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

Both accredited by the French public authorities since 2005

- > 2,100 producers members
- > 520,000 t collected and treated in 2016

Household EEE: all categories exc. Lighting.

Professional EEE: HVAC, commercial refrigeration, industry, vending, laundry, kitchen.

- 1,600 producers members
- > 20,000 t collected and treated in 2016

Household EEE: Lighting.

Professional EEE: Building, industry, research, health.
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  - Lack of data (or outdated) concerning WEEE recycling in LCA databases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, modelling WEEE recycling
    - 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 – Récylum**
  - 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

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**Timeline:**

- **Mid-2014**
  - Phase 1: preparation phase

- **Q1 2015**
  - Phase 2: modelling, peer-review, database creation

- **March 2017**
  - RELEASE of a first batch of data

- **January 2018**
  - RELEASE of a second batch of data
Equipment covered (2017-2018)

✓ Already available
  • Large Cooling Appliances
  • Large Household Appliances non-cold
  • Small Household Appliances
  • Flat Screens

✓ Already available
  • Lamps
  • Small Professional Appliances
  • Self Contained Emergency Lighting

⏰ Coming soon
  • Air Conditioning Roof Top
  • Small Heat Pumps
  • Commercial Cold Equipment
  • Water Fountain

⏰ 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

Evaluating the impacts of each process

- Questionnaires to operators
  - Energy consumption
  - Specific emissions
  - Conditioning

Bibliography / Literature

Adaptation of existing LCI
Granularity of the LCI:
- LCI at [material-WEEE category] scale
  Ex.: steel in large household appliances, glass in lamps, copper in flat screens…

2 LCI for each couple [material-WEEE Category]:
- 1 LCI « Stock method »
- 1 LCI « System expansion method »
Data quality evaluation
## Quality assessment

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

Peer review conclusions

<table>
<thead>
<tr>
<th>Comparison</th>
<th>SHA</th>
<th>LHA cold</th>
<th>LHA non-cold</th>
<th>Flat Screens</th>
<th>Tubes &amp; Lamps</th>
<th>Self-contained emergency lighting</th>
<th>SPA Build &amp; Med &amp; Ind &amp; Research</th>
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<td>Technological representativeness</td>
<td>Very good</td>
<td>Very good</td>
<td>Good</td>
<td>Good</td>
<td>Very good</td>
<td>Good</td>
<td>Fair</td>
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### Evaluation according to PEF method

Internal assessment based on the PEF Data Quality Ratio (DQR): Results ranging from **Fair** to **Very good** depending on WEEE flows and steps of the recycling chain.
Case studies and first key results
Case studies*

**STEP 1:** Integration of the datasets into a LCA software specialized in electr(on)ic devices (eime)
- Use of a test platform + adaptation of elementary flows nomenclatures

**STEP 2:** Modelisations by different producers
- Reworking of existing LCA studies to check data usability and compare previous and new end-of-life modelisations

**STEP 3:** In-depth analyses of the results
- Comparison of former and new results
- In-depth analyses of the significant differences
- Actions to facilitate data integration and use by designers

* If interested in taking part in such case studies, do not hesitate to contact us!
First key results and eco-design perspectives

- Impacts of **end-of-life** mostly **underestimated in previous studies**
  - New LCI Data more representative from field experience

- Importance of **metals** contribution to both impacts and benefits
  - *Balance between high impacts and potential benefits possible with the new LCI*

- High relative contribution of **printed circuit board (PCB)** to the total impacts
  - Importance of accessibility of PCB to optimize recycling

- Importance of developing a **high-quality recycling** to increase the benefits
  - Supports the re-integration of high-quality recycled materials (e.g.: closed loops projects)
Conclusion and perspectives
Outcomes & key messages

- **An unprecedented database in Europe**
  - **WEEE management:** complex processes, modelled with operational data
  - **LCI:** material-WEEE category scale, covering all operations from collection to final treatment
  - **A database** directly usable by producers with their Bill Of Material

- **2 platforms on the LCDN:**
  - [http://weee-lci.recylum.com](http://weee-lci.recylum.com)

- **Collaboration with LCA softwares editors to integrate these datasets**

- **Medium/long term:** extend geographical coverage

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[Source] [avniR] Conference - November 8-9, 2017 | Lille
Any questions?

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