



# **ECO-DESIGN FOR RECYCLING**

**Life-cycle inventories on the end-of-life  
of electr(on)ic products**

# Who we are: 2 leading WEEE take-back systems



▶ > 2000 producers members



(non-exhaustive list)

▶ > 1,100,000 t of EEE put on the market in 2016

▶ > 520,000 t collected and treated in 2016

▶ 1600 producers members



(non-exhaustive list)

▶ > 80,000 t of EEE put on the market in 2016

▶ > 20,000 t collected and treated in 2016

👉 Both accredited by French public authorities since 2005

# Electric & electronic equipment (EEE) categories covered



Household EEE : all categories exc. Lighting



Professional EEE :

HVAC, commercial refrigeration, industry, vending, laundry, kitchen.



(non-exhaustive list)



Household EEE : Lighting



Professional EEE :

Building, industry, research, health



(non-exhaustive list)



Our project:

LCI development on WEEE recycling



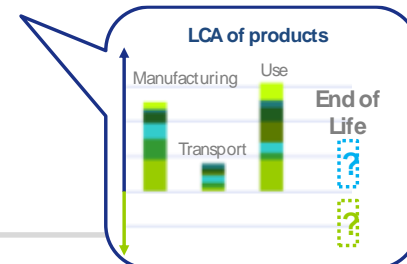
# Context and objectives

## ■ Context :

- Lack of data (or outdated) concerning WEEE recycling in LCA databases
- Increasing interest of manufacturers in the efficient use of resources
- Need for reliable and representative data from field experience

## ■ Objectives :

- Develop a reference database, recognized at European level.
  - Enhancing reliability of LCA conducted by manufacturers (internal studies, environmental communication...)
  - Valuing the environmental benefits of eco-design efforts and efficient recycling



# Partnership and calendar

## ■ Partnership Eco-systèmes – Récyclum

- Co-funded by ADEME (*French EPA*)
- Accompanied by Bleu Safran
  - ▶ *Charlotte Hugrel and Magali Palluau, LCA experts specialized in waste management*



## ■ Peer review “in real-time” by recognized and external experts

- *Philippe Osset, LCA expert (CEN/ISO expert), Solinnen*
- *Ueli Kasser, expert on WEEE treatment, Büro für Umweltchemie Zürich*



# Equipment covered (2017-2018)



## ✓ Already available

- Large Cooling Appliances
- Large Household Appliances non-cold
- Small Household Appliances
- Flat Screens



## Coming soon

- Air Conditioning Roof Top
- Small Heat Pumps
- Commercial Cold Equipment
- Water Fountain



## ✓ Already available

- Lamps
- Small Professional Appliances
- Self Contained Emergency Lighting



## Coming soon

- Inverter
- Lighting Systems
- Large Professional Appliances
- Motors



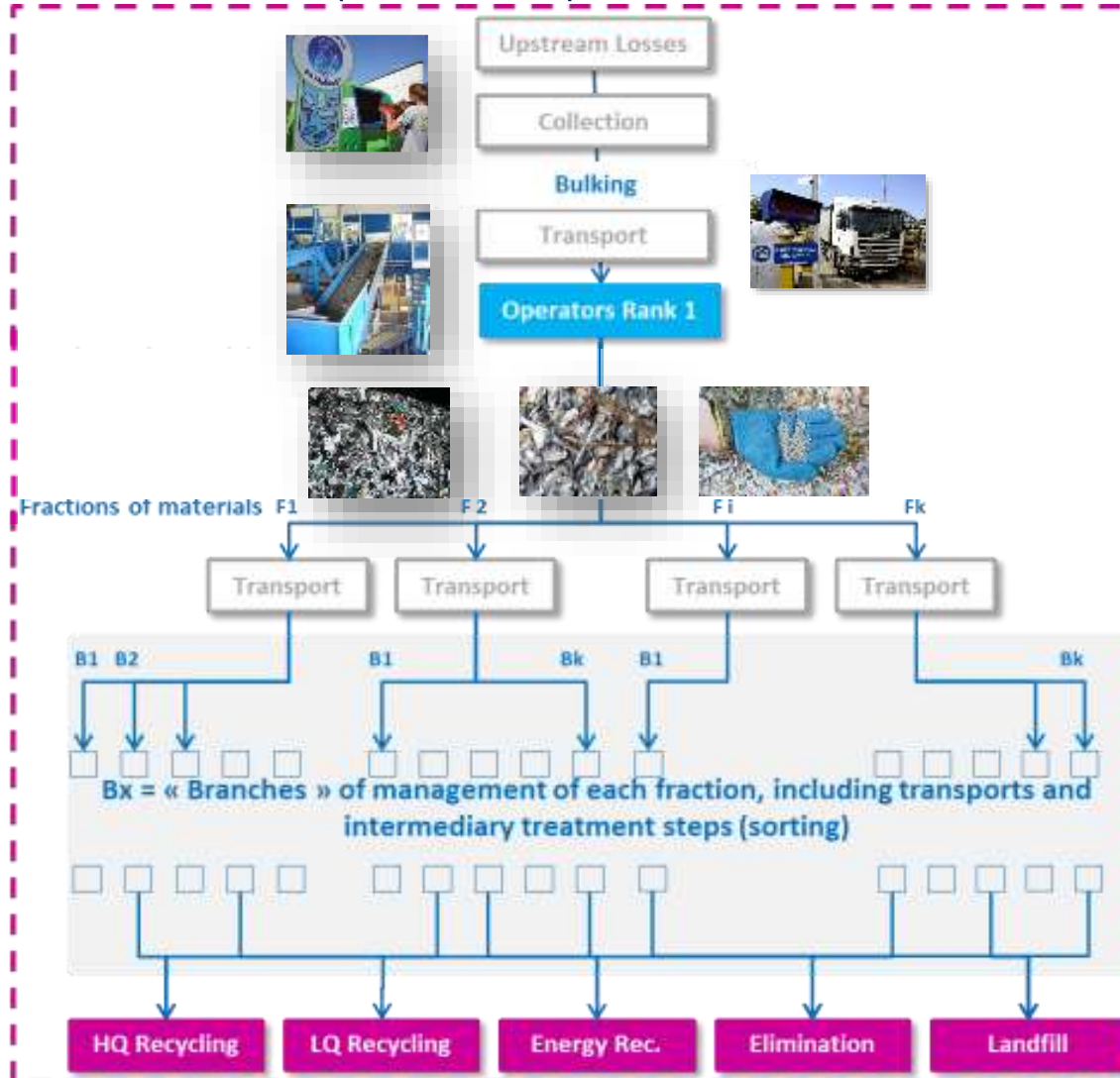
# Modelling WEEE recycling





# System boundaries

- From collection of WEEE (in France) to final treatment of each fraction



# Methodology



## Tracking each material along the recycling chain



Logistic monitoring



Input/output material flow analysis  
(Characterization and sampling programmes)

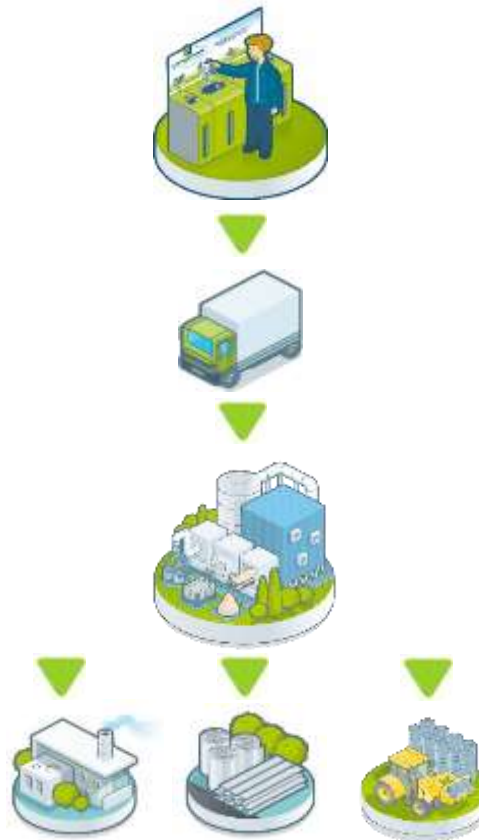


Traceability of downstream operations

Questionnaires to operators



- Composition of complex/mixed fractions
- Impurities in fractions
- Identification of all downstream operators



## Evaluating the impacts of each process

Questionnaires to operators



- Energy consumption
- Specific emissions
- Conditioning

Bibliography / Literature

Adaptation of existing LCI

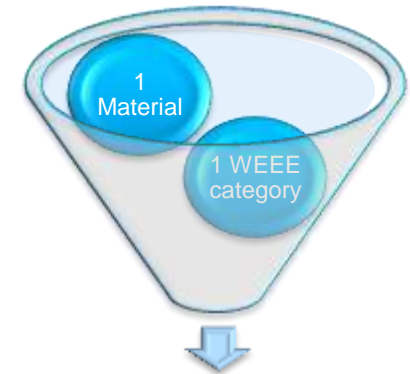
# System boundaries - granularity

## ■ Granularity of the LCI:

- LCI at **[material-WEEE category]** scale

*Ex.: steel in large household appliances, glass in lamps, copper in flat screens...*

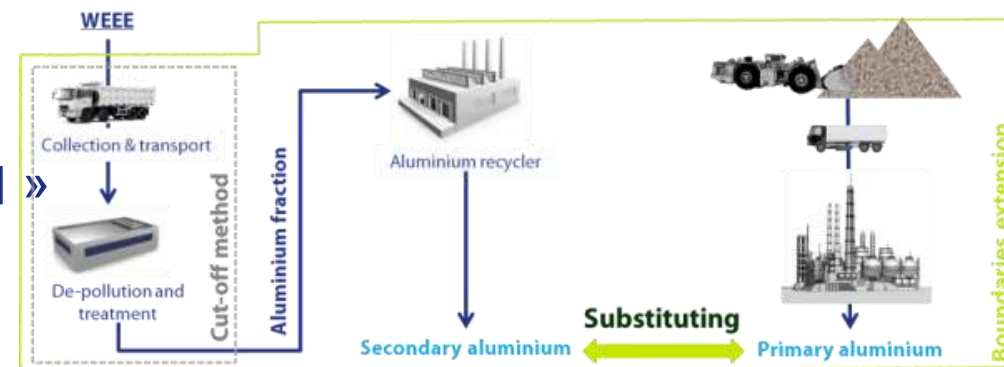
> 60  
materials  
modelled  
in total!



1 LCI « Stock method »  
+1 LCI « System expansion method »

## ■ 2 LCI for each couple [material-WEEE Category]:

- 1 LCI « Stock method »
- 1 LCI « System expansion method »





## ■ Compliance with ISO 14044 and ILCD Entry-level

### *Peer review conclusions*

	SHA	LHA cold	LHA non-cold	Flat Screens	Tubes & Lamps	Self-contained emergency lighting	SPA Build & Med & Ind & Research
Technological representativeness	Very good	Very good	Good	Good	Very good	Good	Fair
Time representativeness	Very good	Very good	Very good	Fair	Very good	Good	Good
Geographical representativeness	Good	Good	Good	Good	Good	Good	Good
Completeness	Good	Good	Good	Good	Good	Good	Good
Precision	Very good	Very good	Very good	Very good	Very good	Very good	Very good
Methodological appropriateness and consistency	Very good	Very good	Very good	Very good	Very good	Very good	Very good
Overall quality	Very good	Very good	Very good	Good	Very good	Good	Good

## ■ Semi-quantitative evaluation according to PEF method

*Internal assessment based on the PEF Data Quality Ratio (DQR) : Results from Fair to Very good*

*(except some specific cases linked to toxicity/ecotoxicity evaluation, unknown particule size, etc.)*



## Conclusion and perspectives



# Availability of the LCI

- Nearly **450 LCI** freely downloadable on the Life Cycle Data Network of the JRC
- **2 platforms:**
  - <http://weee-lci.recyllum.com>
  - <http://weee-lci.eco-systemes.com>



- **Methodological report**



- **FAQ** (coming soon)

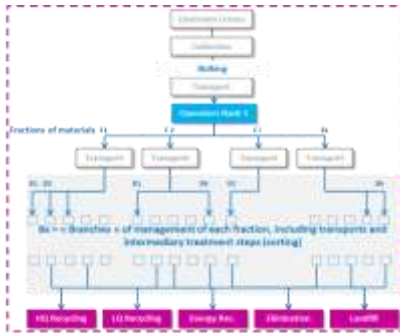
- Collaboration with LCA softwares editors to integrate these datasets



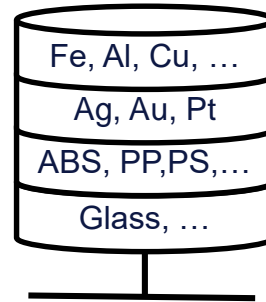
# Outcomes & key messages

- **An unprecedented database in Europe**

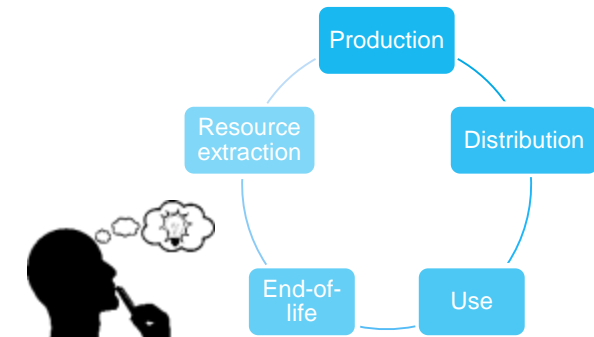
**WEEE management:** a succession of complex processes, modelled with operational data



**LCI:** scale material-WEEE Category, covering all operations from collection to final operations



**A database** directly usable by producers with their Bill Of Material



- **A fundamental methodological work**
- **Medium/long term: extend geographical coverage**



# Any questions ?



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