



# THE CHALLENGES OF COLLECTING AND SORTING FOR RECYCLING OF WEEE

WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT

20/06/2025

# SCHEDULE

## THE CHALLENGES OF COLLECTION AND SORTING FOR RECYCLING OF WEEE – CASE STUDY IN FRANCE

- 1.. INTRODUCTION
- 2.. ECOLOGIC, AN EPR COMPLIANCE SCHEME
- 3.. WEEE GENERATED AND COLLECTION BEHAVIOUR
- 4.. OPERATIONAL ORGANIZATION OF WEEE EPR IN FRANCE
- 5.. TREATMENT PROCESS OF WEEE IN FRANCE

01.

# INTRODUCTION

# EXTENDED PRODUCER RESPONSIBILITY (EPR)

## ENVIRONMENTAL POLICY INSTRUMENT

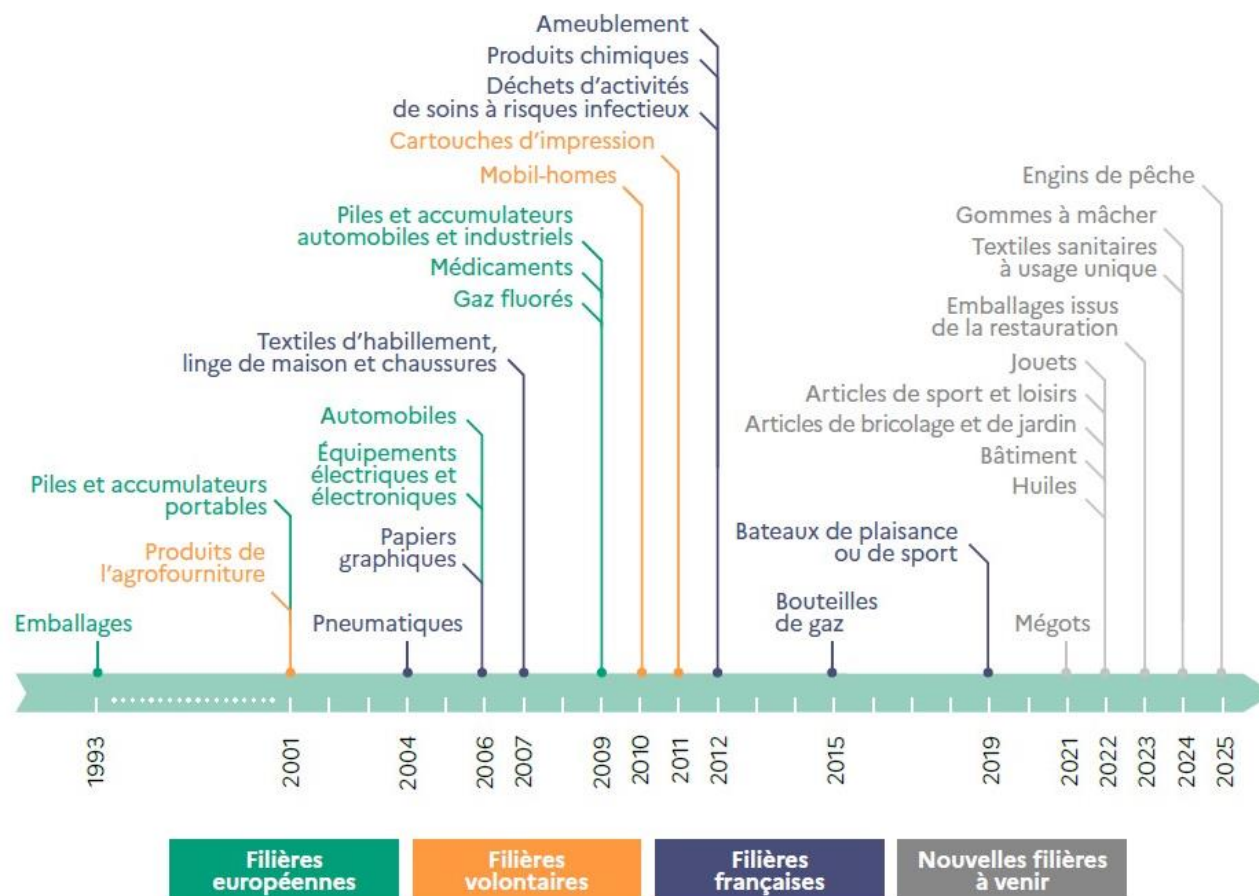
Invented over 30 years ago in Sweden

The equipment **manufacturer** is responsible for the post-consumer stage.

**End-of-life** management provided and financed by an **eco-fees** integrated into the sales price.

25 sectors in France by 2024

Service provided by approved eco-organizations  
(also named EPR compliance scheme)  
or individual systems



### Filières REP et dates de mise en œuvre opérationnelle\*

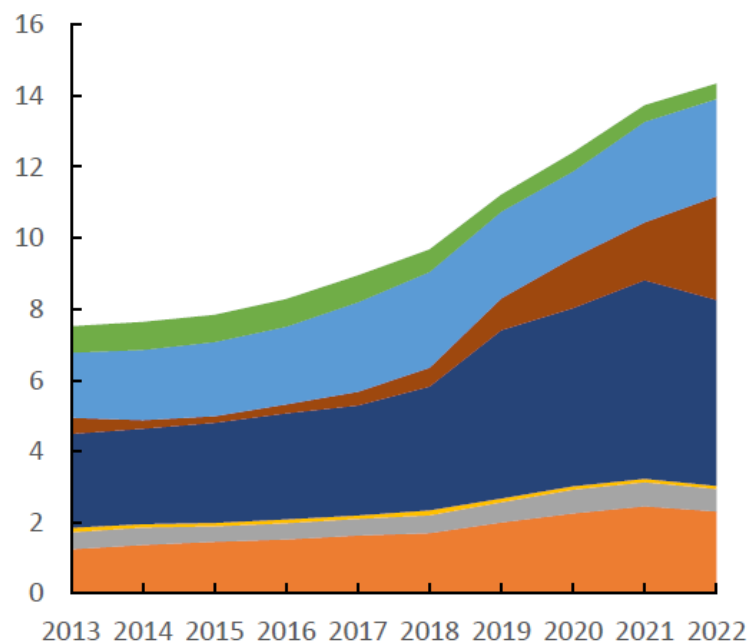
\* Date du premier agrément ou date de fonctionnement opérationnel de l'organisation ou date de prise en charge des produits usagés



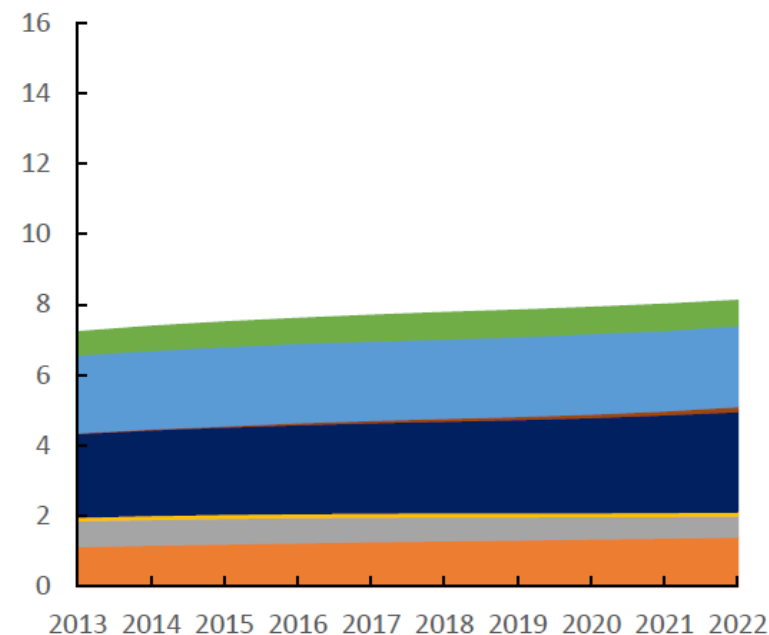
# ELECTRICAL AND ELECTRONIC EQUIPMENT

## IN EUROPE

POM quantities (in Mt), EU27



WEEE generated quantities (in Mt), EU27



Cat. 1 Cat. 2 Cat. 3 Cat. 4a Cat. 4b Cat. 5 Cat. 6

Figure 3.1 POM and WEEE generated quantities per EEE category (in Mt), EU 27 (2013 - 2022)

*EEE: "Equipment operating by means of electric currents or electromagnetic fields, and equipment for the generation, transfer and measurement of such currents and fields, designed for use at voltages not exceeding 1000 volts for alternating current and 1500 volts for direct current".*



# FOUNDING TEXTS OF WEEE EPR



## Directive 2002/96/EC:

prevention of "WEEE" reuse, recycling, recovery to reduce volumes to be disposed of.



## DECREE DEEE 2005-829

Defines the main rules for managing WEEE

2005  
July 20

2014  
August 22

2017  
November 27

2021  
August 22

## DECREE 2017-1607 Energy Transition Law

Article R543-200-1 of the LTE Act, as amended, makes it **compulsory for WEEE management operators to contract with an eco-organization or an individual system.**



## AGEC law (anti-waste for a circular economy)

- 20% of public purchases of reconditioned products or products made from recycled materials
- Reuse and repair fund
- Eco-design prevention plan
- Informing consumers about the environmental qualities and characteristics of products
- Repairability index

## DECREE DEEE II 2014-928 .

Specifies requirements for :

- cross-border transfers,
  - household waste,
- individual solution certificates,
  - distance selling,
  - reuse,
  - 1 for 0, 1 for 1,
- information solutions collection and processing by the producer,
- information processed by the owner

## Directive 2012/19/EU:

Revision "WEEE I" -measures to protect the environment and health by preventing/reducing pollution, aims to reduce the impact of resource use.

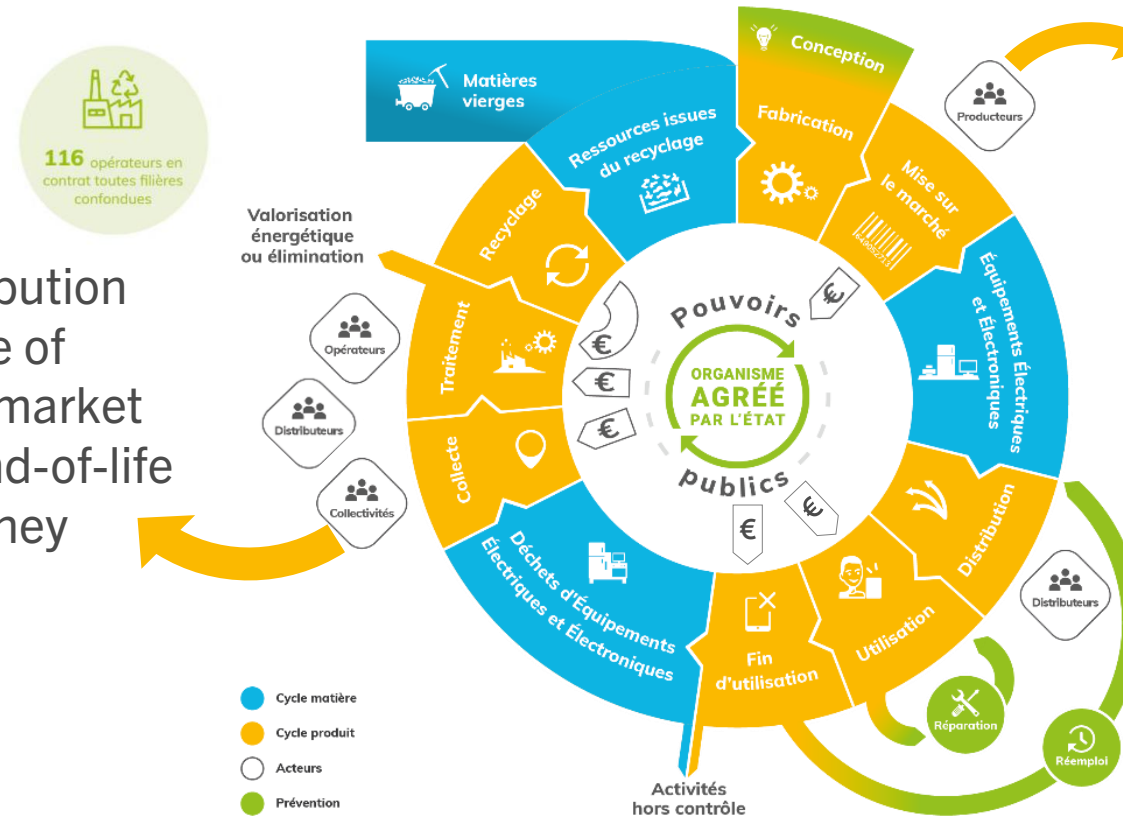
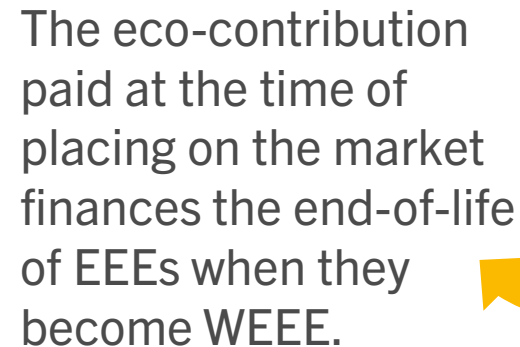
# THE EPR MECHANISM

## WEEE II Directive 2012/19/EU, WEEE II Decree 2014-928

- **Avoiding pollution**
- **Preserving resources**

Paid by the first marketer, it is passed on identically to the end user.

**AGEC law (anti-waste for a circular economy) Decree no. 2021-254**





# THE AGEC ACT

SEVERAL OF THE 54 IMPLEMENTING DECREES IMPACT OUR INDUSTRIES

The 130 articles of the AGEC law aim to transform our system towards a circular economy.

It is divided into 5 main areas:

1. Moving away from disposable plastic,
2. Better consumer information,
3. Combating waste and promoting solidarity-based reuse,
4. Take action against programmed obsolescence,
5. Better production.

Some of the last EU regulations such as ESPR (including DPP) or CRM Act follow the same path as AGEC Law



## LOI ANTI-GASPILLAGE

6 MESURES PHARES POUR CHANGER NOTRE QUOTIDIEN

EN FINIR AVEC LE PLASTIQUE JETABLE



La loi prévoit la **fin progressive du plastique à usage unique**, avec une mise en œuvre dès 2021. L'objectif : faire disparaître rapidement tous les objets et les emballages qui polluent notre quotidien (pailles, couverts jetables, gobelets, etc).

RENDRE LE TRI PLUS EFFICACE



Un logo unique pour le tri (TRIMAN) sera obligatoire et accompagné d'une information sur le geste à effectuer. **Les couleurs des poubelles seront aussi harmonisées** sur tout le territoire.

INTERDIRE L'ÉLIMINATION DES INVENDUS



Les produits non-alimentaires **invendus seront donnés ou recyclés**. Il s'agit des produits d'hygiène quotidienne, des vêtements, des produits électroniques, des chaussures, des livres, de l'électroménager, etc.

CRÉER UN « INDICE DE RÉPARABILITÉ »



Chaque consommateur pourra **savoir en un coup d'œil si son produit est réparable**, difficilement réparable ou non réparable. L'objectif : allonger la durée de vie de nos objets.

VENDRE LES MÉDICAMENTS À L'UNITÉ



Dès 2022, il sera **possible d'acheter des médicaments à l'unité en pharmacie**, lorsque « leur forme pharmaceutique le permet et que le pharmacien l'accepte ».

CESSER L'IMPRESSION DES TICKETS DE CAISSE



La loi prévoit d'interdire dès 2023 **l'impression systématique des tickets de caisse, tickets de carte bancaire, tickets de distributeurs d'argent et des bons d'achat**. Le client aura la possibilité d'en demander l'impression s'il le souhaite.

[www.ecologie-solidaire.gouv.fr](http://www.ecologie-solidaire.gouv.fr)



02.

# ECOLOGIC AN EPR COMPLIANCE SCHEME

# APPROVAL PRINCIPLES


ECOLOGIC IS APPROVED FOR THE SINCE 2006 IN THE EEE SECTOR

Purpose of an EO  
implementation of EPR  
(articles R541-86 to R541-132)

**Ecologic** has submitted  
its application to the  
administrative authority



The ministers responsible for the  
environment and the economy  
have given their opinion on our  
application for approval.

 **GOUVERNEMENT**  
*Liberté  
Égalité  
Fraternité*  
Ministère de la Transition écologique et de  
la Cohésion des territoires  
Ministère de la Transition énergétique

 **MINISTÈRE  
DE L'ÉCONOMIE  
DES FINANCES  
ET DE LA SOUVERAINETÉ  
INDUSTRIELLE ET NUMÉRIQUE**

**Ecologic** has set up a  
Stakeholder Committee in  
application of the law  
(article D541-90).

## OUR COMMITMENTS

- Commit to results on behalf of producers
- Guaranteeing a healthy supply chain

## OUR OBLIGATIONS

- Commitment to qualitative and quantitative targets
- Transparency obligations
- Continuous improvement
- **Transfer of responsibility**

Approval in progress 2022-2027



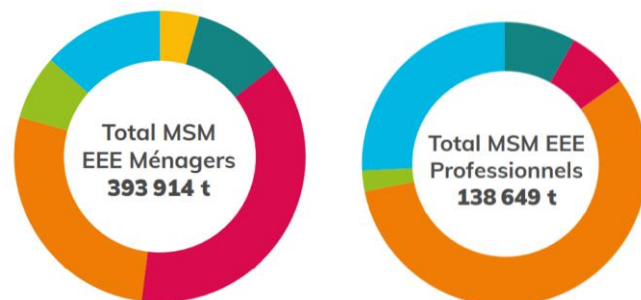
# ECOLOGIC'S MISSIONS

- 1 Ensuring compliance
- 2 Proposing collection solutions
- 3 Promoting prevention
- 4 Ensuring performance
- 5 Supporting sustainability



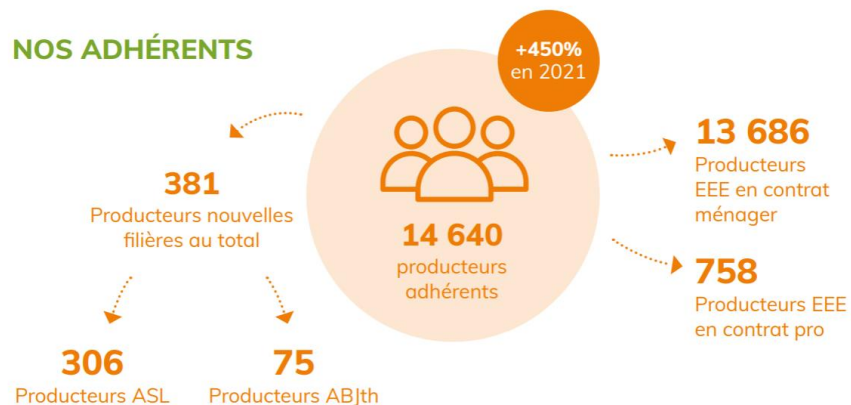
# 2022 KEY FIGURES

## LES ÉQUIPEMENTS MIS SUR LE MARCHÉ PAR NOS ADHÉRENTS



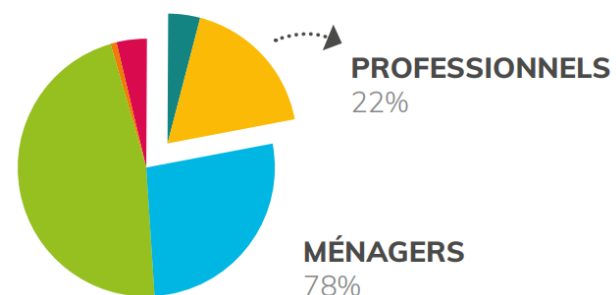
Total EEE : **532 563 t** (431 095 901 unités)

## NOS ADHÉRENTS



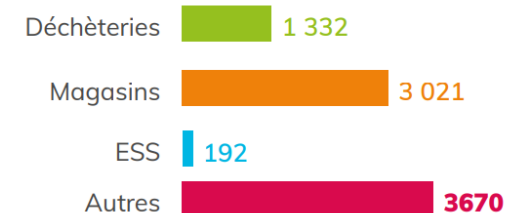
**257 218 t**  
EEE collectées dont **5 440 t**  
collectées dans les DOM

Parts des tonnes EEE collectées  
par types de canal

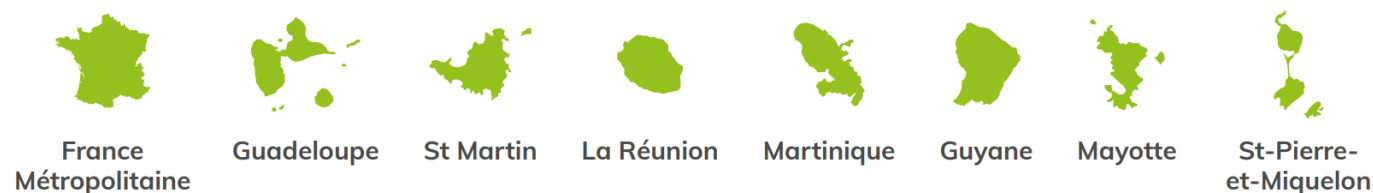


## LES CANAUX DE COLLECTE

Nombre de points de collecte répartis  
par types de canal  
Total : **8 215 PDC**



## NOS TERRITOIRES DE COLLECTE



03.

# WEEE GENERATED AND COLLECTION BEHAVIOR

# WEEE GENERATED - METHODOLOGIES

**Common method**, which is the one recommended by the European Commission for the calculation of the WEEE generated, described in the implementing Regulation (EU) 2017/699. According to this method, WEEE generated is calculated based on the quantities of equipment put on market (POM) historically and the total holding time of this equipment <sup>8</sup>(also called *sales-lifespan method*)

$WG\ 2019 = \text{Historical POM} \times \text{total holding time}$

Points of consideration:

- Requires a comprehensive and reliable database of historical POM
- Total holding time must take into account hibernation and domestic reemployment
- Not very sensitive to short-term socio-economic fluctuations

**Method based on the share of annual POM allocated to equipment replacement**

$WG\ 2019 = \text{POM}\ 2019 \times (\text{share of POM allocated to equipment replacement})$

Points of consideration:

- Does not take into account disposals without replacement
- Sensitive to changes in unit weight

**Stock renewal rate method** (also known as the leaching method)

$WG\ 2019 = \text{Stock}\ 2019 \times (\text{share of stock renewed annually})$   
 $= \text{Stock}\ 2019 / \text{average total holding time}$

Points of consideration:

- Unreliable for equipment with growing/decreasing stock
- Sensitive to changes in unit weight
- Total holding time must take into account hibernation and domestic re-use

**Method based on the annual evolution of the stock** (also called the time-step method)

$WG\ 2019 = \text{POM}\ 2019 - (\text{Stock}\ 2019 - \text{Stock}\ 2018)$

Points of consideration:

- Requires annual quantification of the stock
- Very sensitive to relatively small fluctuations in the estimated stock

**Method based on extrapolation of consumer survey results**

$\text{Household WG}\ 2019 = \text{Reported annual disposal rate} \times \text{number of households (example)}$

Points of consideration:

- Considered little reliable due to many possible biases (representativeness of the sample, understanding of the questions, bases for extrapolation, etc.)

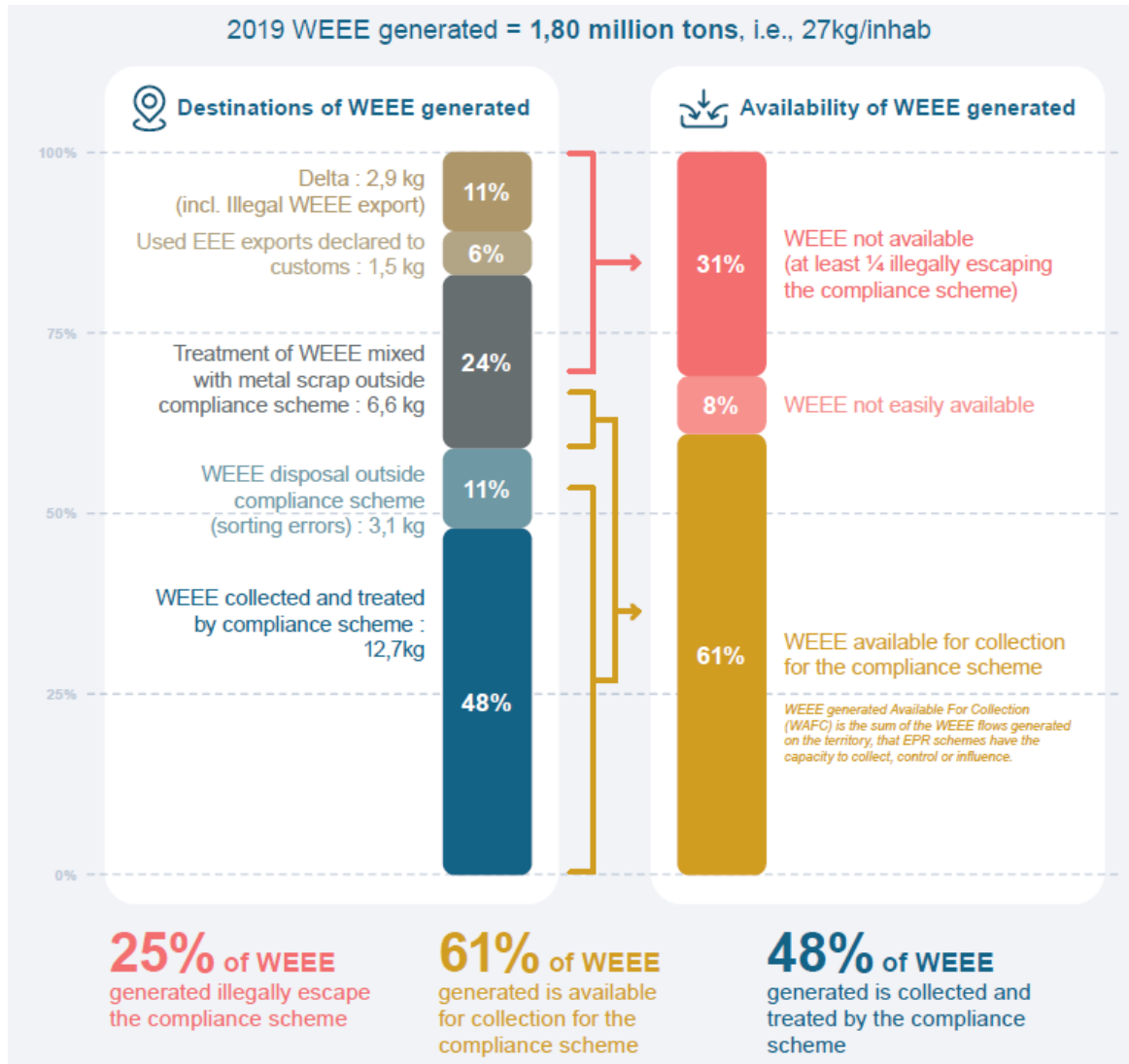
- 4 « top-down » methods
- 1 bottom-up method (+ measurements in-situ)

Feasibility depends on robust data → 1<sup>st</sup> step!  
Especially for a new EPR sector





# WEEE GENERATED – FRANCE 2021



Collection targets not met

→ 1/4 of WEEE at “[scrap dealers](#)”

→ 1/8 of WEEE: [exported](#)

→ 1/8 of WEEE: [disposed of](#)

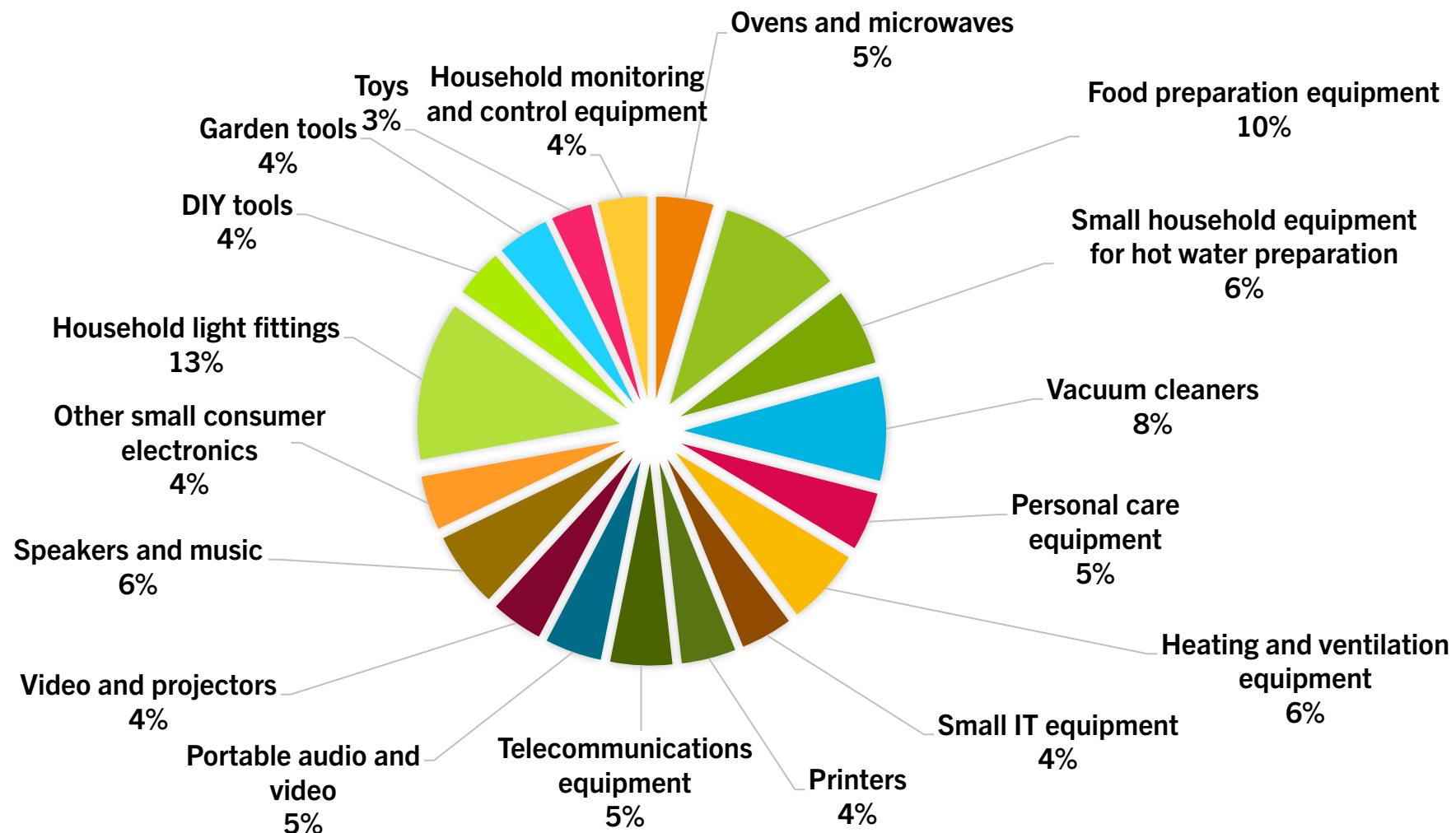
• 48% collection in 2019, 60% in 2024, mainly thanks to GDDs

• New calculations in progress (new WEEE directive on-going)



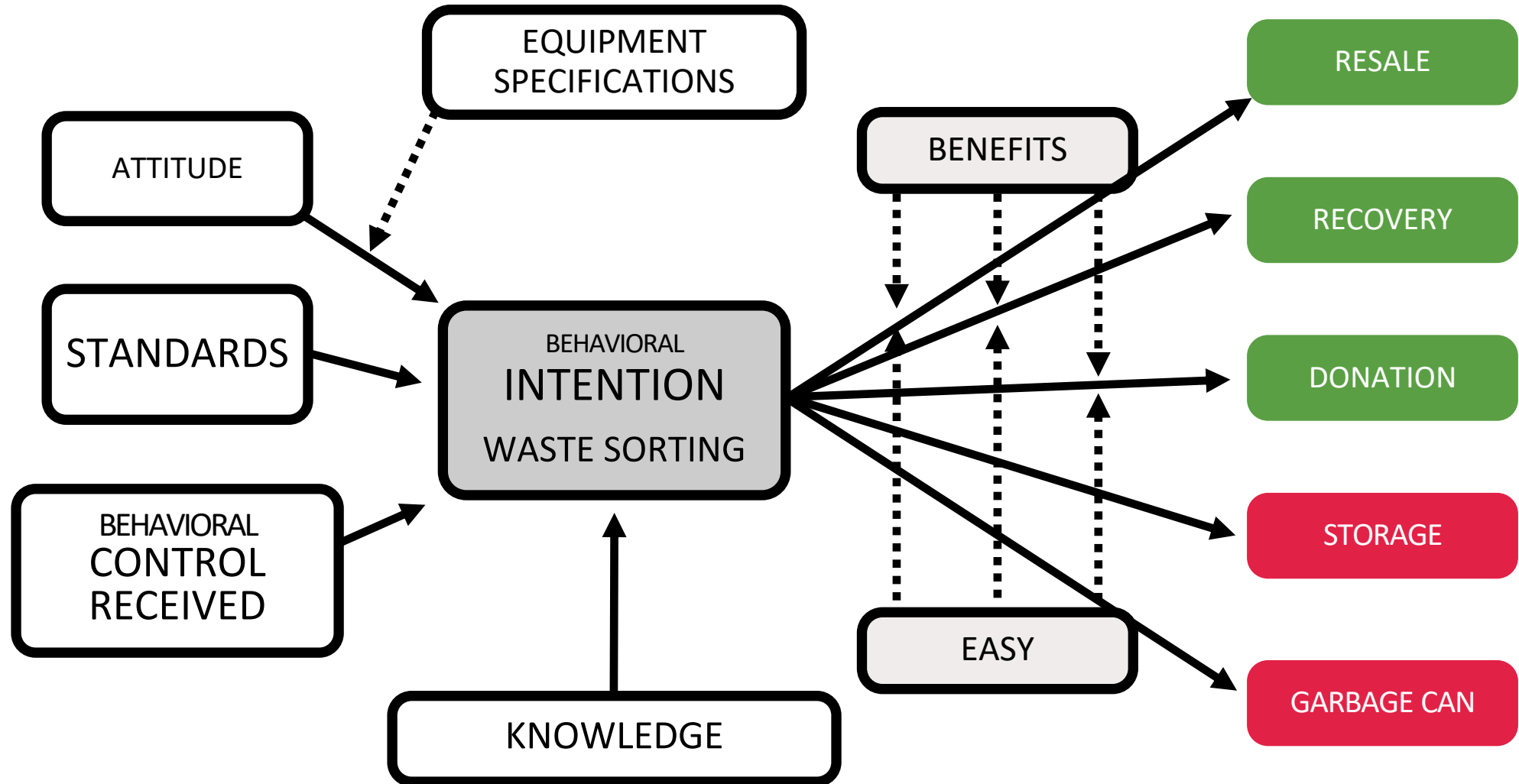
# ELECTRICAL AND ELECTRONIC EQUIPMENT

## COMPOSITION OF SMALL MIXTURES



# BEHAVIORAL MODEL FOR SORTING DEEE

BY ECOLOGIC IN 2022



# BEHAVIOR - REPAIR



## STATE OF THE ART IN THE SCIENTIFIC LITERATURE: RECOMMENDATIONS

- 1. Reduce perceived** repair costs (repair act, tools or parts).  
Offer tools, spare parts or repair tutorials. The overall price of repair also has an overall impact on behavior adoption.
- 2. Simplify** repair processes.  
Simplify repair, access to spare parts, access to help, reduce time spent preparing the repair (including the time it takes to receive parts).
- 3. Raising consumer awareness at the point of purchase.**  
A product doesn't stay new forever. They need to be maintained and repaired, or have them repaired. Raising awareness can be as much about environmental issues as about economic ones.
- 4. Promote a repair culture.**  
Encourage the creation of repair communities, such as Repair Cafés, where individuals can learn and share repair skills. The community aspect can have an impact, not least by creating a social norm.
- 5. Financial incentives.**  
Financial incentives or tax rebates can work. To be used as a complement to a campaign, not as the main argument.





# BEHAVIOR = CHARITABLE GIVING

## STATE OF THE ART IN THE SCIENTIFIC LITERATURE: RECOMMENDATIONS

### 1. Reassurance :

- Proving that we don't make money on people's backs
- Put forward any element of credibility

### 2. Playing on social norms and social desirability :

- Showing the action or attitude of majority groups
- Highlighting beneficiaries and the visibility of the donation

### 3. Raising awareness

- Environmental impact
- On social impact

### 4. Bringing personal values to life in communications



04.

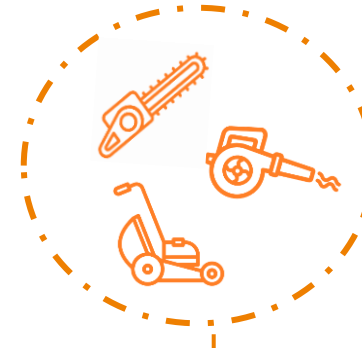
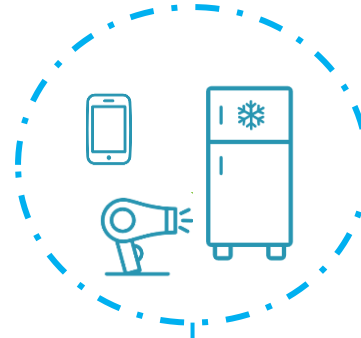
# OPERATIONAL ORGANIZATION OF WEEE EPR IN FRANCE



# ACTIONS EXPECTED OF WASTE HOLDERS

## 1 Good sorting

Don't put it in the household garbage or packaging, or leave it on the sidewalk...



## 2

Drop off at collection points or use the services of the eco-organization



**Waste collection centers** run by local authorities



**Retail outlets**



**Other points** (bins, practice areas)



**Players in the Social and Solidarity Economy (SSE)**



**Companies and administrations**



**Waste manager**

**NETWORK OF COLLECTION POINTS FOR THE GENERAL PUBLIC**

**SERVICES FOR PROFESSIONALS**

**e-dechet**  
la solution d'Ecologic

**e-réemploi**  
un service d'Ecologic

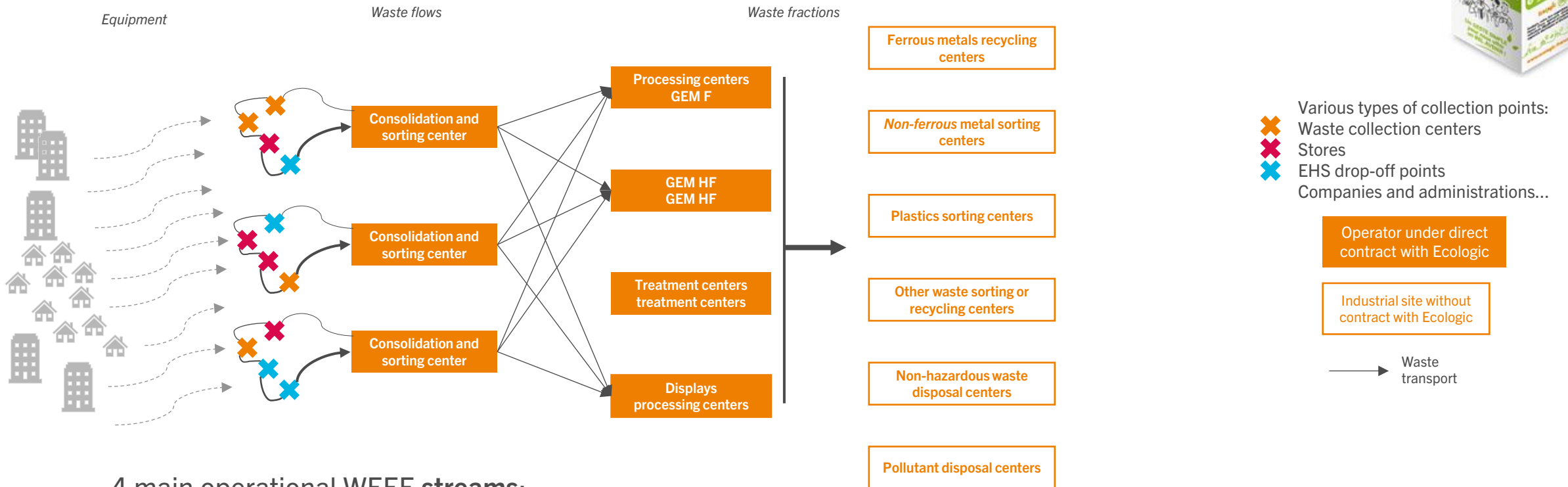


**Transport to collection and treatment centers**



# ORGANIZATION OF THE SYSTEM

## GENERAL DIAGRAM - FROM COLLECTION POINTS TO FIRST PROCESSING CENTERS



### 4 main operational WEEE streams:

GEM F - refrigerators and air conditioners

GEM HF - large household appliances other than refrigerators and air conditioners

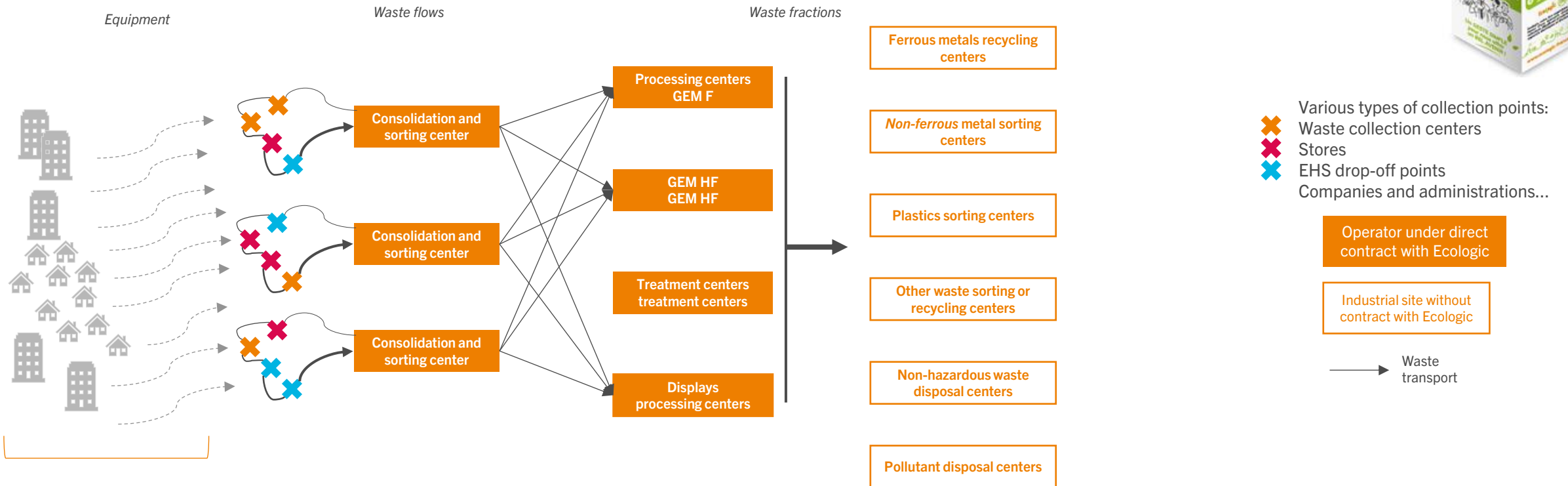
Displays - over 100 cm<sup>2</sup>, including laptops and tablets, as well as cathode ray tubes

PAM - all other electrical equipment sold to households (vacuum cleaners, telephones, computers, toasters...)



# ORGANIZATION OF THE SYSTEM

## GENERAL DIAGRAM - FROM COLLECTION POINTS TO FIRST PROCESSING CENTERS

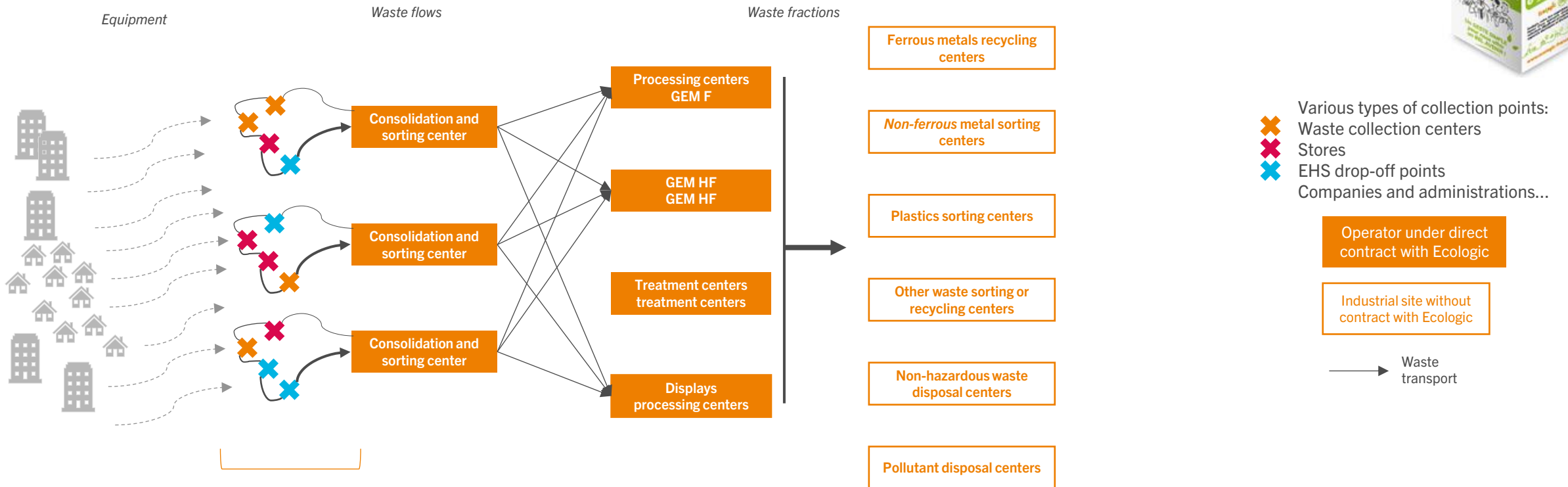


Highly dispersed: ~30kg/capita/year in France



# ORGANIZATION OF THE SYSTEM

## GENERAL DIAGRAM - FROM COLLECTION POINTS TO FIRST PROCESSING CENTERS



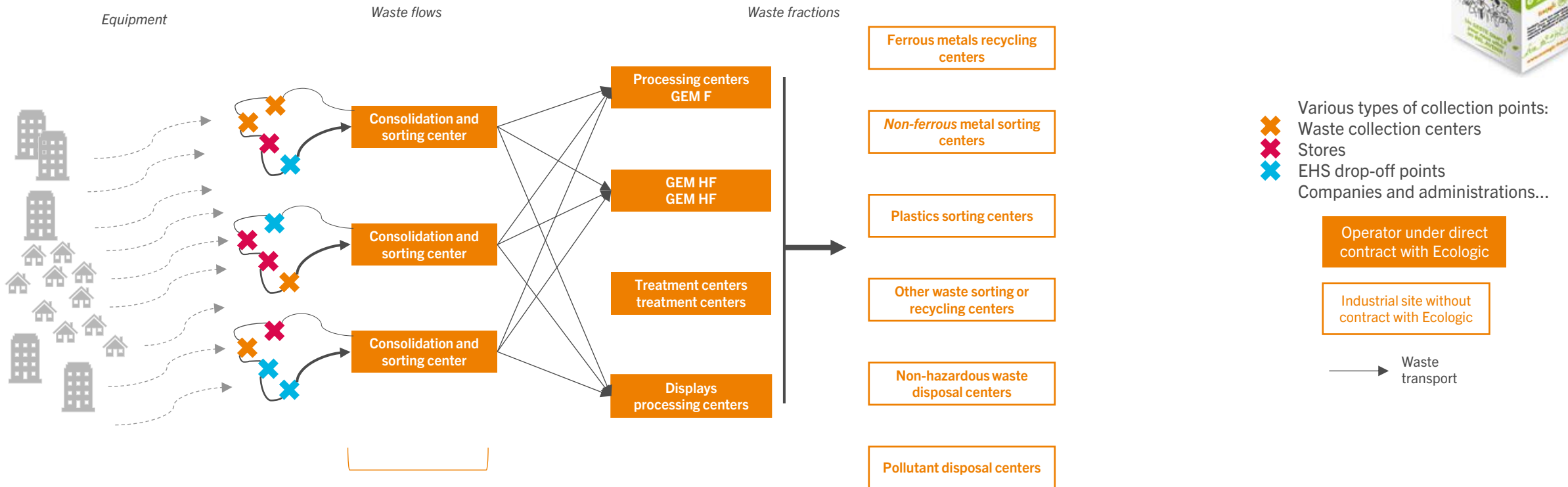
Collection solutions throughout France  
Extensive territorial coverage  
Collection point : guide consumers to the right *bin* for their waste

Different **collection channels**, adapted to holders and waste types



# ORGANIZATION OF THE SYSTEM

## GENERAL DIAGRAM - FROM COLLECTION POINTS TO FIRST PROCESSING CENTERS

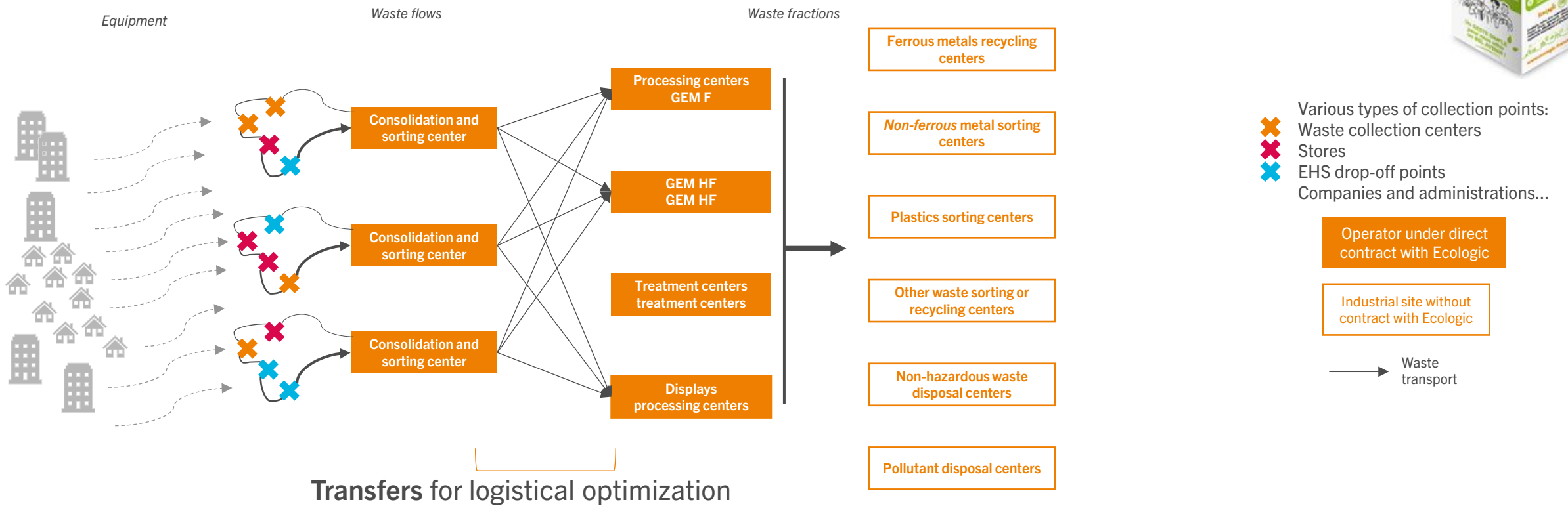


~ 1 Sorting Center for 3 départements  
**Collection** from collection points  
**Consolidate** for logistical optimization  
**Sort** to correct errors



# ORGANIZATION OF THE SYSTEM

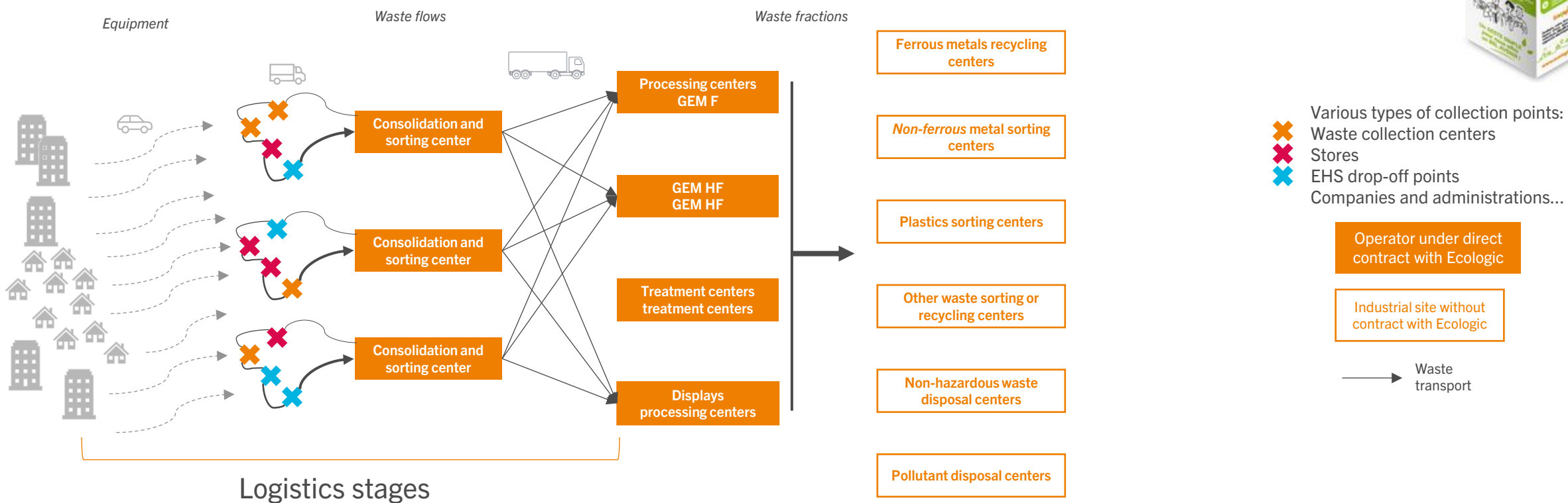
## GENERAL DIAGRAM - FROM COLLECTION POINTS TO FIRST PROCESSING CENTERS





# ORGANIZATION OF THE SYSTEM

## GENERAL DIAGRAM - FROM COLLECTION POINTS TO FIRST PROCESSING CENTERS

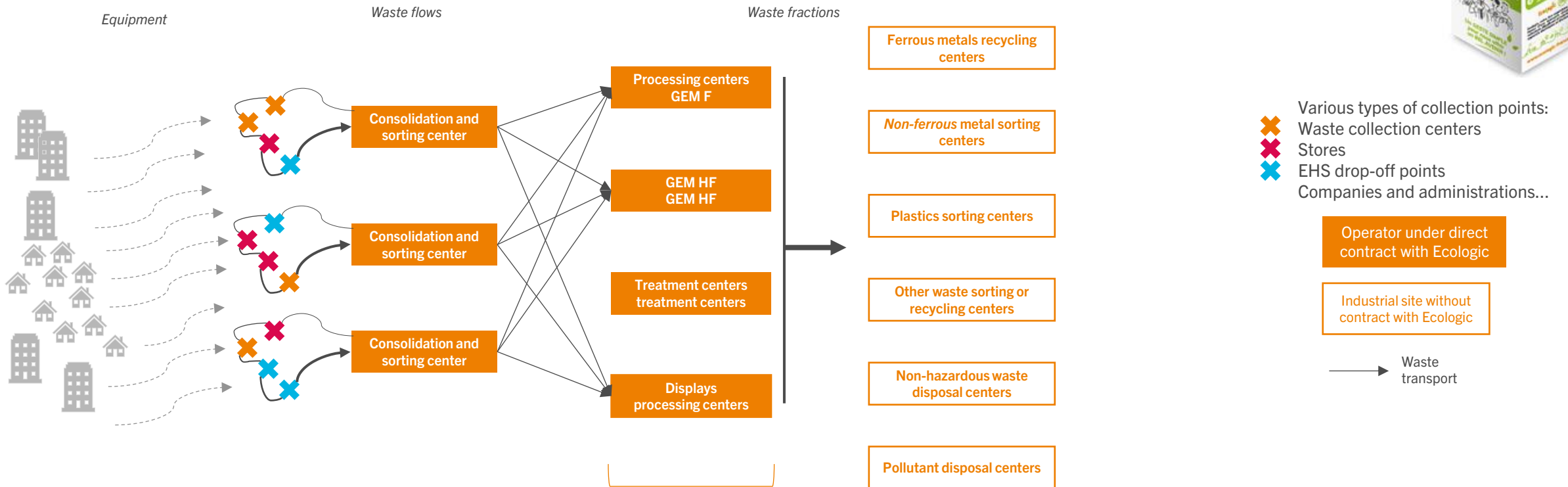


Main costs of the sector and of waste management in general



# ORGANIZATION OF THE SYSTEM

## GENERAL DIAGRAM - FROM COLLECTION POINTS TO FIRST PROCESSING CENTERS

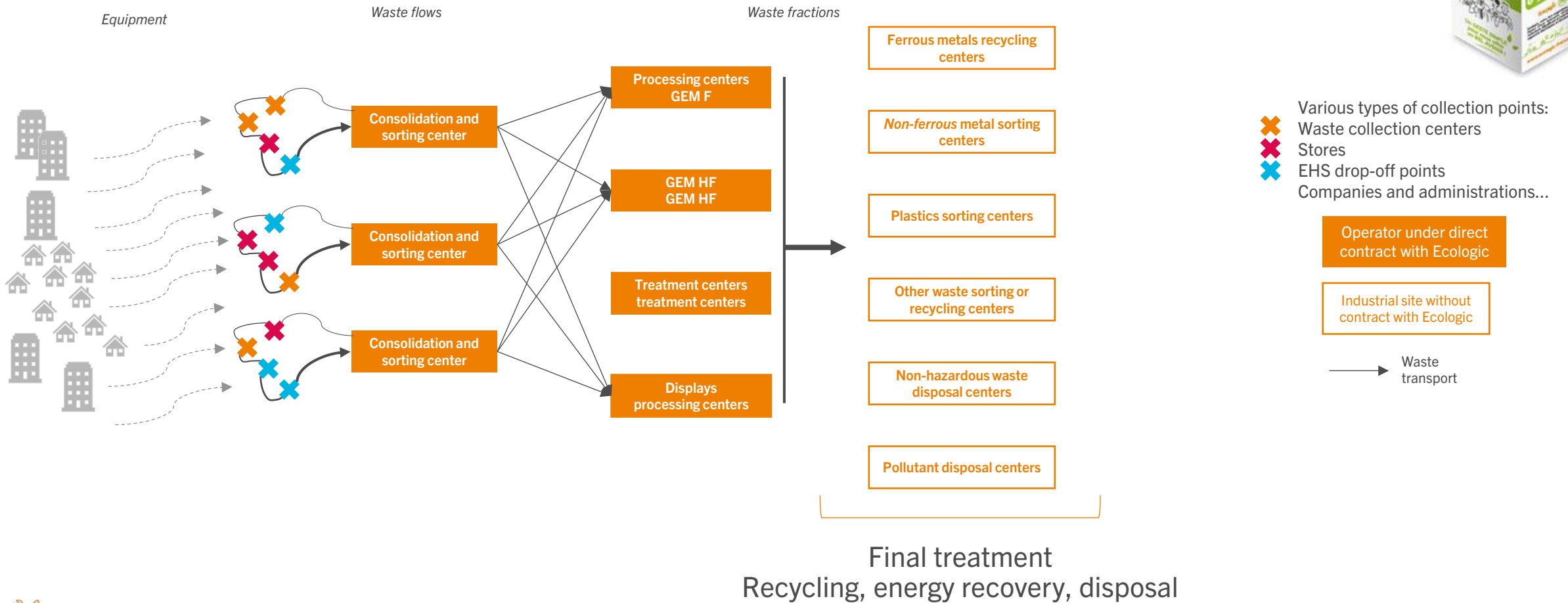


Initial treatment phases :  
Preliminary depollution, removal of undesirable materials, followed by  
Automated size reduction and separation of materials



# ORGANIZATION OF THE SYSTEM

## GENERAL DIAGRAM - FROM COLLECTION POINTS TO FIRST PROCESSING CENTERS

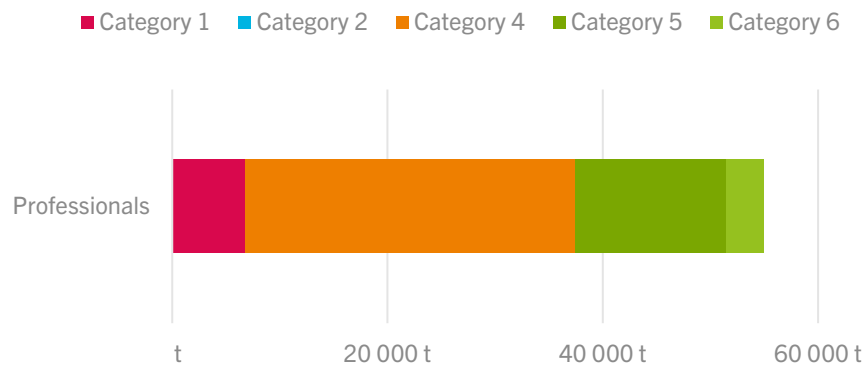
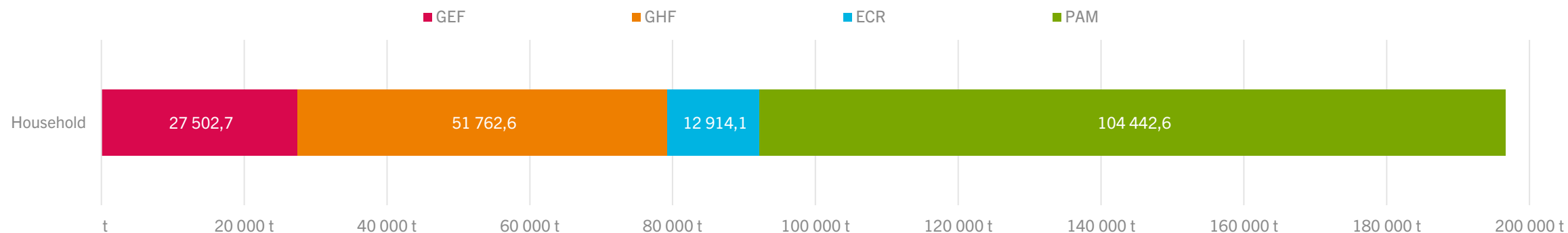


05.

# TREATMENT PROCESSES OF WEEE IN FRANCE

# ELECTRICAL AND ELECTRONIC EQUIPMENT

## PROCESSED BY ECOLOGIC IN 2022



### 4 to 5 main operational flows of WEEE :

Cat 1: GEM F (CFA) - refrigerators and air conditioners

Cat 4: GEM HF (LHA) - large household appliances

(dishwashers, washing machines, ovens...)

Cat 2: Displays - over 100 cm<sup>2</sup> in size

including laptops and tablets, and still cathode ray tubes

Cat 5 PAM (SHA)- all other electrical equipment sold to households

(vacuum cleaners, toasters...)

Cat 6: SHA IT: small IT and telecommunications equipment

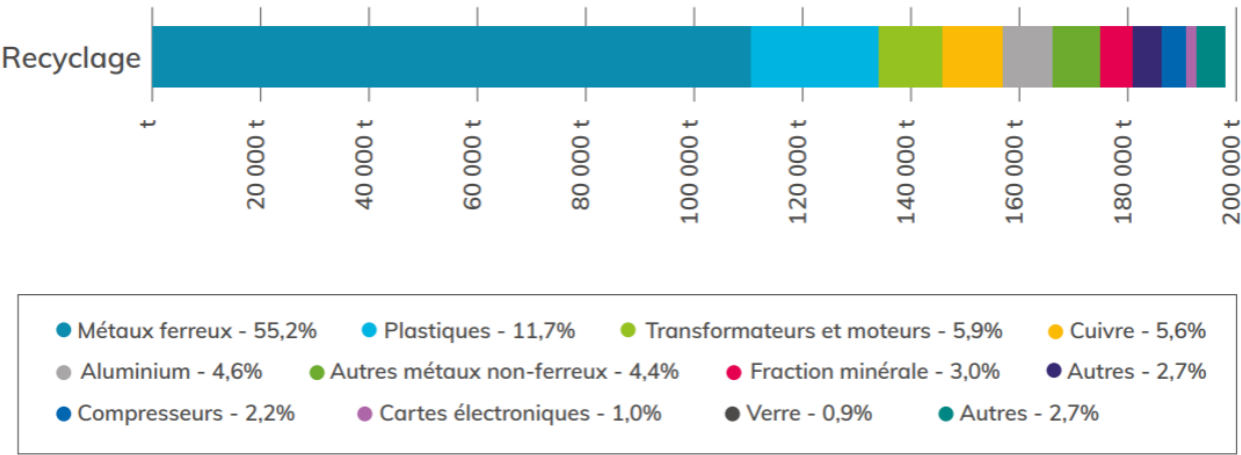
(telephones, printers...)



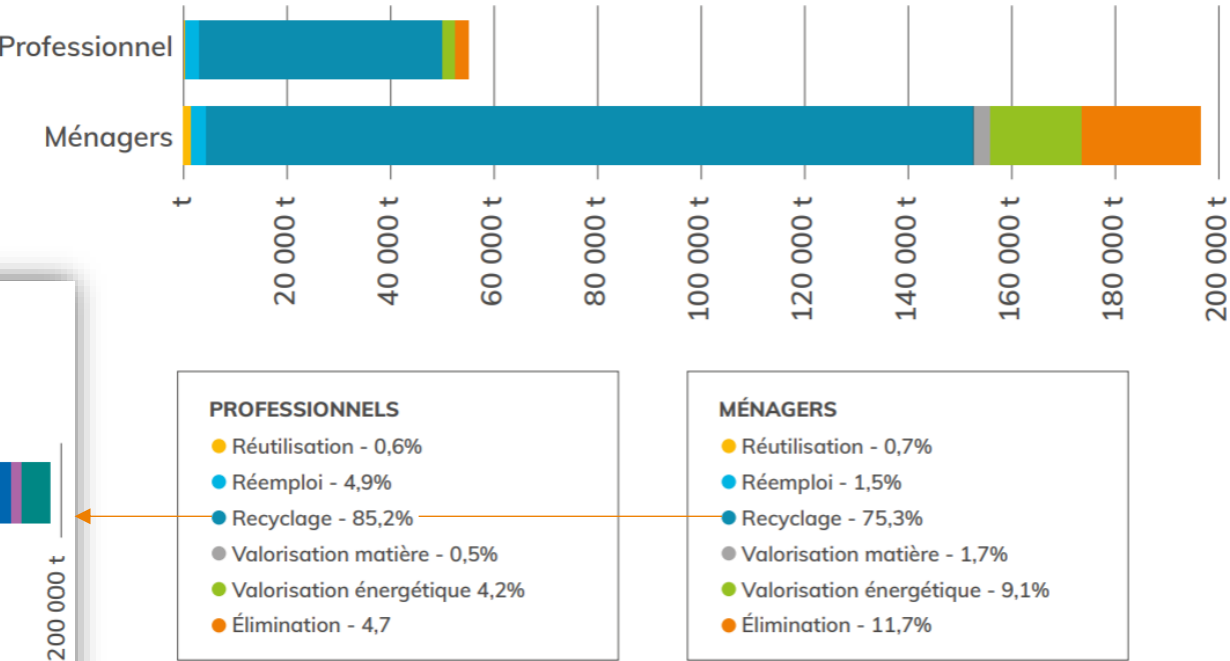
# INDUSTRY CHALLENGES

## THE RESULTS

BILAN EN MATIÈRE EEE



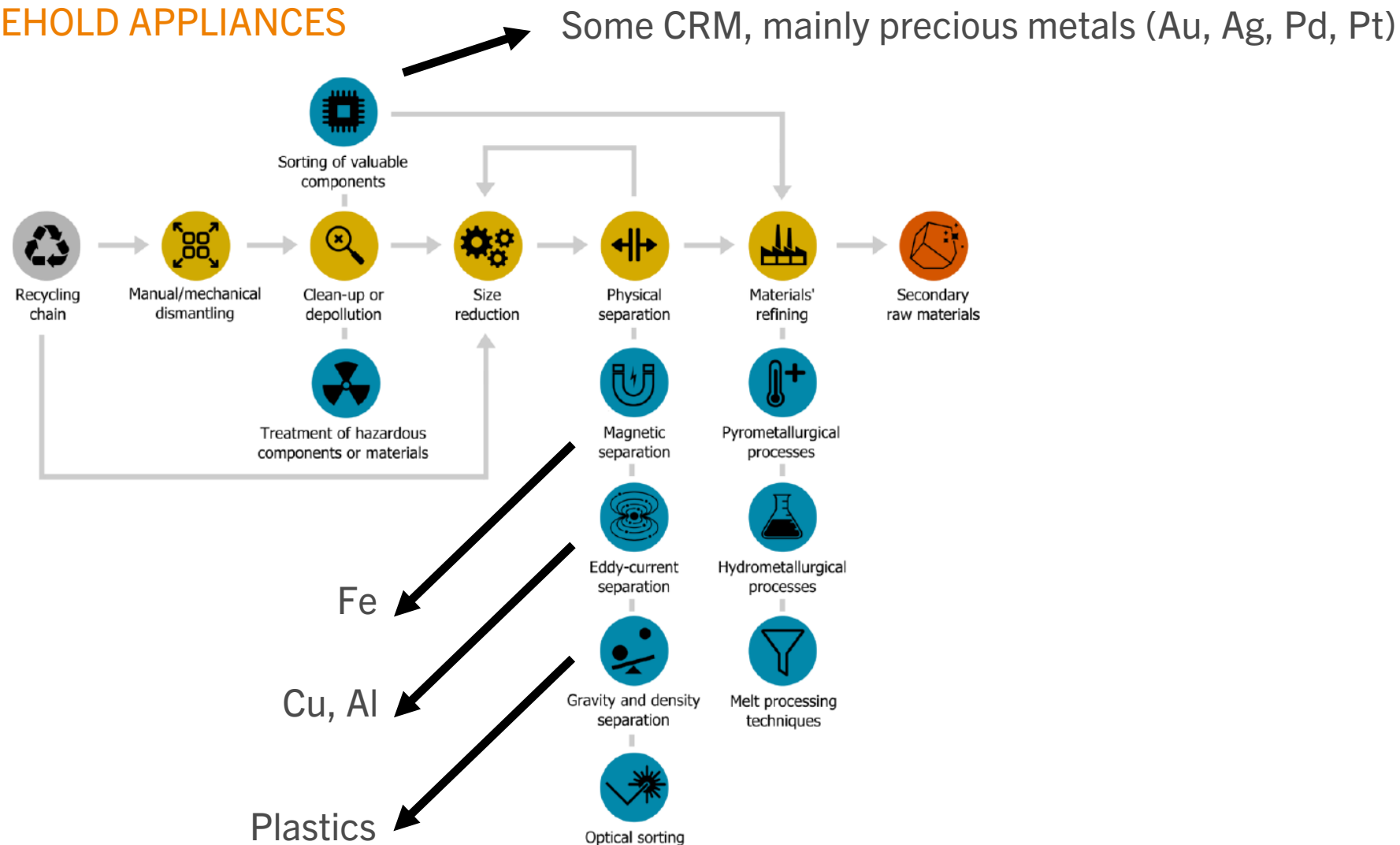
BILAN DES DIFFÉRENTS TRAITEMENTS DES EEE





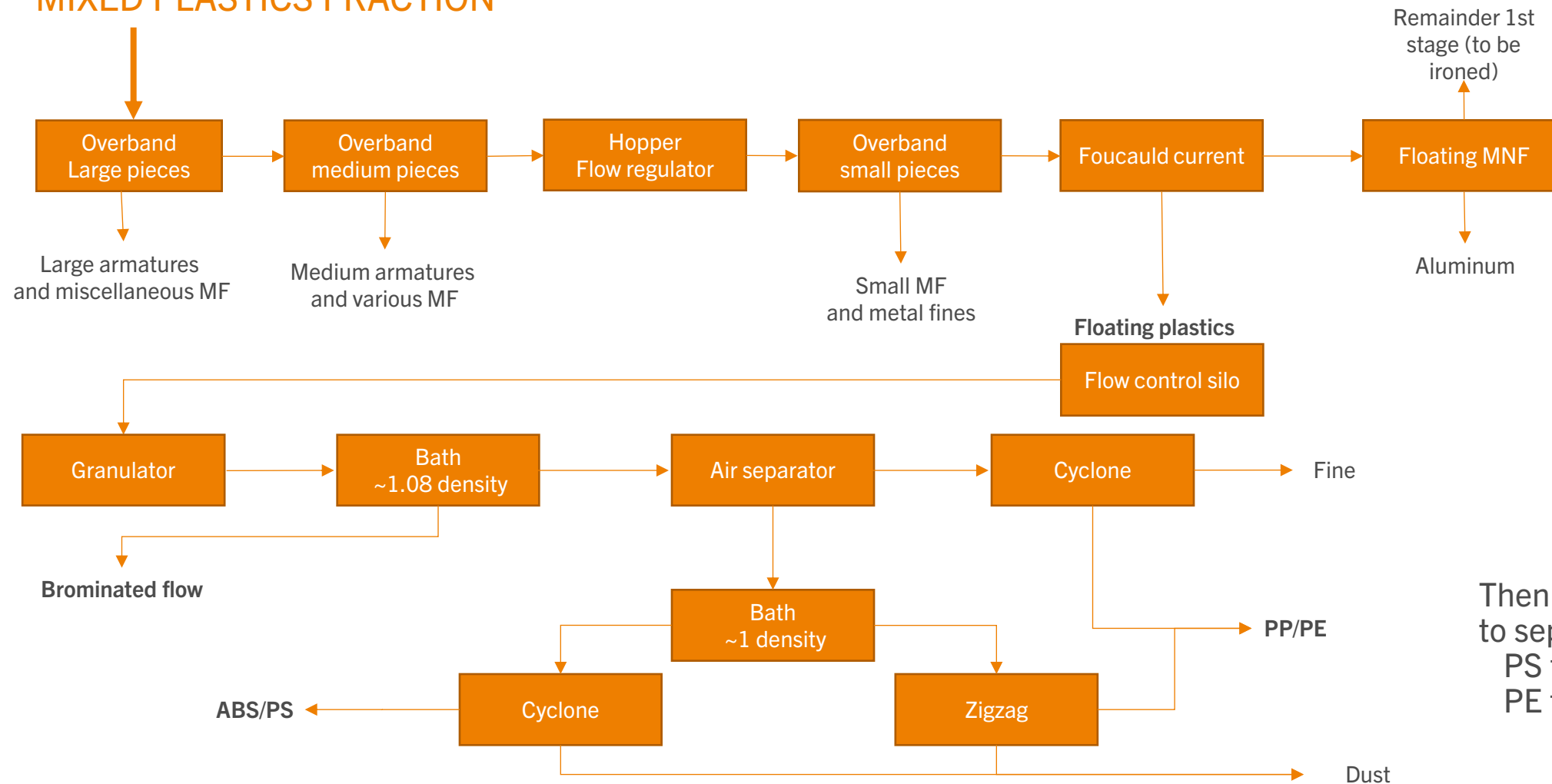
# DETAILED TREATMENT

## EXAMPLE OF SMALL HOUSEHOLD APPLIANCES



# DETAILED PROCESSING

## MIXED PLASTICS FRACTION



Then triboelectric sorting to separate :  
PS from ABS  
PE from PP





EcoLogic



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Manager

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