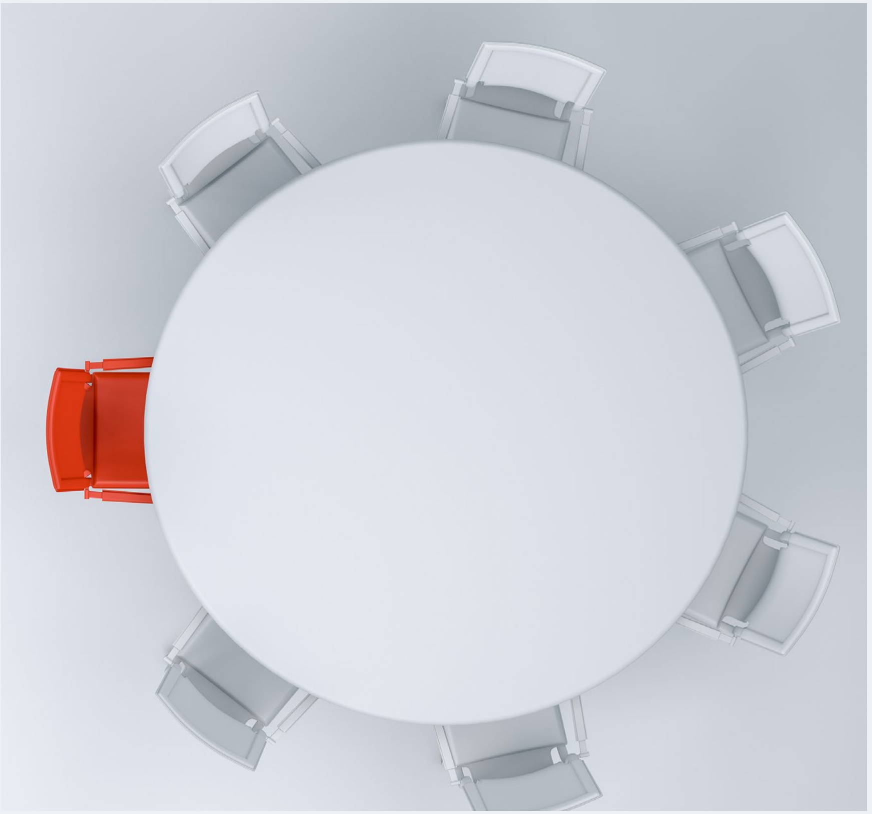
25 October 2023

Al Aluminium | Cu Copper | Ni Nickel | Pb Lead | Zn Zinc | Au Gold | Ag Silver | Pt Platinum | Sb Antimony | Be Beryllium | Si Silicon | Co Cobalt | Mo Molybdenum | V Vanadium | Sn Tin | Pd Palladium | Ru Ruthenium | Re Rhenium | Os Osmium | Ir Iridium | W Tungsten | Ta Tantalum | Ge Germanium | Se Selenium | Ga Gallium | Cr Chromium | Mg Magnesium | Li Lithium

Outline

1. Starting point…
2. Do we have ways forward?
3. Added value of MFAs for exposure assessment



Starting point

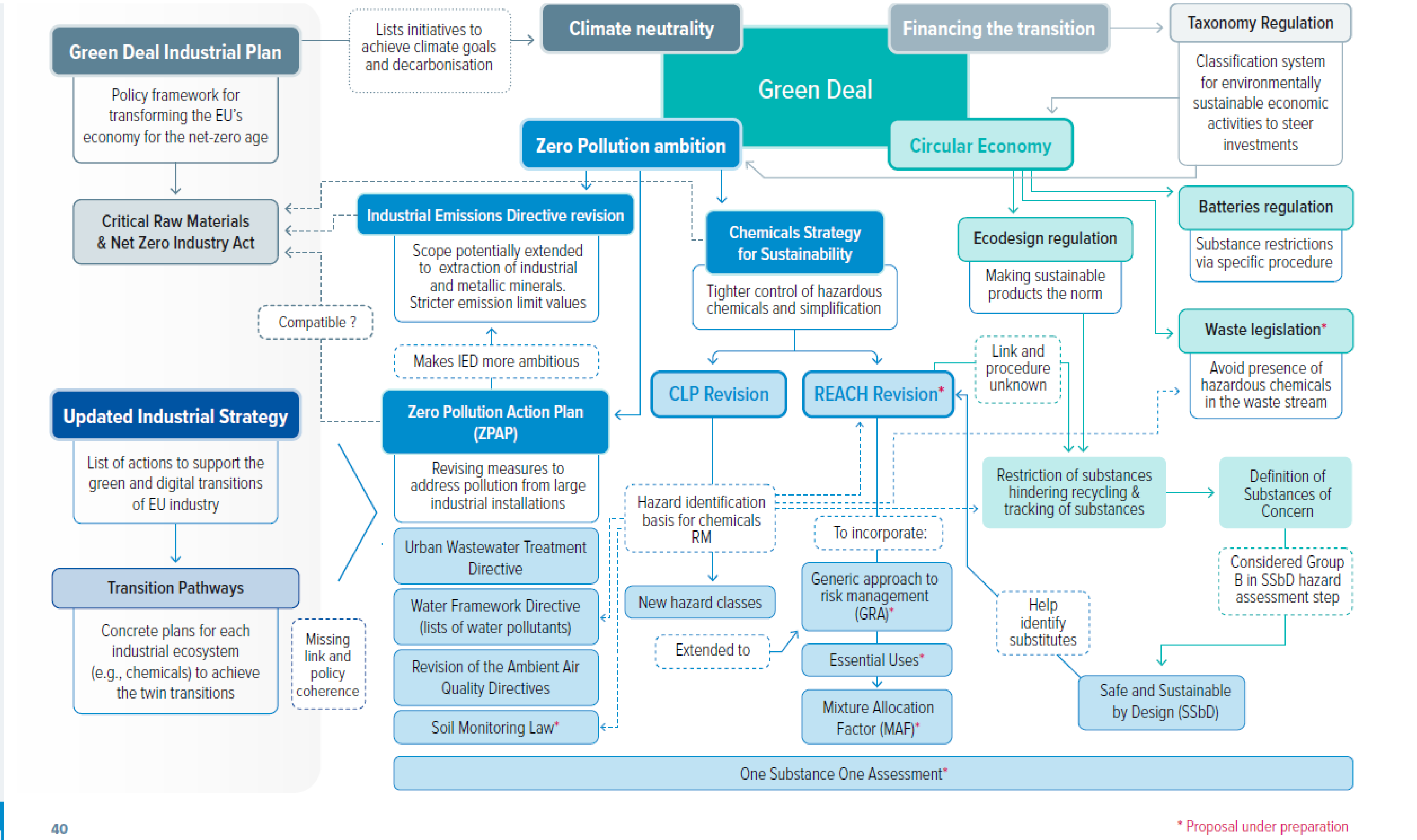
Risk assessment/management

- Starting from the equation…

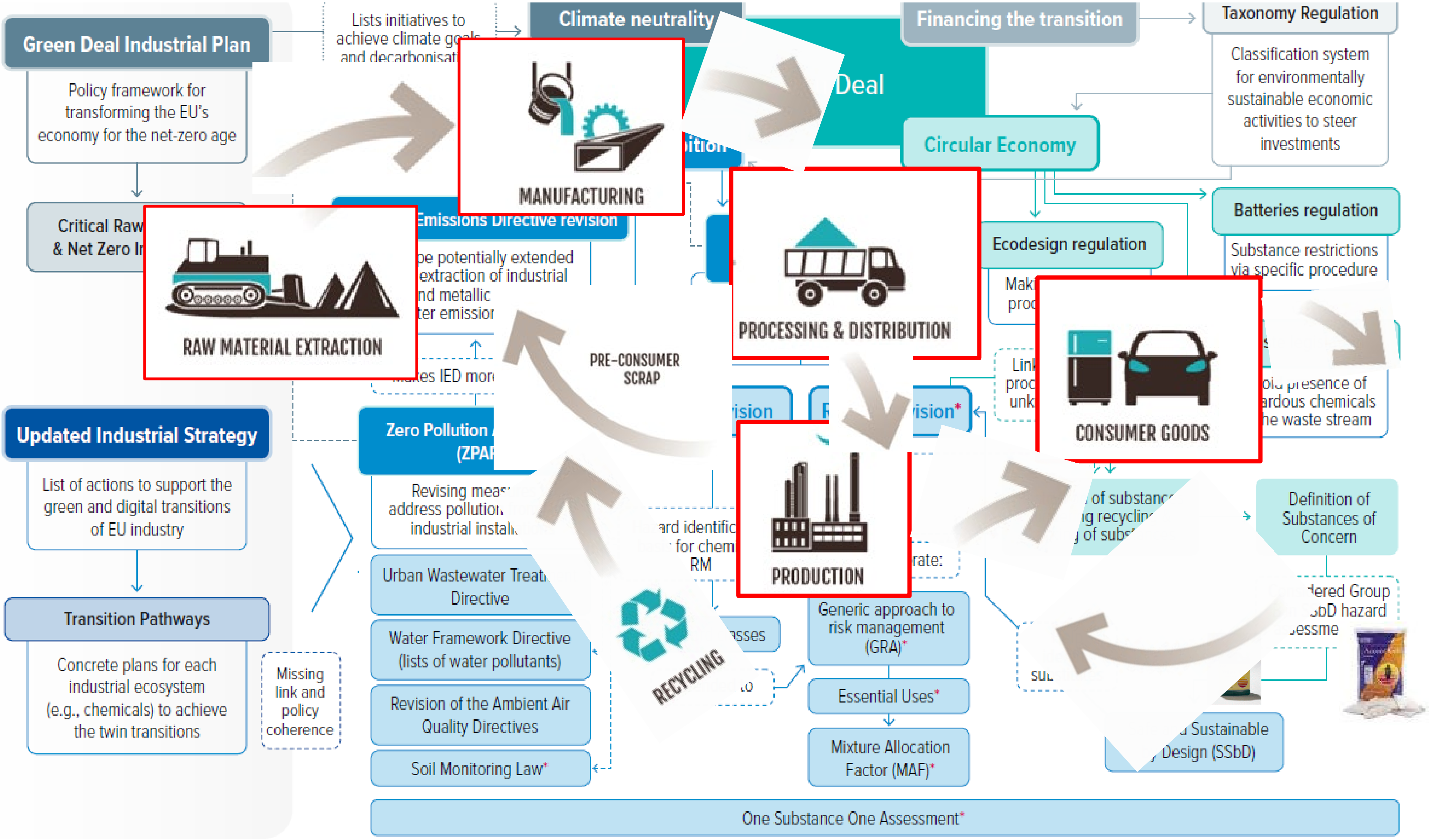
(Risk = hazard x exposure)

- By definition: **effective** risk management involves **identifying and evaluating chemical risks**, implementing appropriate measures to **control exposure**, and monitoring and reviewing the **effectiveness** of these actions
  - Conditions: good knowledge on hazard, **uses** and **exposure pattern**

Risk management in practice (1): who and how?



Risk management in practice (2): by substance (fate)



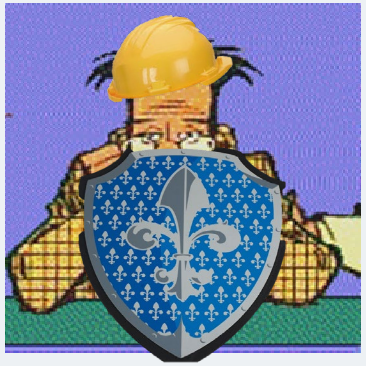
* Proposal under preparation

Risk management in practice (3): challenges and results

$$(\text{Risk}^{y} = \text{hazard}^{w} \times \text{exposure}^{x})^{z}$$

with w: number of substances, number of hazards
with x: unknown exposures
with y: perceptions of risks
with z: ways to regulate risks

Uncertainty



Tempting to focus on **hazard** of the **substance, more certain**

Most efficient risk management?

Can we refine this with data?

Possible ways forward and tools

Gathering of exposure information as part of REACH risk assessments (1)

- Sound use description entails
  - only relevant descriptors
  - grouping and splitting of ES considering similarity of exposure settings (not only economic aspects)
- Hazard assessment defines the scope of the exposure assessment
  - structured approach under REACH
    - Hazard conclusion for each type of effect, exposure duration and exposure route
    - Risk characterisation (and thus exposure assessment) required for each hazard

  →hazard potential sets the required level of information

  →feedback loop: relevant exposure route (hazard vs. exposure potential)

  →leading to more awareness for dermal exposure (for systemic effects)

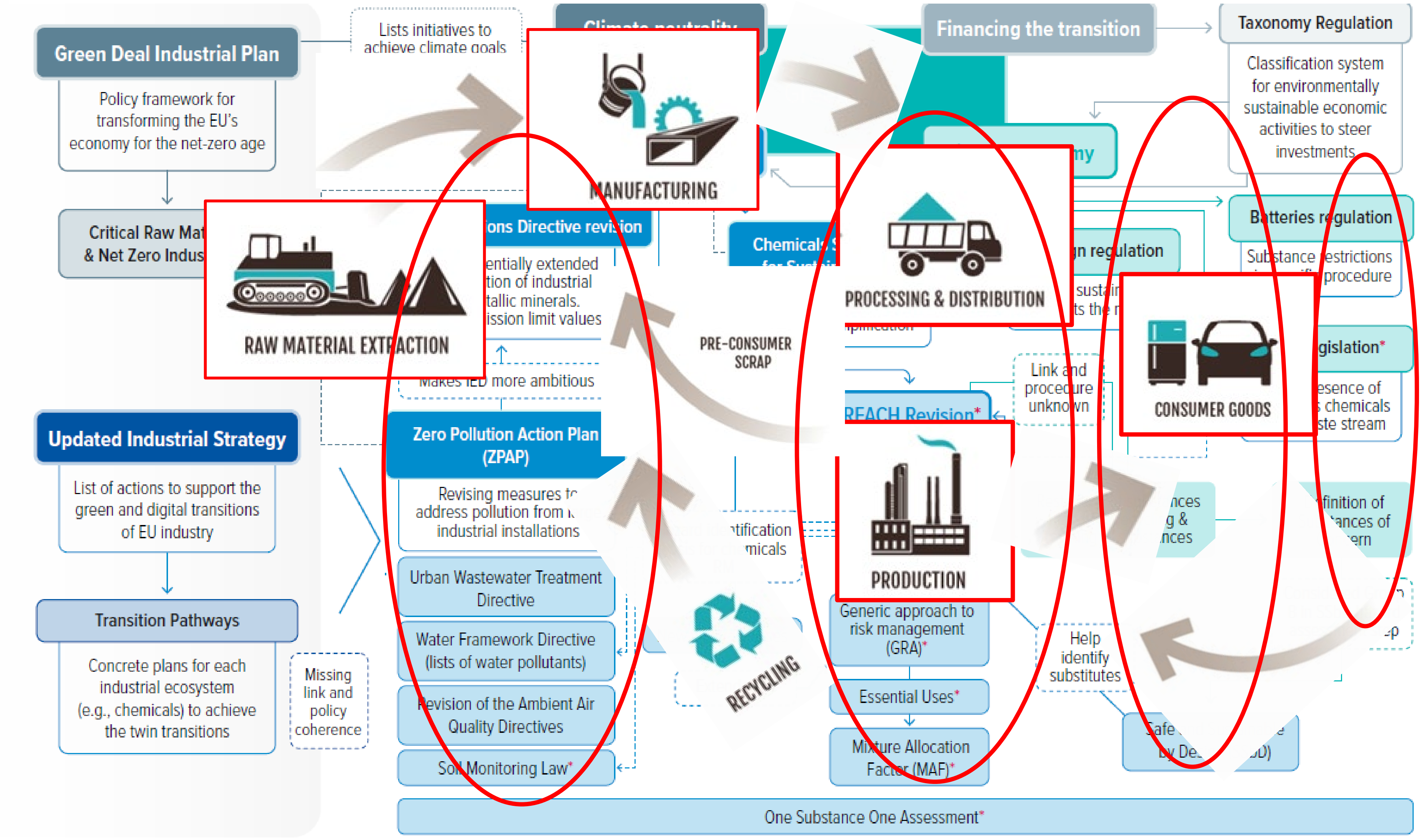
Gathering of exposure information as part of REACH risk assessments (2)

- Standard risk assessment under REACH
  - to cover the entire life cycle of the substance
  - to be described by “use descriptors”
  - top-down approach: (safe) conditions of use to be communicated down the supply chain
  - downstream users to comply or to communicate deviations from exposure scenario
- More collaborative approach possible
  - downstream user survey to obtain knowledge about
    - Conditions of use (processes/tasks, RMMs, exposure data?)
    - Substances handled in parallel (same metal compound) and associated tonnages
  - asking for information rather than imposing conditions of use via ES

Gathering of exposure information as part of REACH risk assessments (3)

- Pros
  - structured approach
  - extensive guidance available
  - needs to be done anyway
  - facilitates communication, discussion and understanding
- Cons
  - registration is/was already expensive → additional costs for surveys
  - regular updates required (as for any other exposure assessment…?)
  - confidential information requires trustee
  - compromise between specificity and generalisation (company-specific vs. sector-wide)

Materials flow to avoid silo-working



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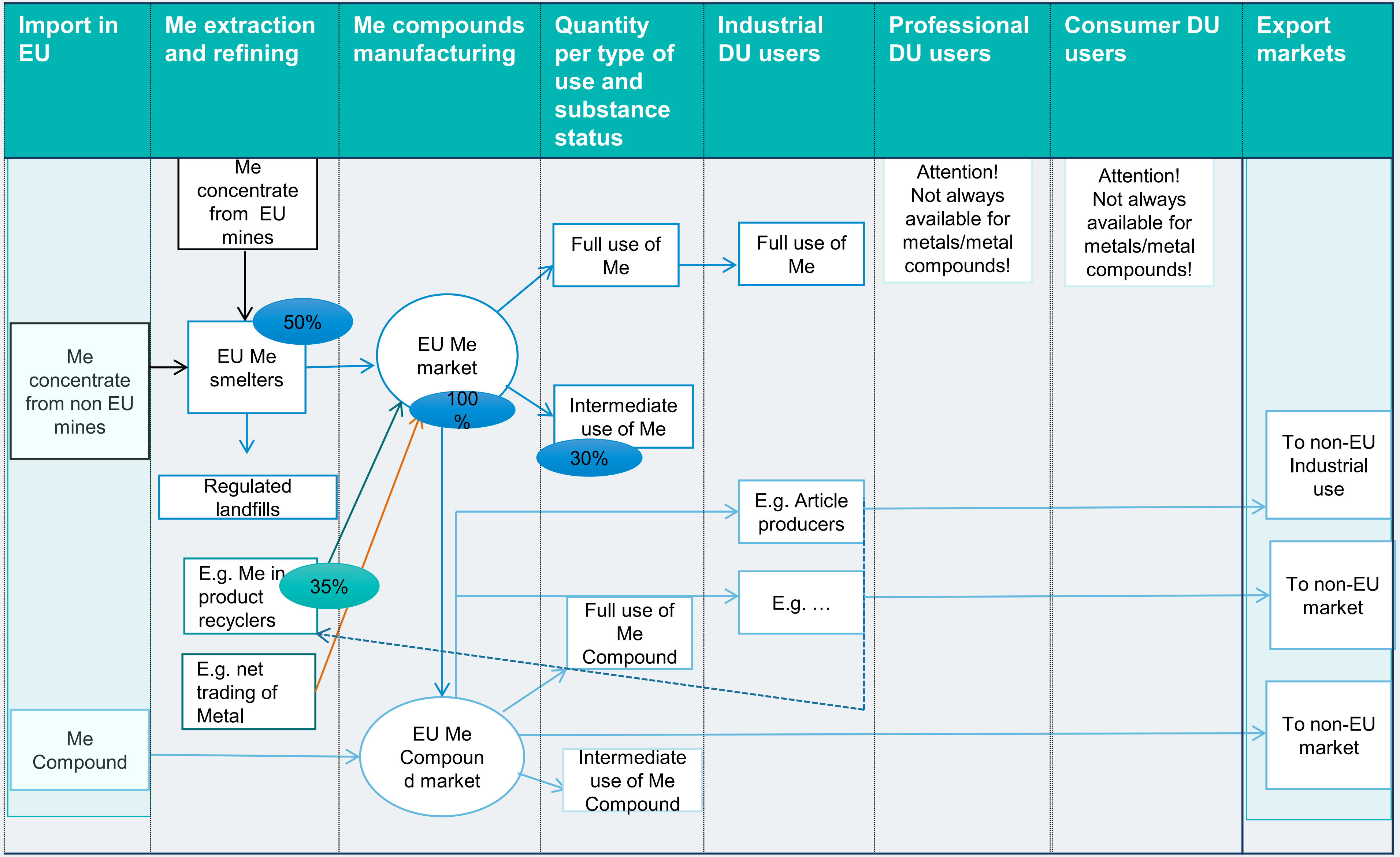
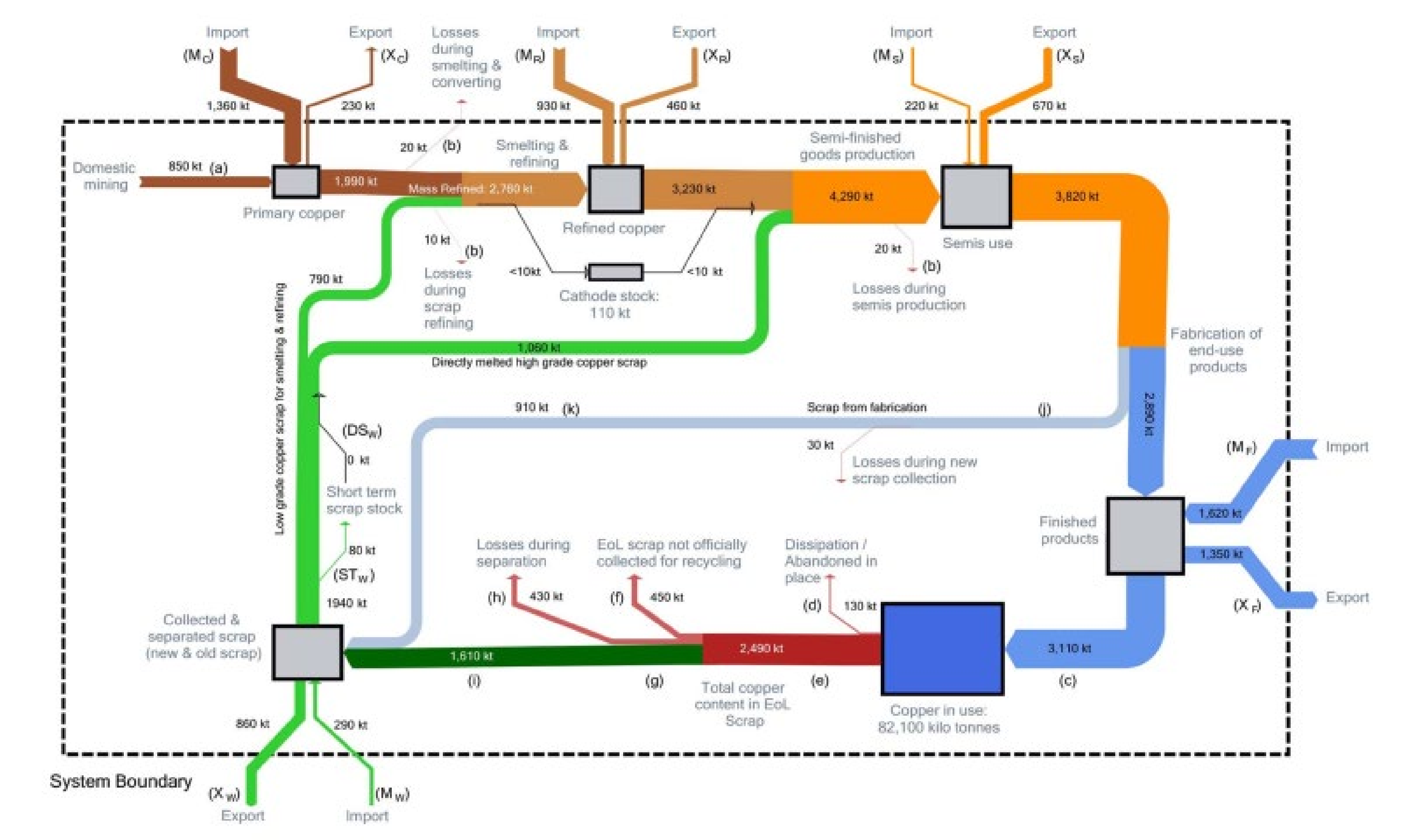
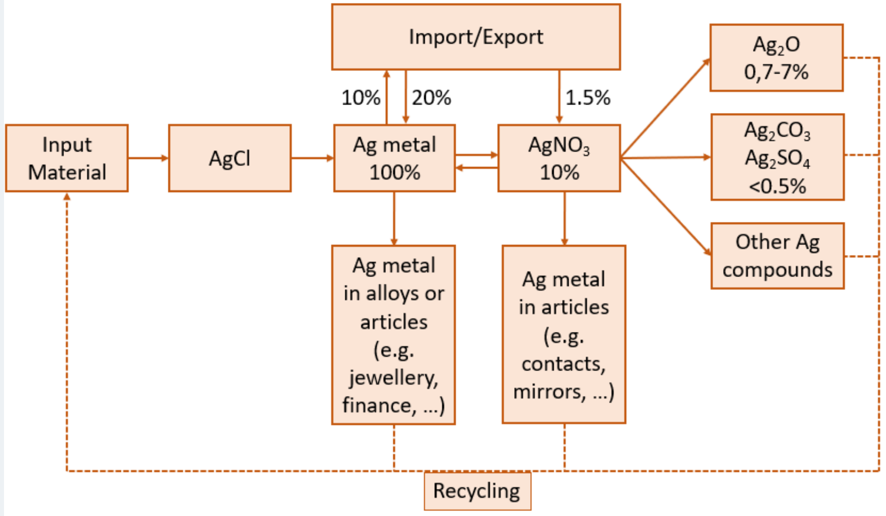

Import in EU
Me extraction and refining
Me compounds manufacturing
Quantity per type of use and substance status
Industrial DU users
Professional DU users
Consumer DU users
Export markets
Me concentrate from EU mines
Me concentrate from non EU mines
EU Me smelters
50%
Regulated landfills
E.g. Me in product recyclers
35%
E.g. net trading of Metal
Me Compound
EU Me market
100 %
EU Me Compound market
Full use of Me
Intermediate use of Me
30%
Full use of Me Compound
Intermediate use of Me Compound
Full use of Me
E.g. Article producers
E.g. …
Attention! Not always available for metals/metal compounds!
Attention! Not always available for metals/metal compounds!
To non-EU Industrial use
To non-EU market
To non-EU market

Materials flow

- Sequence of processes ranging from the extraction of raw material via its processing, reprocessing and machining up to the finished product, delivery to the end consumer, and recycling (different visuals)

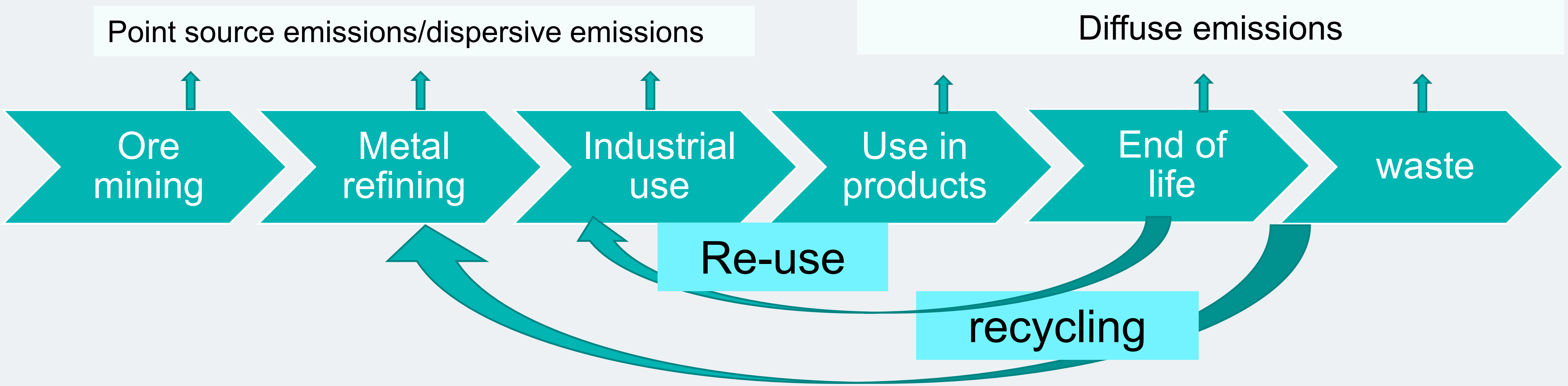




Where can it help?

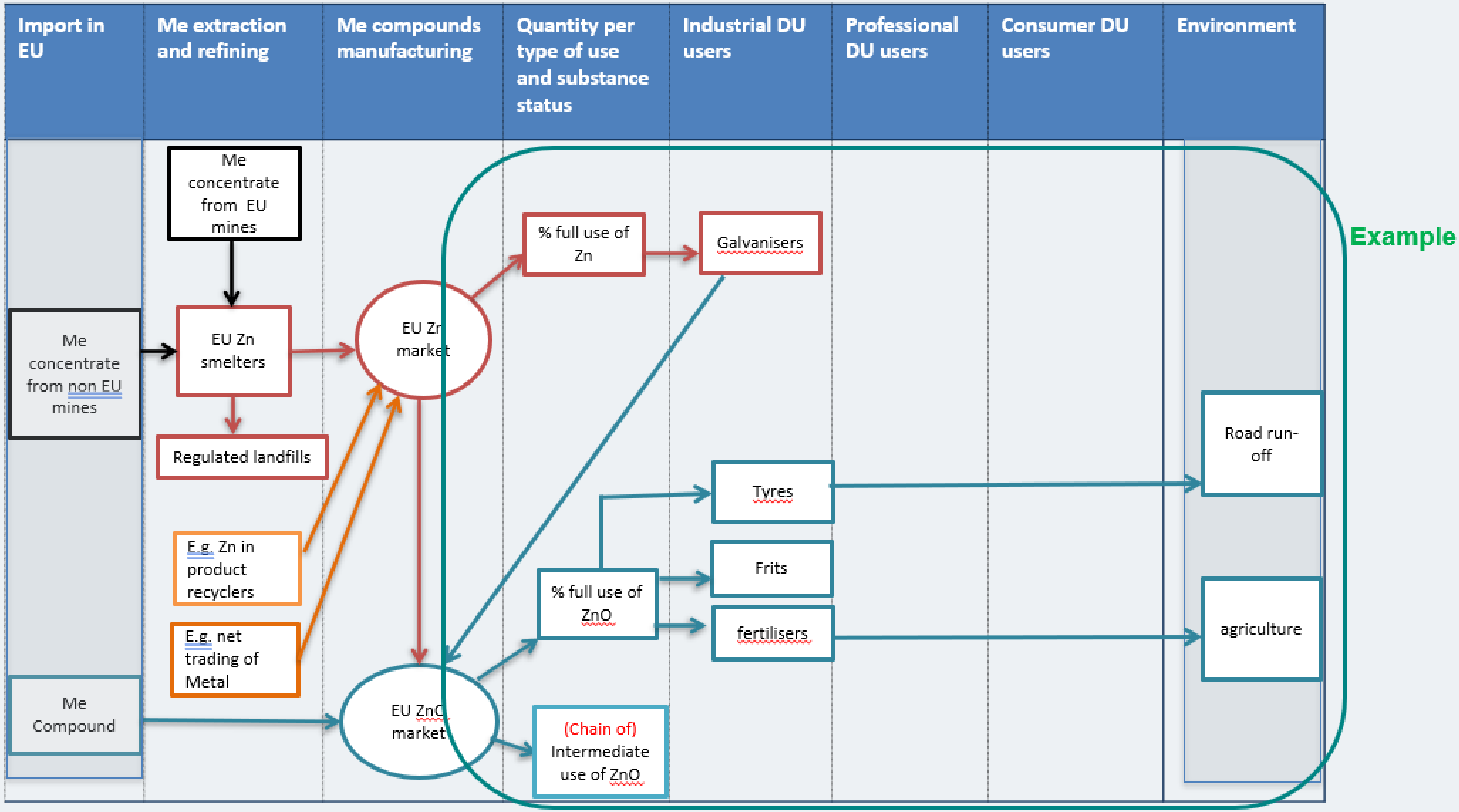
- Identifying ‘wider picture’
- Identifying where:
  - exposures/releases may take place,
  - Material leakages take place (single use)
- Prioritisation of information required
- Prioritisation of risk management based on *exposure and materials leakage*
- Mainly qualitative

Environmental emissions identified in the materials flow



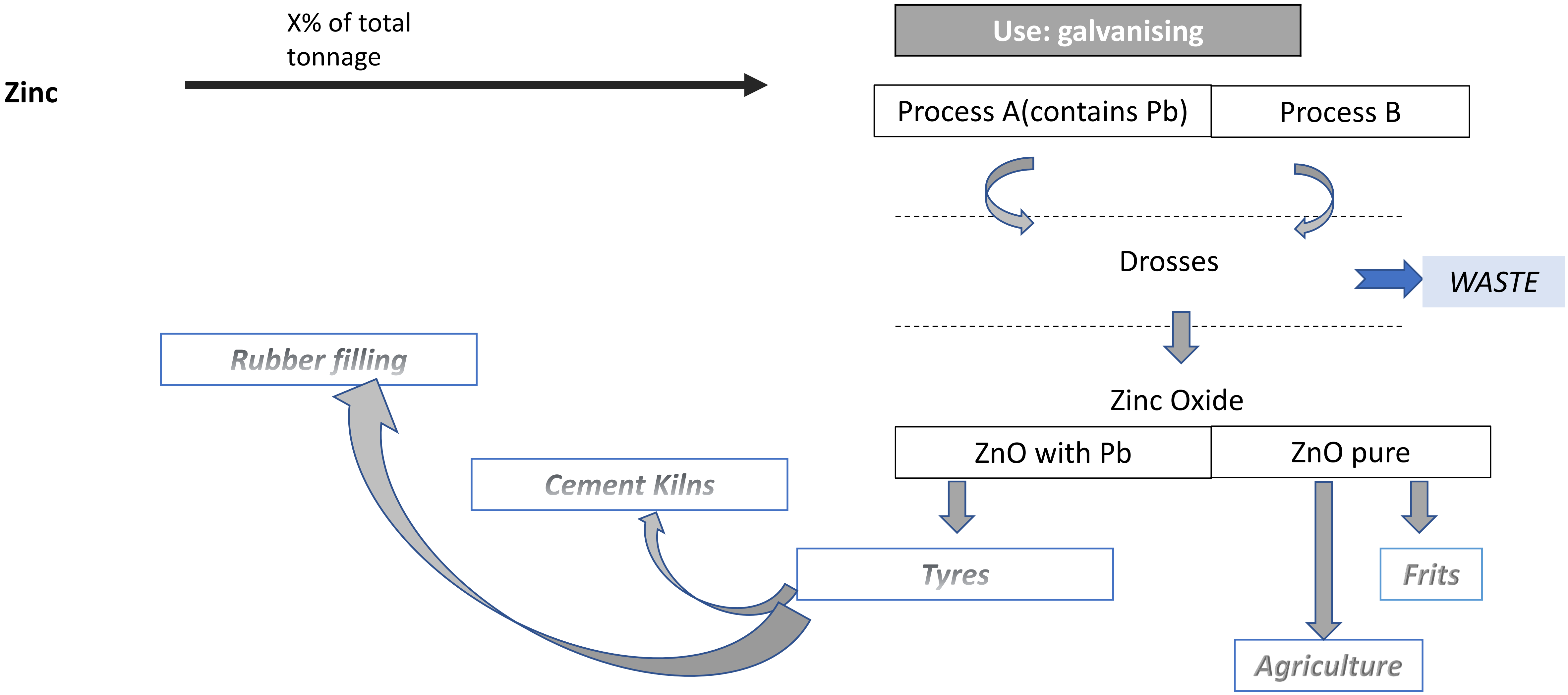
- Metal emissions can occur at all stages of the life cycle, as quantified in the materials flow
- Use of the metal in different products exposed to environment can result in diffuse emissions
- In general, point source-related industrial emissions are strictly regulated and controlled. This has resulted in a progressive and general reduction of industrial emissions over the past decades (see emissions of cadmium as an example)
- recycling and re-use prevents emissions from waste

Example

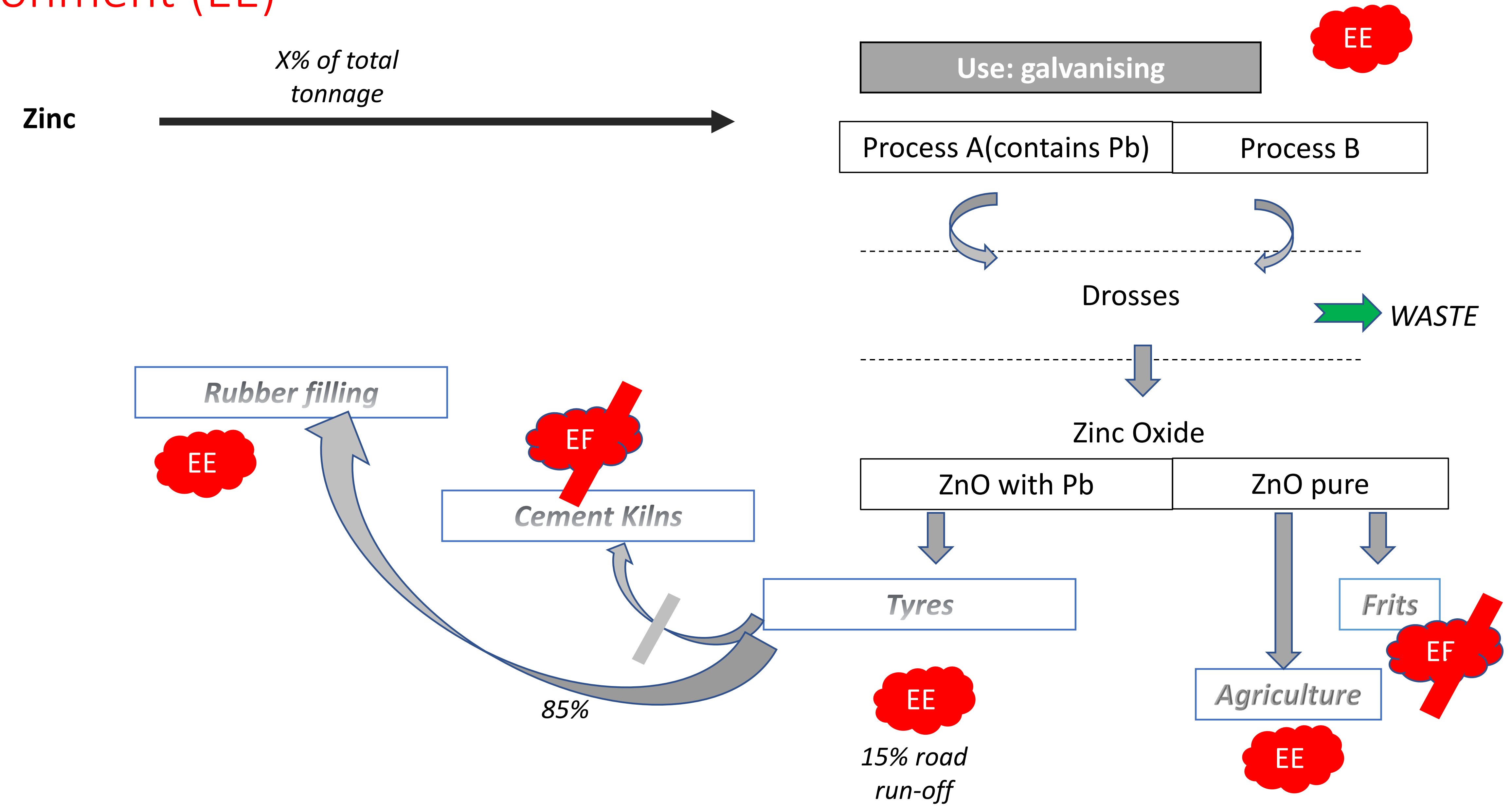


Notes: (1) Me refers to the metal substance analysed; (2) Me Compound stands for the Me compound analysed (e.g. Me oxide, Me chloride, Me sulfite); (3) smelter process is given as a typical example of metal production; (4) REACH registration dossiers that do not cover professional/consumer uses, typically report the uses advised against.

Example :substance zinc /uses: galvanisers

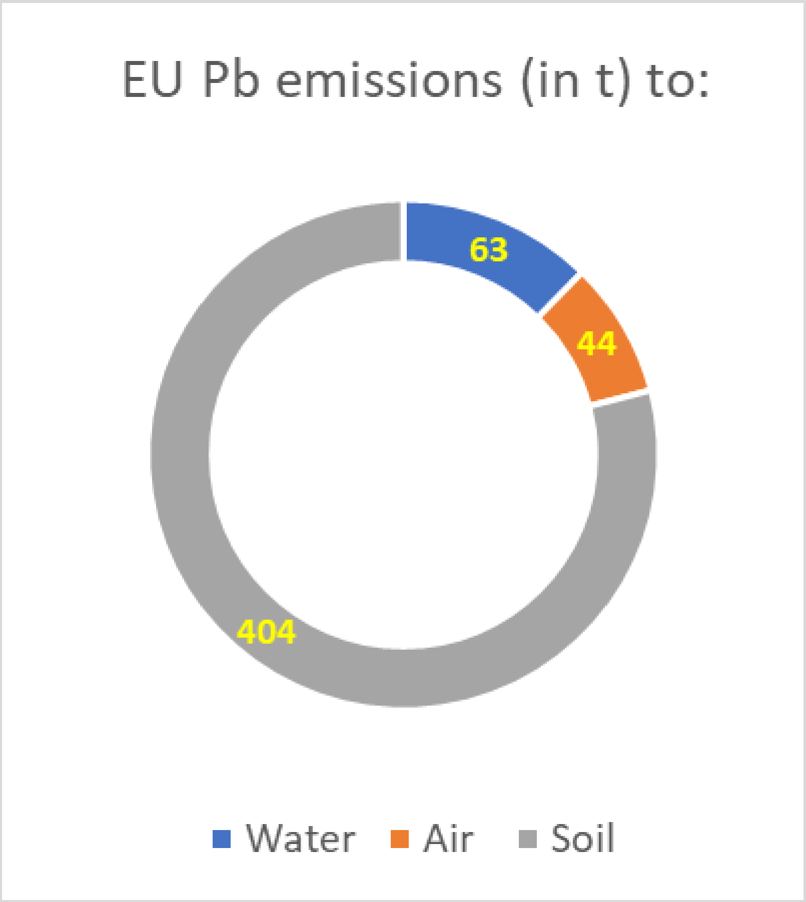


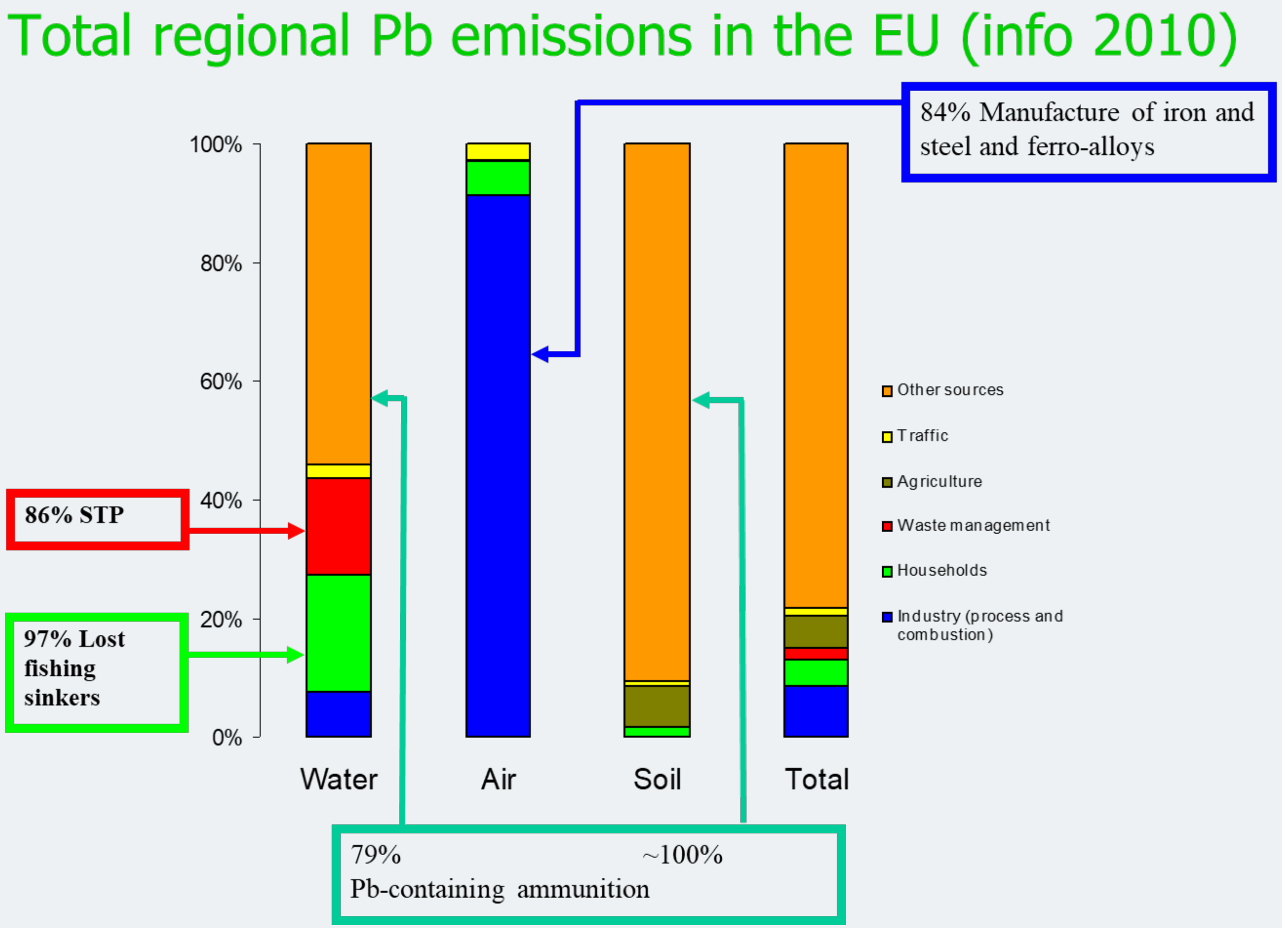
Example 1:substance zinc /uses: galvanisers + emissions environment (EE)



Prioritisation for risk management

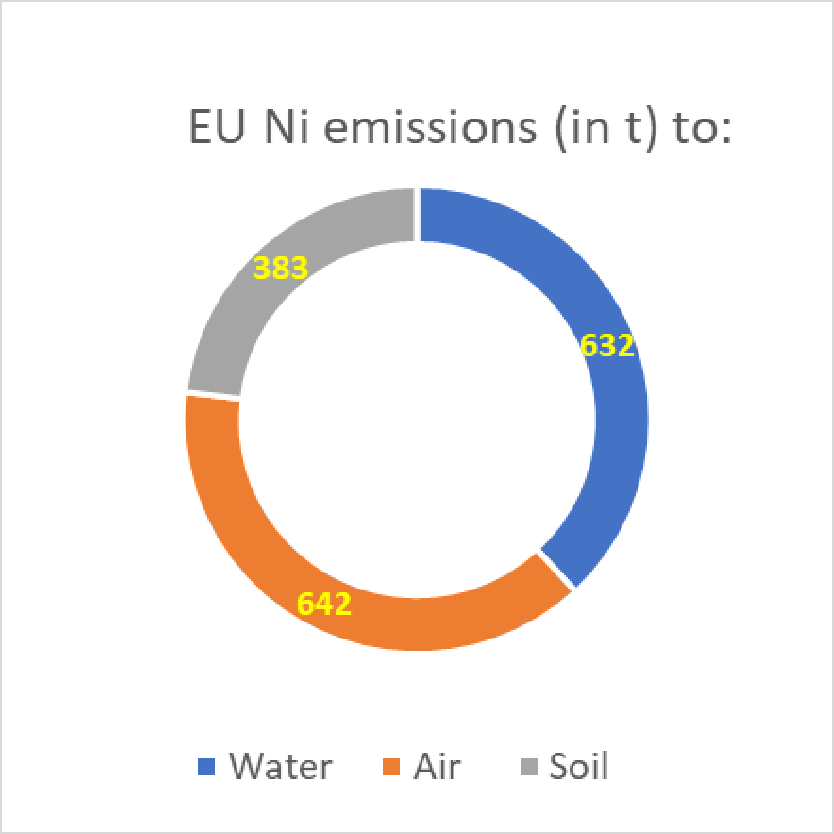
- Pb emissions to soil from ammunition > 70 % of total Pb emissions in the EU



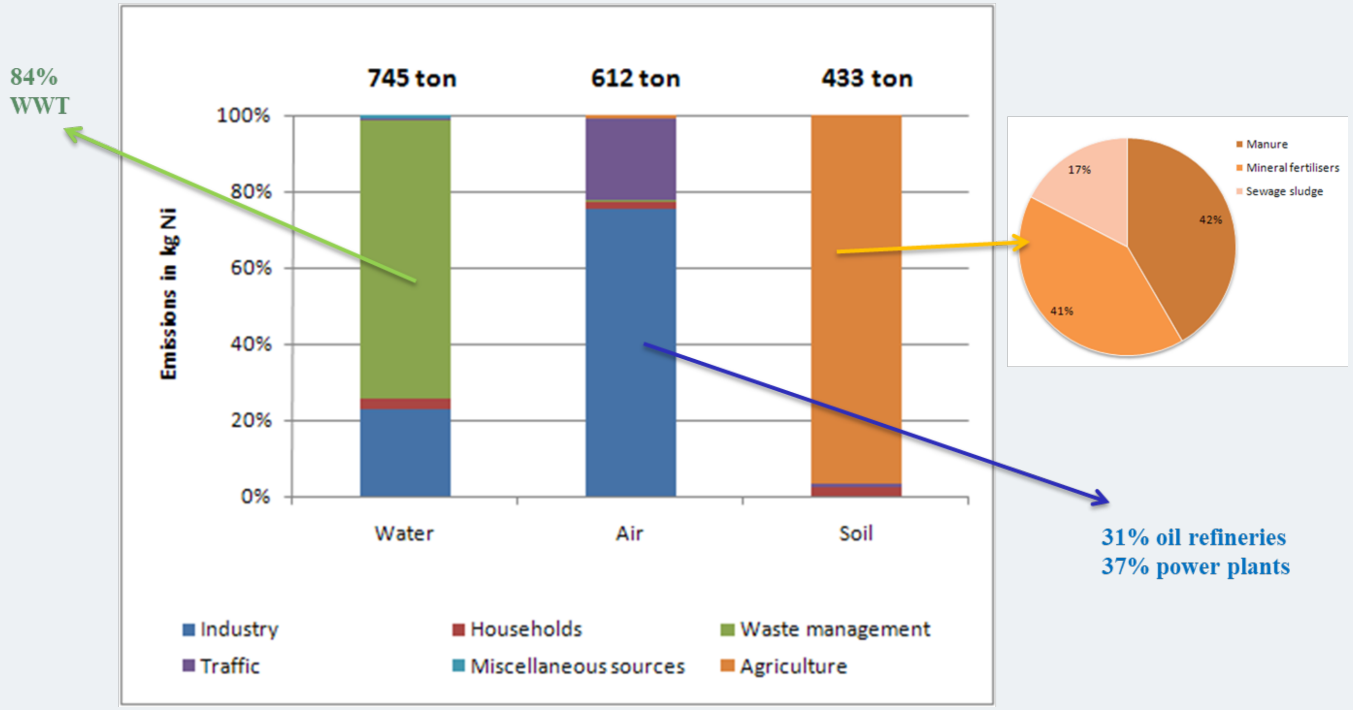


Prioritisation for risk management

> 90 % of Ni emissions to soil from agriculture and
> 2/3 of emissions to air from fossil fuel refineries and energy plants
> 60% of emissions to water from households and SMEs



Total Regional Ni emissions in the EU (info 2010)



Key messages to conclude

Materials flow is very relevant for **metals and inorganics** because:

- those cannot be destroyed, hence "exposure based risk control" is a most effective risk management measure
- Those help identifying how much substance is in use in society and up for re-use, recycling or emissions

Materials Flow Mapping **helps to prioritise and define risk management effectiveness by**:

- Identifying where the main exposures may occur (i.e., areas for risk control)
- Identifying where materials are not recycled, so single use only (i.e., areas to consider alternative uses if possible)

THANK YOU

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