FORCE
Cities Cooperating for Circular Economy

Hans Christian Christensen, City of Copenhagen

Project Coordinator

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 689157.
FORCE project website: www.ce-force.eu

Objectives

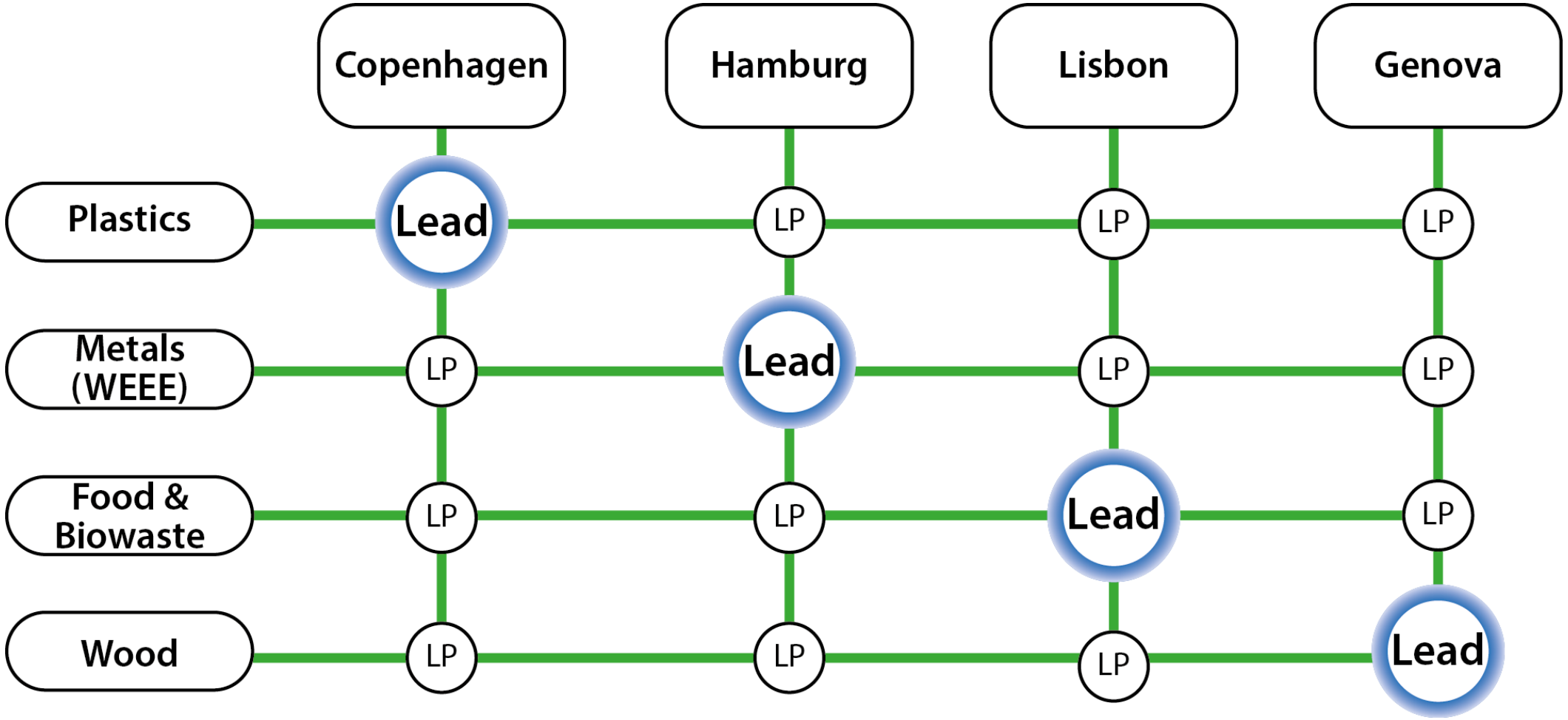
- Engage cities, enterprises, citizens and academia in 16 value chain partnerships to develop eco-innovative solutions.

- Develop 10 viable end-markets solutions, by demonstrating new applications for
  - plastic waste,
  - metals/(W)EEE,
  - surplus food and bio-waste
  - wood waste

- Use a value chain based partnership approach to develop a governance model for cities.

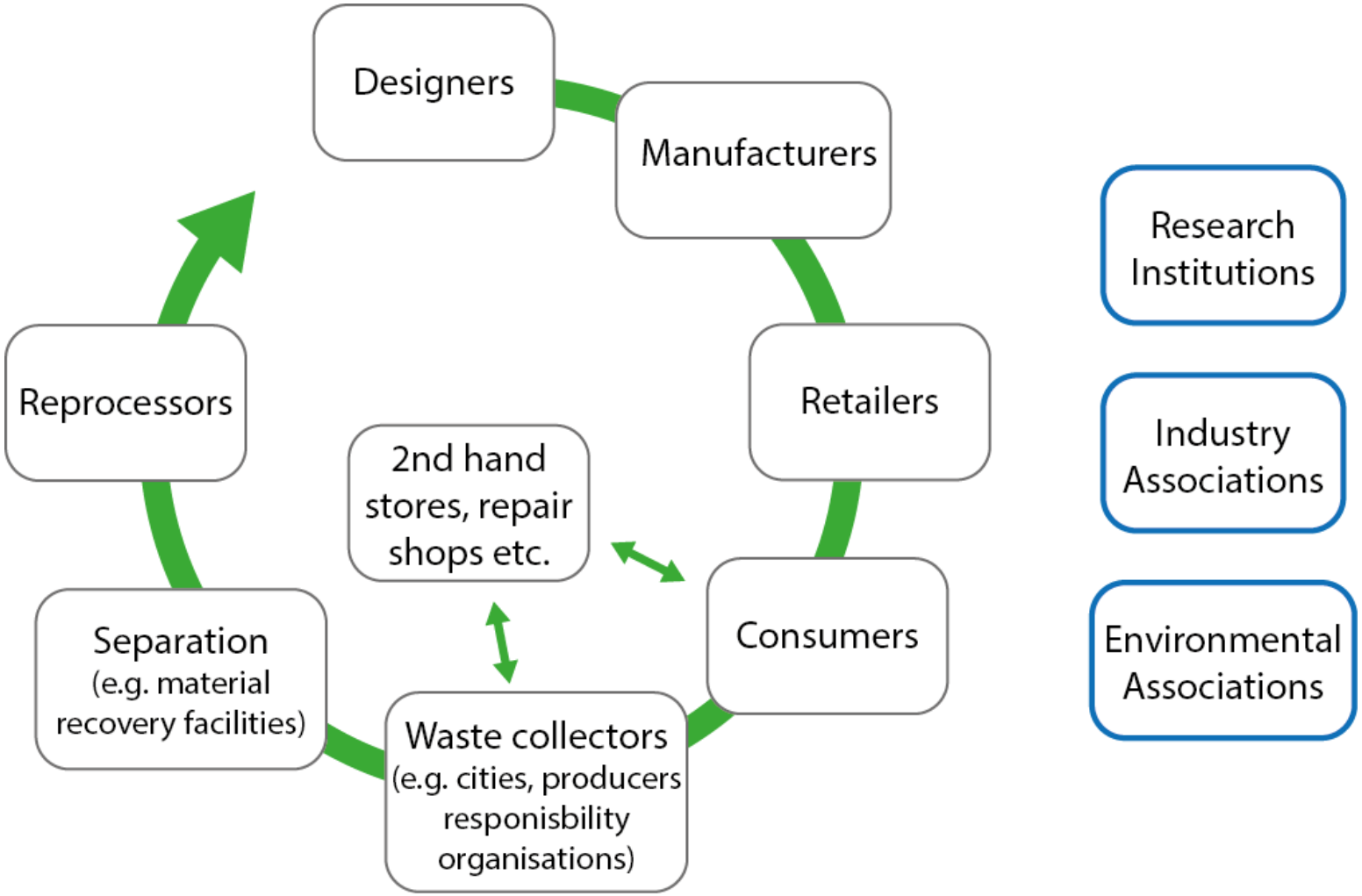
- Use Big Data Technology to develop decision support tools.

Methodology



Methodology

The partnership approach seeks to engage stakeholders across the entire value chain – from design to reprocessing



Plastic Waste - Lessons learned

- Easy to separate plastic for citizens – all plastics -> + 30 %
- PET, PP and PE is almost 90 % of all collected plastic waste.
- Up to 25% of the total household plastic waste stream is not suitable for recycling due to its design (e.g. multi-layer).
- Good design is key for good recycling.
- A circular plastic flow includes black plastic – sorting and design of products.
- Recycled PET well suited for food-grade, so if we can avoid to use PET for non-food packaging -> recycle PET into food-grade

(W)EEE - Lessons learned

- Market potential for second-hand shops selling EEE.
- Market potential for professionals to handle seleceted WEEE-devices (repairing).
- Citizens are important actors – both suppliers and buyers of EEE devices.
- 90 % of the plastic from manual dismantling is suitable for recycling.
- Dismantling is not economically viable.

Food and biowaste - Lessons learned

- Construction: allow space for waste collection systems – difficult in old city centres.

- Most compostable and biodegradable waste bags, also certified ones, are not degradable in the anaerobic digestion process.

- Home and community composting, word of mouth and social media proved to be the most effective means of communication.

Wood waste - Lessons learned

- Today, a large part of the wood waste is already recycled for panel boards. Focus should be on better recycling and reuse.
- It seems possible to reuse post-consumer wood waste for professionel use in construction sector. However, it is time-consuming to prepare the wood.
- Forest management can prevent flooding and heavy financial burdens.
- More focus should be put on bio economy.

Lessons learned in general

- Partnerships – with enterprises:
  - works well, if the stakeholders have the same interests – mutual benefits are key – find the interfaces.
  - Cities (!?) (State, municipality, NGO) needs to facilitate the partnership.(no conflict of interest helps)

Citizen involvement:

- Citizens are key actors for cities to implement policies on waste prevention, reuse/repair and recycling.
- However most cities inform citizens rather than involve them.

Thank you for your attention!

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Plastic Waste Lead: Copenhagen

- Test of new collection schemes for plastic waste.
- Sorting of the collected plastic waste at new test facility.

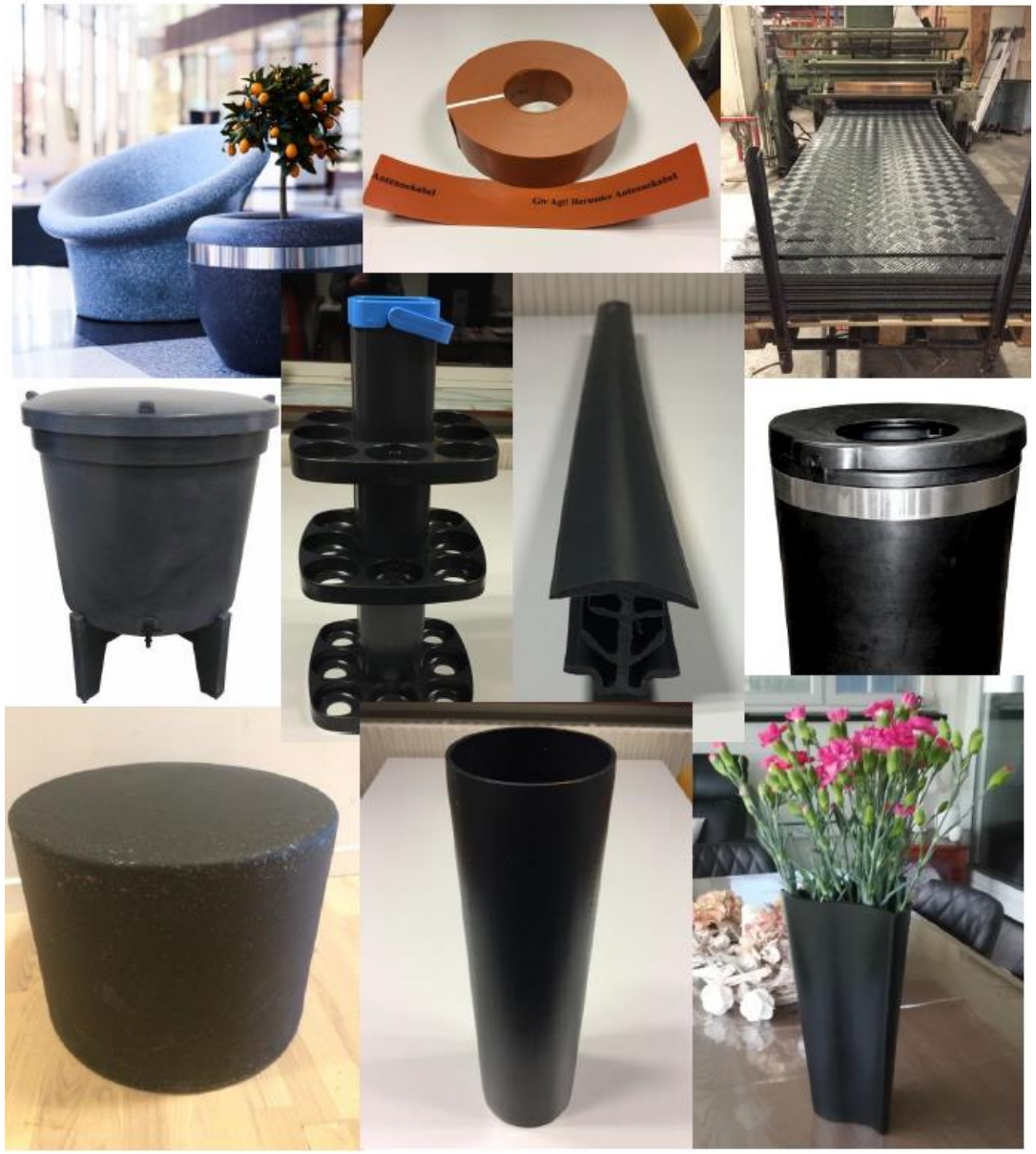
Plastic waste: Food grade recycled PET

- Partnership with Danish retailers COOP and REMA1000, packaging producer, FAERCH, food producer, Danish Crown, to demonstrate tray-to-tray recycling at a large scale in Copenhagen.

- 90 % of a tray is made of recycled plastic waste. 50 % from used trays collected from households in Copenhagen.

Plastic waste:

- Have produced 10 prototypes made from post-consumer plastics.
- Half of the 10 products have the potential to become viable business cases.



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Plastic: Design of packaging

Design manual for plastic packaging for private use

To be revised annually

Criteria / Quality	Main component (Container, bucket, tray, bottle, foil)	Sub-component (Closures, lid, inserts, seals)	Decoration (Cover, print, glue and labels)	Emptying (By consumer)	Examples
High	Main component is in mono-material: PET, PE or PP. Shall tolerate washing to a suitable degree.	Sub-components are in the same material as the container or completely separated from the container in use.	Cover and labels are entirely removed in use or simple dismantling. There is no coloured print on the container, only on the cover or labels.	The packaging can easily be entirely emptied of residues after normal use. Only needs a light rinse with water (e.g. meat tray).	rPET can for example be used for new bottles, food trays and food tubs. rPE and rPP can for example become pipes, buckets or containers for non-food products.
Moderate	Main component is of mono-material: PET, PE or PP. Or a minimum content of compatible material (cf. Appendix A). Main component is coloured.	Sub-components are not separated in use but are of materials that are compatible with the main component (cf. Appendix A). Sub-components are coloured.	Cover and labels are not separated from the container but are of the same material as the container or compatible materials (cf. Appendix A). There may be printing on the cover, labels or container.	The packaging is only partly emptied of residues after normal use. However sub-components are easily separated so that the consumer can rinse the packaging. (e.g. ketchup bottle)	rPET can for example be used for fibres for textiles. Can also be used for fleece sweaters, blankets etc. rPE and rPP can for example become pipes, buckets or containers for non-food products.
Low	Main component consists of laminated materials that are not compatible (cf. Appendix A)	Sub-components contain incompatible plastic types, metal, paper etc. Sub-components are not separated in use.	Labels and cover are incompatible with the main components and cannot be removed. There is a great deal of ink printing on the packaging.	The packaging cannot be emptied of residues after normal use. (e.g. toothpaste tube).	Mixed plastic can for example be used for concrete filling, RDF and plastic to diesel.

Design Manual

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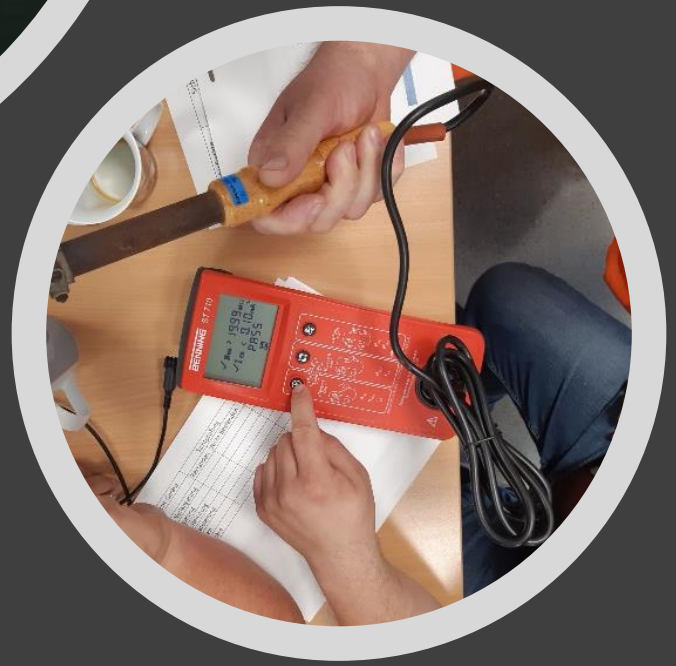


(W)EEE
Lead: Hamburg

Optimization and pilots of collection systems

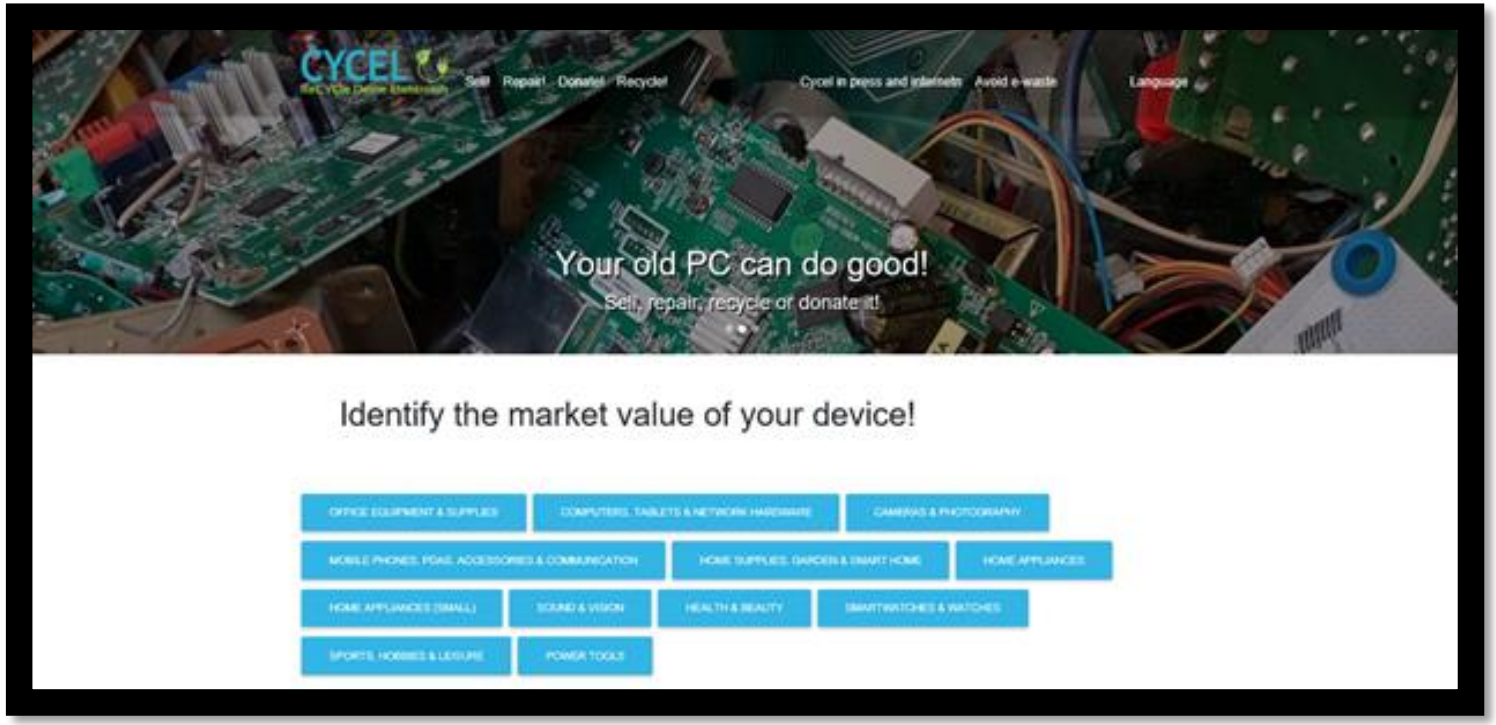
- Containers for collection of small WEEE have been increased by introducing new depot containers.
- A pre-device-check at the collection desks at the recycling stations has been introduced.
- Big containers for transportation to STILBRUCH has been replaced by trolleys and boxes to reduce broken devices.

(W)EEE

Launched the portal/app CYCEL.

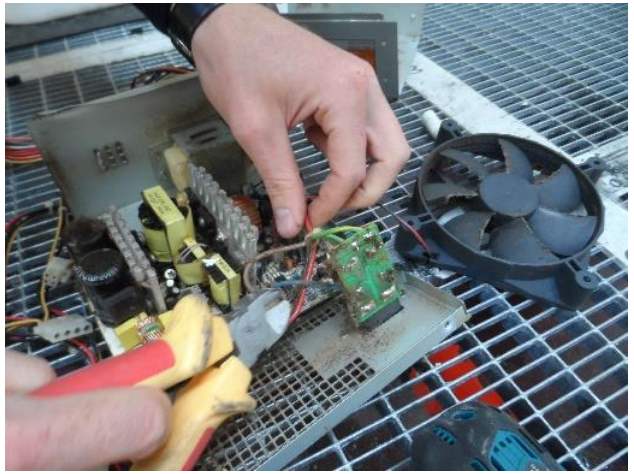
Helps citizens to decide what to do with their used EEE.

Reselling, Repairing, Recycling and Donation.



Dismantling of 10 tonnes of WEEE

- Manual dismantling of small WEEE is personnel and time consuming.
- Manual dismantling can have a environmentally positive effect.
- Revenues from the sale of sorted material are not cost-covering.



Collection of LHA for reuse at recycling stations

The company Recirk is responsible for the collection, testing, repairing and selling of the items.

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Food waste prevention and biowaste
Lead: Lisbon

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Launch of app on surplus food

#1

Association of Restaurants, Hotels, Summer Festivals, Events, Retail, among others to ZERO DESPERDÍCIO PROGRAM.

#2

Collection by the Receivers Entities of all meals not consumed, according to the best hygiene and food safety practices in the ZERO DESPERDÍCIO DONORS.

#3

Reception of meals and food by social institutions and other entities close to the communities, establishing the bridge with the families and beneficiares

#4

Access to meals and donated goods by families and beneficiaries in a continuous and free way

#5

Continuous monitoring and coordination of all stages of the process, management of relationships between all the agents – donors, receivers, sponsors, etc -, establishment of protocols with the different cities, companies, organizations and development of awareness campaigns.

Separate collection of biowaste in Lisbon

Citizen involvement in home composting

- 5 Community composters (84 dwellings) established.
- 2505 domestic composters distributed to citizens.
- More than 100 awareness sessions were conducted: 81 workshops and 28 online workshops.
- Reducing 720 tonnes of biowaste/year

Discount on waste tax in Genoa

- A “doggy bag” has been developed to be distributed in all restaurants called RICIBOX.
- A 10% reduction of waste tax is expected for restaurants and retailers joining the initiative.

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Wood waste Lead:Genoa

Survey of wood waste in Genoa has identified 4 collection schemes.

Focus on how to raise recycling and reuse through re-design and re-engineering of all 4 streams.

1 – Post consumer

2 – Parks and gardens

3 – Driftwood (seaside and rivers)

4 – Brushwood (wood from forests)

Focus at collection schemes for post-consumer wood in Copenhagen

- Sorting and collection of reusable wood waste at recycling stations – for professional use.

- Sorting and collection of reusable wood waste at recycling stations – for citizens use.

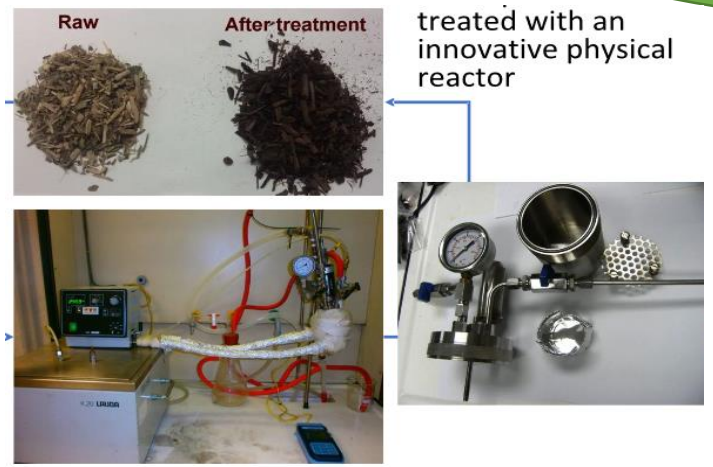
- Collection scheme for bulky wood waste for reuse at swapping centre.

- Collection scheme for bulky wood waste for reuse at wood workshop.

Testing new market possibilities

Bio economy – an economy relying on renewable natural resources to produce food, energy and products

Sugarplatform from green waste in Genoa – biobased and green chemistry field



Proteins, lactic acid and succinic were produced from biogas in a successful labscale test from the biowaste from Copenhagen

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