

STUDY ON THE QUANTIFICATION OF WASTE OF ELECTRICAL AND ELECTRONIC EQUIPMENT (WEEE) IN FRANCE

HOUSEHOLD AND SIMILAR WEEE ARISING AND DESTINATIONS

December 2013

A study carried out on behalf of ADEME and OCAD3E
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FINAL REPORT

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SUMMARY

The European Commission's revision of the WEEE Directive introduced new collection targets by 2019: the minimum collection rate to be achieved annually should be 65% of the average weight of EEE placed on the market in the three preceding years in the Member State concerned (which in the case of France should be equal to 14.9 kg per inhabitant annually, including the photovoltaic panels, and based on the WEEE put on the market in 2012) or alternatively 85% of WEEE generated on the territory of that Member State.

Given that these collection targets are very ambitious, better knowledge of potential household and similar WEEE arising is necessary. Even though the quantities of electrical and electronic equipment put on the market (e.g. number of units and weight) are accessible in France thanks to the declarations made to the ADEME WEEE Register, there is no common methodology at the EU level which allows for WEEE to be evaluated at the level of a national territory such as that of France.

In this context, the OCAD3E (a certified co-ordinating body of WEEE and a common platform for four authorised WEEE Compliance Schemes, which connects local authorities with WEEE Compliance Schemes and supervises the overall WEEE stream) and the French environment and energy management agency ADEME commissioned the present study at the end of 2012 in order to answer the following questions:

1. What quantity of household and similar WEEE is generated in France?

The evaluation scope covers household WEEE as defined by the Directive 2012/19/EU:

- WEEE generated by private households, collected in five flows: cooling household appliances (cooling LHA), other large household appliances (non cooling LHA), screens, mixed small household appliances (SHA) and lamps.
- WEEE which comes from commercial, industrial, institutional and other sources which, because of its nature and quantity, is similar to that from private households (e.g. personal computers).

The declarations of collection and treatment of household WEEE which are made to the ADEME Register do not cover all WEEE arising. The present study aims to provide OCAD3E and ADEME with:

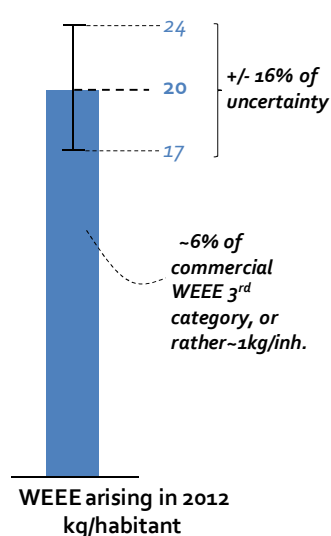
- **A first evaluation of the volume of WEEE arising**, calculated on the basis of the data made available by the Register and which was evaluated in 2012 between 17 and 24 kg/inhabitant and per year;
- **A tool to evaluate volumes of WEEE arising**, which can be updated in the future by integrating new sources of information to refine the estimations (especially of EEE lifespan and (W)EEE stocks in households).

2. How are the various flows of household WEEE divided up quantitatively and qualitatively in France?

The volume of WEEE collected via the network set up by WEEE Compliance Schemes is 6.9 kg/year/inhabitant, or 30 to 40% of estimated volumes of WEEE arising. The rest of the WEEE streams are either collected on public footpaths or directly from households. For example some collect WEEE and resell the appliances to scrap metal dealers by negotiating their price per kilo of

mixed scrap metal¹. In addition, a fraction of the waste stream which originates from selective collection is diverted from WEEE Compliance Schemes at local authorities' waste collection sites (theft and plundering) and distributors. Finally, used EEE (which contains some WEEE) and "whole" WEEE are exported legally and illegally.

The collection of the above-mentioned objective of 85%, with a volume of household and similar WEEE arising² evaluated at between 17 and 24kg/year/inhabitant, corresponds to a volume of 14 to 20kg/inhabitant. According to quantities declared by the compliance schemes to the ADEME Register, this represents more than double the annual collection of household WEEE, which was 6.9 kg per inhabitant (the equivalent of 35% of WEEE arising) in 2012. The present study allowed for the quantification of a share of the non-registered flows, documenting in total 60 to 80% of generated household and similar WEEE.



The non-collected parts of WEEE arising	
Non cooling LHA	62 to 69%
Cooling LHA	34 to 62%
SHA	73 to 81%
Screens	39 to 56%
TOTAL	59 to 71%

About 30% of WEEE arising, corresponding to 6.4 kg/inhabitant could not be documented or quantified by the study. As a matter of fact, approximately 19% of flows were not documented by the Dutch study³, 30% by the Belgian study⁴, and finally 37% of household appliances were not documented by the Italian one⁵.

3. Which action plans to achieve the collection targets?⁶

In order to address these three questions, it was necessary to have a better understanding of who are the actors collecting and recycling the WEEE flows. The organisation of these actors (operating legally or illegally) for collection, sorting, separation, reselling and recycling operations is illustrated in Figure 1.

¹ Mixed scrap metal is metal which can be shredded and which is sufficiently light to go through a shredding installation. This metal is different from clean irons which are almost all recycled by the factory where the products are manufactured; and from factory iron which passes through metal scrap negotiations. In this study, mixed scrap metal does not include end-of-life vehicles.

² Similar WEEE arising is WEEE which comes from commercial, industrial, institutional and other sources which, because of its nature and quantity, is similar to that from private households (e.g. personal computers).

³ Study made by UNU on behalf of Wecycle and ICT Milieu, 2011.

⁴ Study made by UNU and FFact Management Consultants on behalf of Recupel, 2012

⁵ Study made UNU on behalf of ECODOM, 2012.

WEEE flows in France

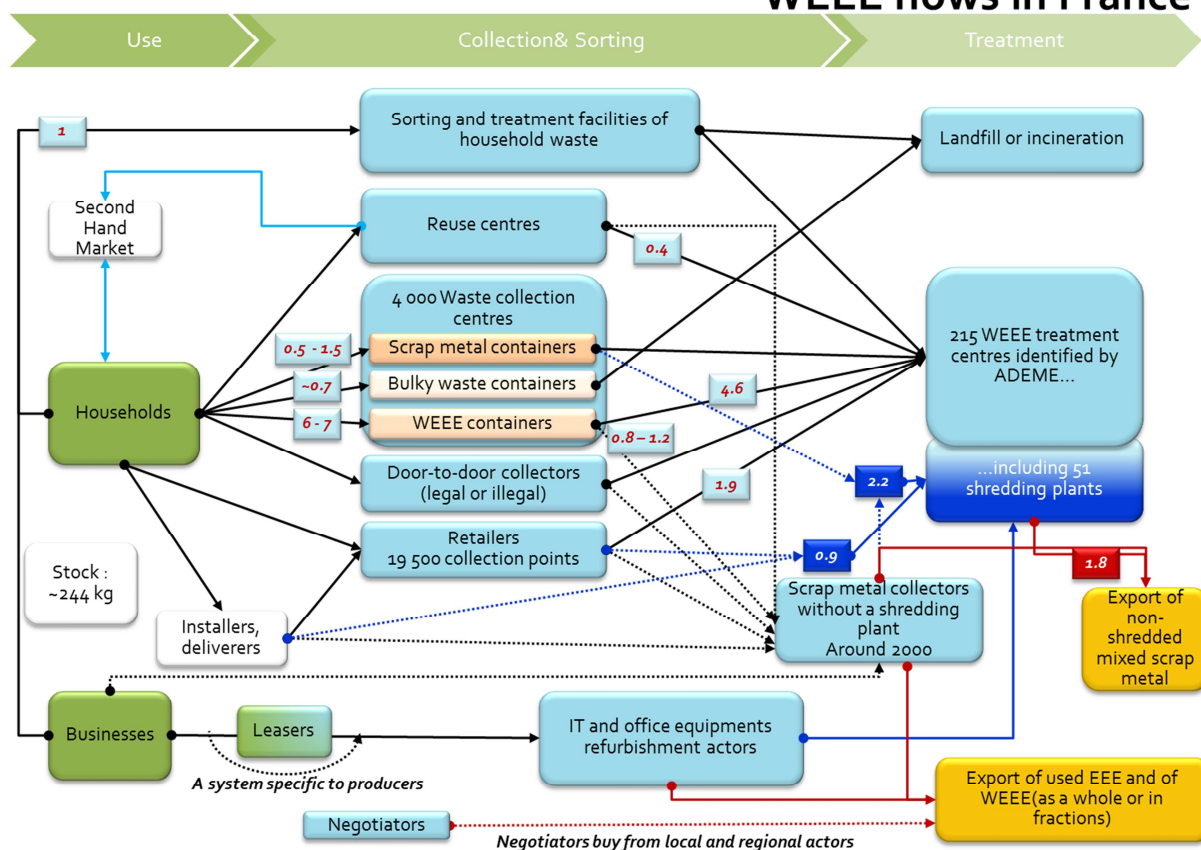


Figure 1 – An overview of WEEE flows from origins to treatment

I. VOLUMES OF WEEE ARISING

Summary: the evaluation of household and similar WEEE arising in 2012 is between 17 and 24kg/inhabitant, with a reference scenario of 20 kg/inhabitant. This is the result of a theoretical evaluation of WEEE arising following the UNU methodology. This chapter describes the model, the hypothesis and the data sources which were used for this evaluation. It also gives details of the results generated by the model, such as the EEE quantities placed on the market and the evaluated volume of WEEE arising.

I.1. PERIMETER, METHODOLOGY AND DATA SOURCES

I.1.1. PERIMETER

The perimeter of this evaluation covers household WEEE as defined by the Directive 2012/19/EU⁷. It therefore also covers WEEE which comes from private households and from commercial, industrial, institutional and other sources which, because of its nature and quantity, is similar to that from private households.

I.1.2. METHODOLOGY

In order to evaluate the volume of WEEE arising in France, this study uses a statistical model⁸ developed by the United Nations University (UNU)⁹. This model was previously used for similar research studies in the Netherlands¹⁰, Belgium¹¹ and Italy¹².

The UNU model gives a theoretical estimation of WEEE arising based on the types and quantities of EEE put on the market annually (units and weight) as well as their lifespan.

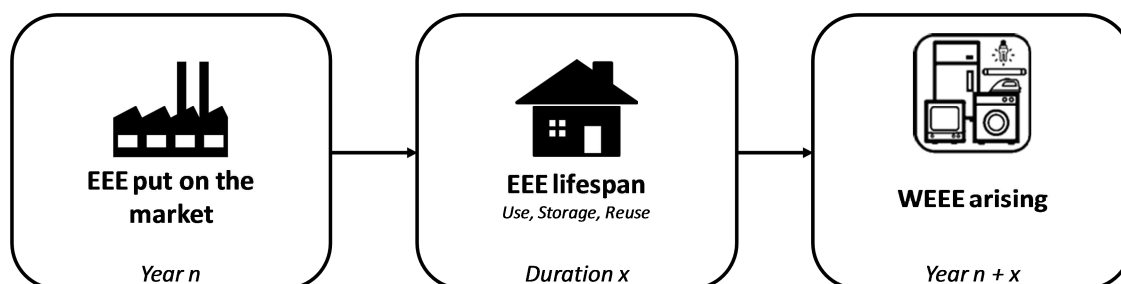


Figure 2 – Estimation of WEEE arising based on EEE put on the market and their lifespan

⁷ Directive 2012/19/EU OF the European Parliament and of the Council of 4 July 2012 on waste electrical and electronic equipment (WEEE), the Official Journal of the EU

⁸ Feng Wang, Jaco Huisman, Ab Stevels, Cornelis Peter Baldé "Enhancing e-waste estimates: Improving data quality by multivariate Input-Output Analysis", Waste Management, Available online 28 July 2013

⁹ www.unu.edu

¹⁰ Huisman, J., van der Maesen, M., Eijsbouts, R.J.J., Wang, F., Baldé, C.P., Wielenga, C.A., The Dutch WEEE Flows. United Nations University, ISP – SCYCLE, Bonn, Germany, March 15, 2012

¹¹ FFact Management Consultants, United Nations University – « Bilan de masse et structure du marché des (D)EEE en Belgique, Rapport final pour le compte de Recupel FFact Management », 2011

¹² F. Magalini et al, Household WEEE generated in Italy, United Nations University, 2012

For each UNU-key and for each year when EEE was put on the market, EEE lifespan is a statistical distribution expressed using a Weibull function. This function gives the probability that equipment put on the market in year n appears in WEEE arisings x years later (year $n+x$). It should be noted that the examined lifespan corresponds to the total lifespan of EEE, which takes into account the reuse of certain equipments or its storage in households.

By combining the data of electric and electronic equipments placed on the market with the statistical distribution of their lifespan, this model can evaluate WEEE arising (in volume and units) for specific equipment, as illustrated below.

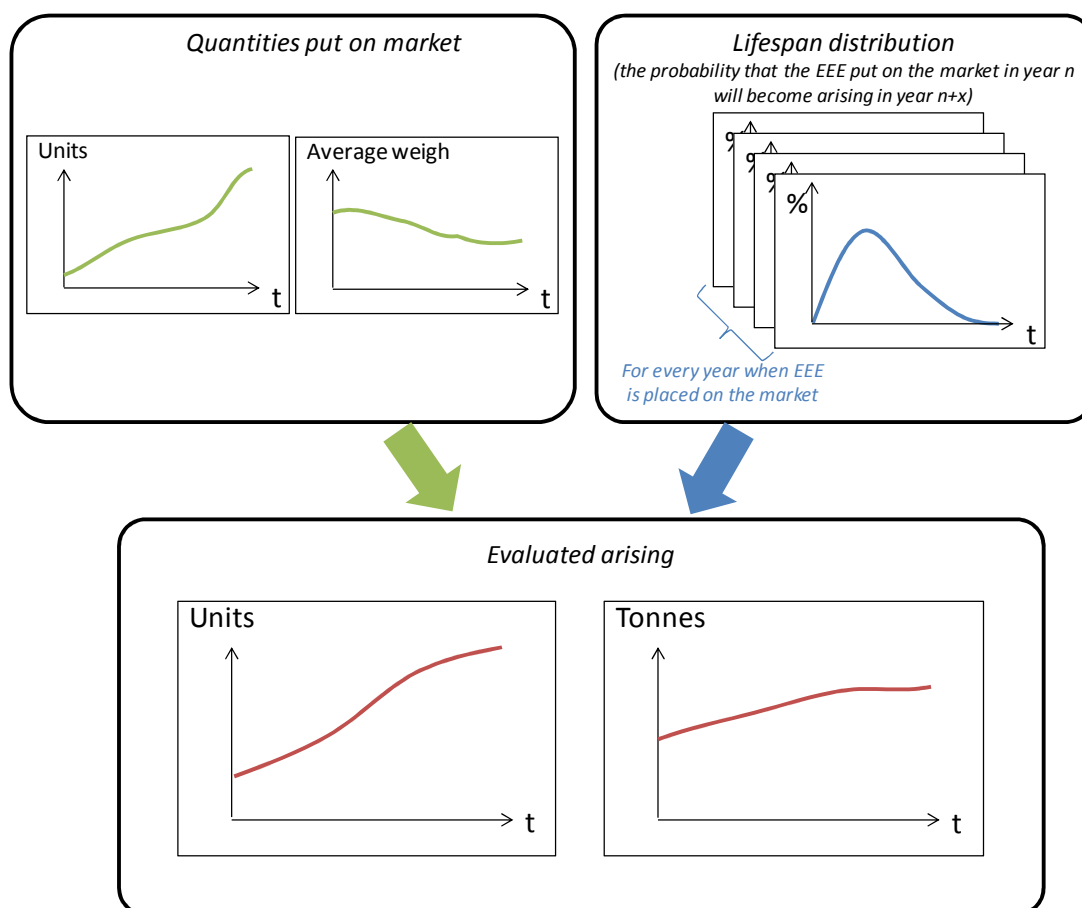


Figure 3 – Illustration of the UNU model for a given EEE

This method is applied to all EEE categories within the perimeter. EEE of similar nature are regrouped according to the 46 categories of household EEE identified by the UNU model.

The modelling of lifespan according to statistical distribution creates a smoothing effect for the evaluated arising, which can be visualised by comparing the curve of the EEE put on the market with the WEEE arising curve.

I.2. ENTRY DATA

■ EEE PUT ON MARKET

The data regarding EEE put on the market corresponds to the number of units put on the market each year. The main data source used in this study is ADEME's WEEE Register; for some equipment further data sources were needed such as federations of manufacturers, national¹³ or European¹⁴, as well as import-export data from COMTRADE¹⁵ developed by the United Nations.

As the Register included declarations from all the actors putting EEE on all the markets relevant for this study, this data source was preferred. The data extracted from the ADEME Register was used for most of the EEE categories examined by this study, corresponding to 88% of WEEE arising in 2012.

The Register's data is expressed according to a customs nomenclature called "SH4" and which does not provide the level of detail needed to link directly the declarations to the EEE typology used in the UNU model. In order to make better use of the Register's declarations, allocation factors were established using as a basis the data provided by Eco-Systèmes, declared in the nomenclature as "SH8" and which is more detailed than SH4.

The "EEE put on market" data, extracted from the Register, covers a short time span (2007-2012) compared to the average lifespan of some equipment. Therefore extrapolations were necessary for the periods of time not covered. In particular, historical extrapolations which date from before 2007 are very important as they have a direct impact on the actual WEEE arising. These historical extrapolations were created on the basis of the EEE put on market data coming from federations with historical data that can go back to 1987 (especially for dishwashers, ovens, washing machines, driers, refrigerators and freezers). Linear extrapolations were applied when federations lacked data, or for time periods which precede those covered by it. For equipment where this information was identified, the first put on market year was integrated to the historical extrapolation.

The impact of the different types of historical extrapolation (linear, logarithmic or exponential) on WEEE arising in 2012 was evaluated via a sensitivity analysis (Figure 3).

■ AVERAGE WEIGHT

As in the case of the EEE put on market, the EEE average weight data essentially comes from the declarations of the WEEE Register. Nevertheless, with respect to the period of time which is not covered by the Register, the evolution of the average weight used in the Dutch study **Erreur ! Signet non défini.** was applied.

Similarly, for the equipment categories which are not covered in the Register, data was extracted directly from the Dutch study.

The impact of the average weight variation in 2012 of WEEE arising was evaluated using a sensitivity analysis (Figure 3).

■ LIFESPAN

The UNU model uses the lifespan of different types of equipment as data input. This is described as the period of time between the moment that the equipment was bought to the moment when the last owner discards the appliance, regardless of its condition (functional or not). This includes the

¹³ SIMAVELEC (Syndicat des industries de matériels audiovisuels et électroniques) and GIFAM (Groupement interprofessionnel des fabricants d'appareils et d'équipement ménager)

¹⁴ EITO (European Information Technology Observatory)

¹⁵ United Nations Commodity Trade Statistics Database

possibility of its refurbishment, reuse and storage inside private households. In this model, lifespans are modulated in statistical distributions, meaning that some households will keep equipment more than others, as illustrated in Figure 2, p12.

In France, specific lifespans were provided by federations, for some equipment. However, these lifespans do not correspond to the total lifespan as they do not systematically take into consideration the potential “second life” of an appliance and therefore they cannot be integrated in the model. Because of this specific data gap for France, the lifespans identified by the Belgian study were used. The Belgian lifespans were calculated starting from a survey including several households and which covered the perimeter of the evaluation of WEEE arising.

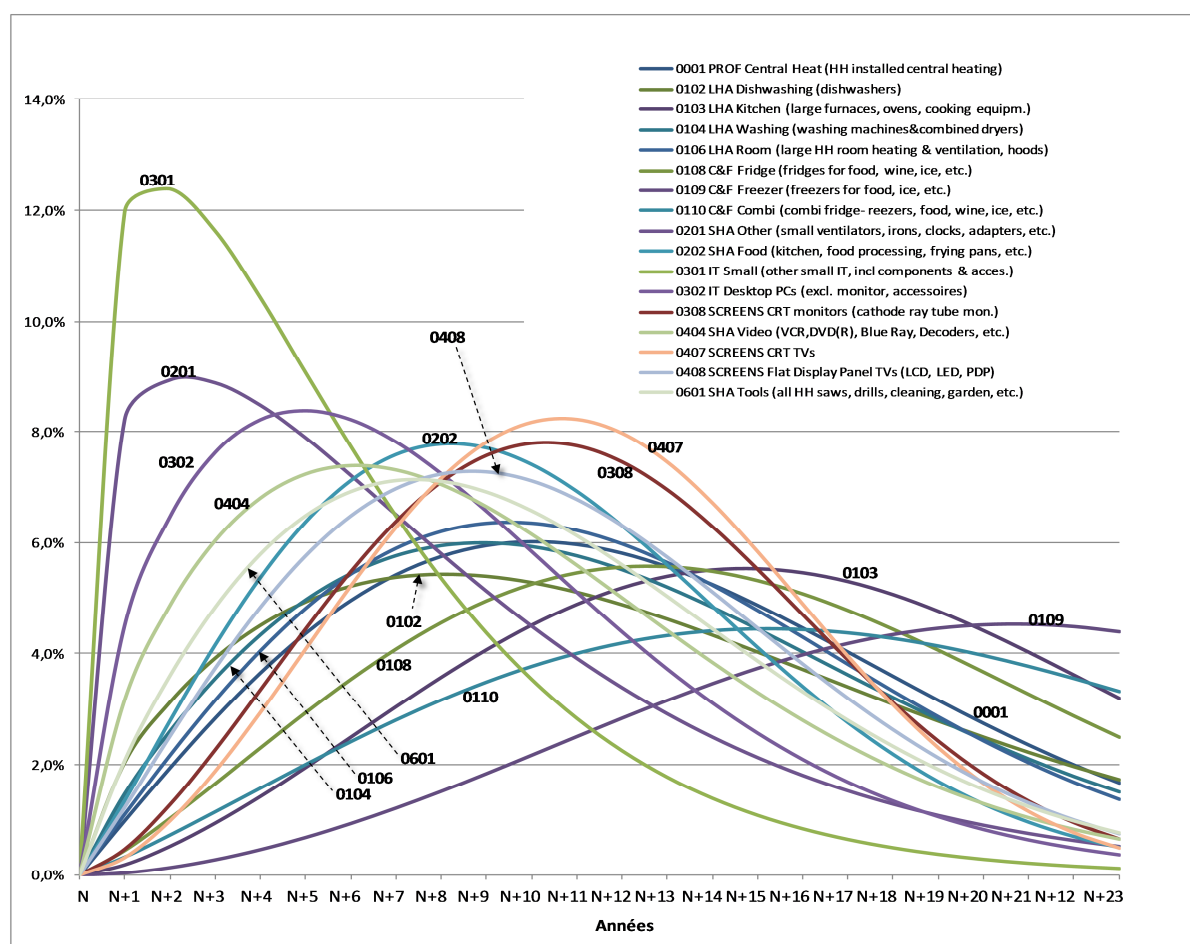


Figure 4 – Lifespan distribution for the main equipments put on the market in 2005

The influence of the lifespan variation on the WEEE arising in 2012 was evaluated via a sensitivity analysis (Table 3).

The parameters of the lifespan distribution are specific for each year of the EEE put on market and for each type of equipment. This allows the identification of the average change in household behaviour over time: some types of equipment will be kept more (or less) by households.

Nevertheless, it should be stressed that lifespan distributions do not take into account cyclical behavioural modifications which occur after the purchase of the equipment. For example:

- The influence of the economic crisis can delay the renewal of an appliance and lengthen its lifespan;

- The invention of new technologies replacing existing ones can incentivise households to dispose of their former technologies, for example during the transition from cathode-ray tube TVs to flat screen TVs.

In order to integrate these cyclical effects into the model, regular consumer behavioural studies are necessary in order to generate lifespan distribution parameters which reflect recent household behaviour.

1.3. RESULTS

1.3.1. VOLUMES OF EEE PUT ON MARKET

The four figures below illustrate the evolution of EEE put on market calculated by the model. Even though solar panels should be in the fourth category, they are presented separately because they have just recently been added to the revised WEEE Directive.

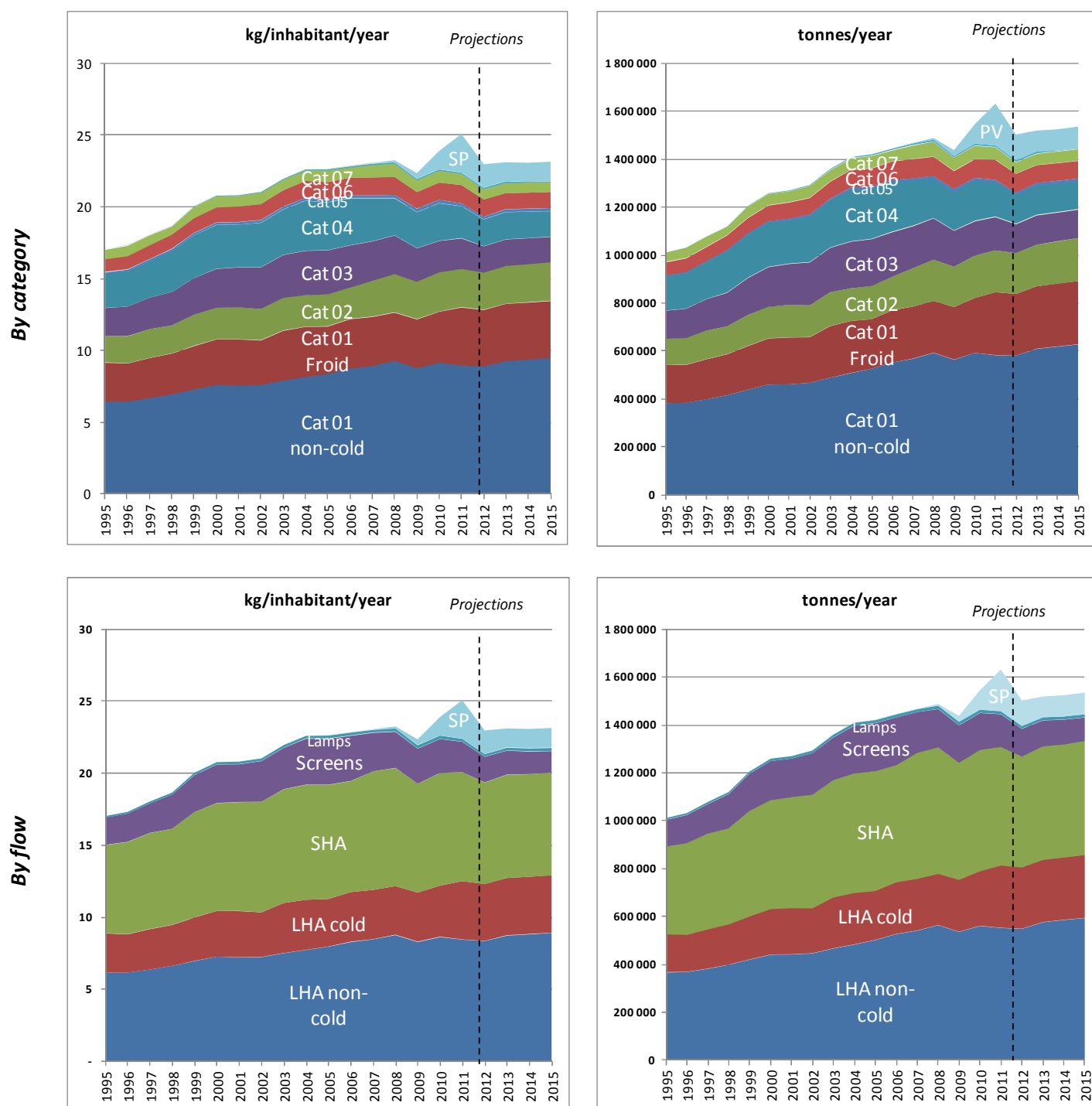


Figure 5 – Evolution of EEE put on the market, by category and flow

1.3.2. THE EVALUATION OF WEEE ARISING

■ FOCUS ON WEEE ARISING IN 2012

In 2012, the quantity of WEEE generated by households was evaluated between 17 and 24 kg/inhabitant, with a reference scenario of 20 kg/inh, approximatively 1 300 000 tonnes.

By excluding WEEE coming from ICT equipment and solar panels, the 2012 arisings are evaluated at 19 kg/inhabitant.

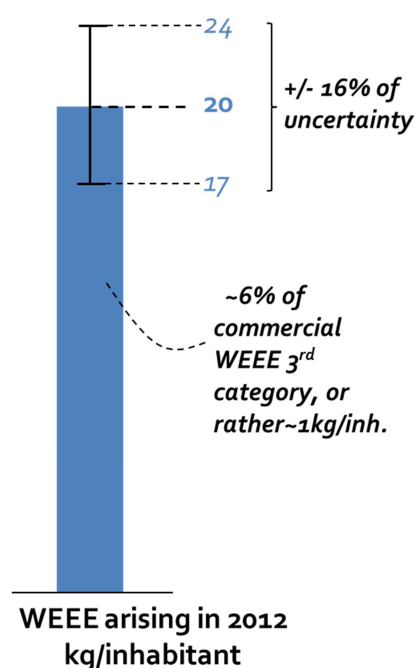


Figure 6 – Evaluation of household and similar WEEE arising in 2012

Table 1 – WEEE arising 2012, by category

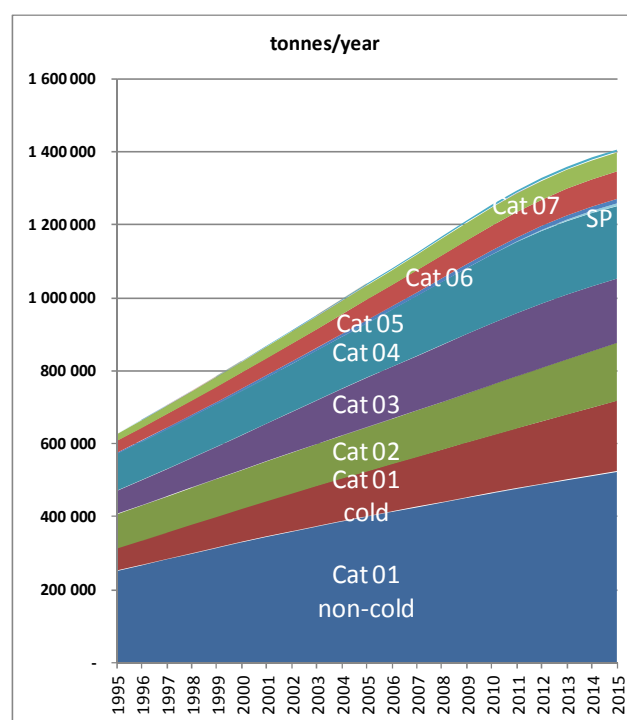
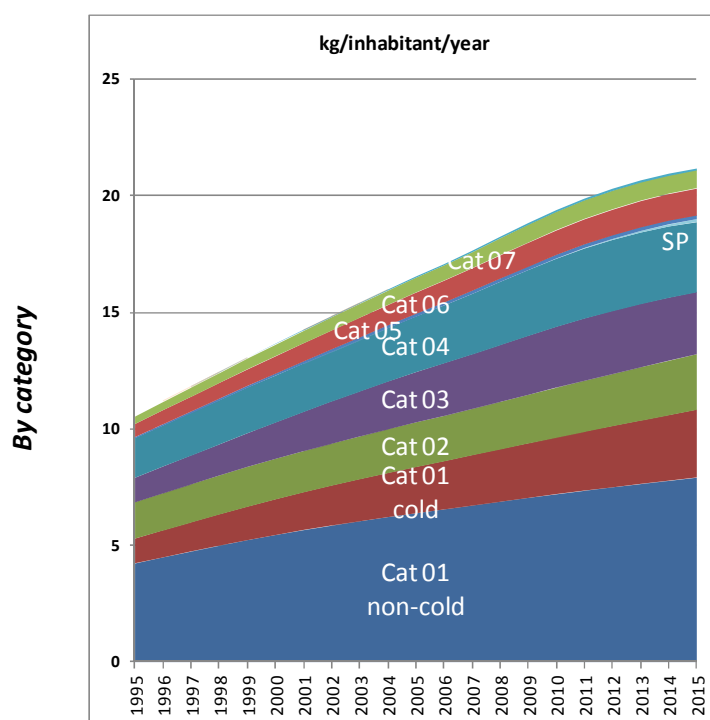
Categories	WEEE arising 2012 (kg/inhabitant)			WEEE arising 2012 (thousands of tonnes)			Contribution to WEEE arising 2012		
	Min	Ref	Max	Min	Ref	Max	Min	Ref	Max
Cat 01 non cooling	6.7	7.5	8.3	436	489	542	28%	37%	49%
Cat 01 cooling	1.9	2.6	3.3	126	172	217	8%	13%	20%
Cat 02	1.8	2.2	2.7	120	147	174	8%	11%	16%
Cat 03	2.1	2.7	3.2	140	176	212	9%	13%	19%
Cat 04	2.6	3.1	3.5	168	200	231	11%	15%	21%
Solar Panels	0.03	0.04	0.04	2	2	3	0,1%	0,2%	0.2%
Cat 05	0.15	0.18	0.20	10	12	13	0,7%	0,9%	1.2%
Cat 06	0.9	1.1	1.2	62	72	82	4%	5%	7%
Cat 07	0.7	0.8	0.9	44	52	60	3%	4%	5%
Cat 08	0.0	0.0	0.0	0.04	0,05	0.06	0.0%	0.0%	0.0%
Cat 09	0.1	0.1	0.1	5	6	7	0.3%	0.5%	0.6%
TOTAL	17	20	24	1 100	1 300	1 500		100%	

Table 2 – WEEE arising 2012, by flow

Flow	WEEE arising 2012 (kg/inhabitant)			WEE arising 2012 (thousands of tonnes)			Contribution to WEEE arising 2012		
	Min	Ref	Max	Min	Ref	Max	Min	Ref	Max
LHA non cooling	6.3	7.1	7.9	418	466	515	26%	35%	46%
LHA cooling	1.9	2.6	3.3	126	172	217	8%	13%	20%
SHA	5.9	7.3	8.6	389	475	560	25%	36%	50%
Screens	2.6	3.1	3.6	170	201	233	11%	15%	21%
Lamps	0.2	0.2	0.2	10	12	13	0.6%	0.9%	1.2%
Solar panels	0.0	0.0	0.0	2	2	3	0.1%	0.2%	0.2%
TOTAL	17	20	24	1 100	1 300	1 500	100%		

■ EVOLUTION OF GENERATED WEEE

The figures below illustrate the evolution of WEEE arising over time, by category and by flow.



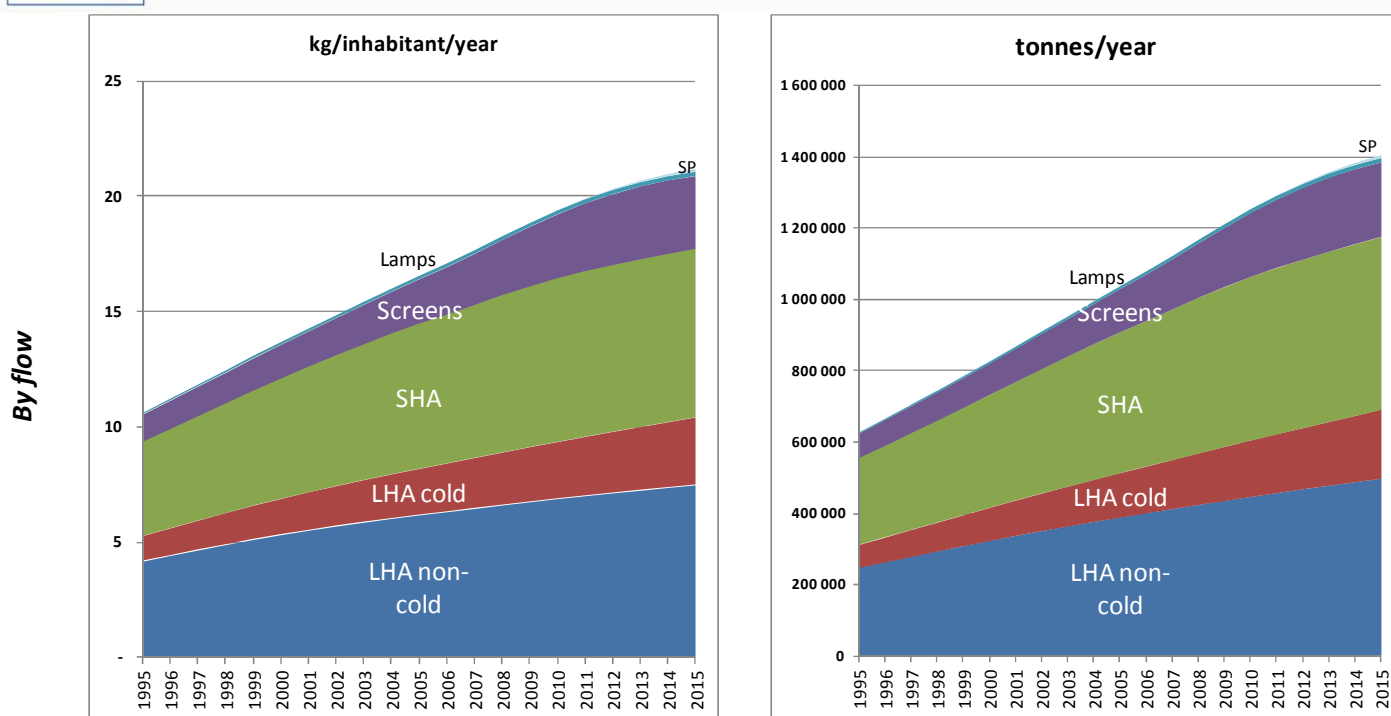


Figure 7 – Evolution of WEEE arising, by category and by flow

Following the increase of the EEE put on market, household and similar WEEE arising is generally increasing too: generated WEEE increased by 49% between 2000 and 2012, which is equivalent to an average increase of 3.4% per year. The increase will tend to slow down between 2012 and 2015, meaning an average increase of 1.4% per year (the low growth of EEE put on the market between 2008 and 2012 beginning to have an impact).

■ UNCERTAINTIES RELATED TO THE DATA AND ASSUMPTIONS

In order to evaluate the impact of data and hypotheses on the evaluation of generated WEEE in 2012, a sensitivity analysis was conducted. It uses the same data entries as the UNU model: the volume of EEE put on market (in units), the average weight and the lifespan. For every data entry, a variation of the WEEE arising result was designated by equipment category in order to analyse the global WEEE arising in 2012.

The consolidation was made by adding on the one hand all the maximal, and on the other hand all the minimal, values. This method maximises the overall variability of the generated WEEE, as it does not take into account the potential compensation effects between the different types of equipment or the different types of data entries.

Table 3 – Results of the sensitivity analysis on the WEEE arising evaluation in 2012

Data entry type	Inferior evaluation (kg/inhabitant 2012)	Reference WEEE arising (kg/in habitant 2012)	Superior evaluation (kg/in habitant 2012)	Variability
Quantities of EEE put on the market	19.0	20	216	+/- 6.3%
Average weight	19.7		20.9	+/- 3.0%
Lifespan	18.9		21.7	+/- 6.8%
Overall variability <i>Sum of all the variabilities by type of data</i>	17		24	+/- 16%

II. THE WEEE MARKET STRUCTURE IN FRANCE

Summary: *This chapter aims to identify and map all the different actors involved in the WEEE management chain in France, from collection to recycling, by specifying the relations between them. A special effort was made to identify “alternative” flows of WEEE, meaning WEEE which is collected and/or treated by the so called “historical” actors (who existed before the set up of the WEEE EPR schemes) or “informal” actors (of a parallel economy, and whose activity escapes government surveillance or legislation).*

WEEE is generated either by private households (“household WEEE”), or by businesses and the public sector (“professional WEEE”), which can be “similar to household”.

Households can choose between discarding their WEEE at local waste collection centres, at retailers’ collection points (if a piece of equipment is purchased there or not, depending on whether the retailer offers this service), or giving their used EEE to social enterprises.

WEEE Compliance Schemes select the WEEE collection and recycling service providers via calls for tenders. Several factors (such as sorting errors, plundering, alternative systems of collection and treatment) divert household WEEE from WEEE Compliance Schemes.

Businesses and public administrations (institutions, regional and local authorities, hospitals, schools, etc.) also discard electric and electronic equipment. Nevertheless, they generally put in place an individual collection and treatment system for their used equipment.

II.1. LOCAL COLLECTION

II.1.1. LOCAL PUBLIC AUTHORITIES

■ WEEE IN WASTE COLLECTION CENTRES

OCAD3E identified around **4 000 waste collection centres** “active” in 2012¹⁶, covering between 61 and 62 million inhabitants, and representing **68% of WEEE flows collected by household Compliance Schemes** in 2012.¹⁷

■ OTHER COLLECTION SYSTEMS: DOOR-TO DOOR OR UPON REQUEST

Bulky waste services are in charge of collecting WEEE from private households at pre-established times. This door-to-door collection can be:

- **Mixed with other waste flows** (in the case of bulky waste or of the yellow waste bin where households can place packaging, paper and small electrical appliances), **and**

¹⁶ A waste collection centre is “active” if a compliance scheme collected WEEE from them at least once a year.

¹⁷ Data from the 2012 Annual Report on the implementation of the WEEE legislation, drafted by BIO Intelligence Service for ADEME in Juin 2013 (not yet published).

regularly, meaning that the regional authorities organise its collection at certain fixed dates and times.

It is important to stress that bulky waste collected door-to-door is rarely sorted and ends up in landfills.

- **On request** (periodic collection): an individual calls its local public authority to ask for the services of a pick-up van which normally arrives the following day, early morning. However, most users tend to leave their equipment on the sidewalk in the evening prior to the pick-up of the collection van.

WEEE and other valuable equipment are less and less often collected together with other waste flows, and the increase in volume in waste collection centres of the total intake of bulky waste, wood, metal and WEEE indicates a good transfer from the door-to-door collected tonnage.¹⁸

II.1.1. RETAILERS

There are several types of retailer, including: major food retailers (MFR)¹⁹, do it yourself stores (DYI), large specialised retailers (LSR)²⁰, and e-commerce via all channels, including the internet.

As the consumer electronics market (televisions, personal computers, hi-fi systems, photo cameras, etc.) is declining for some types of equipment, online sales are all the more important especially via the “pure players” (internet websites)²¹. In 2012, online sales represented 17.6% of the electronic equipment market, out of which 14% was represented by “pure players” and only 3.6% by online websites of LSR and MFR. Businesses which have both store locations and online websites are called “click and mortar”²².

Online or in shops, retailers are obliged to accept the free return of used appliances when they are replaced with a new equivalent product. This is what is called a “one-for-one” obligation. In fact, the person in charge of delivering the new product is also responsible for returning the old one to the producer. Craftpersons and installers also have to bring them back for example to their wholesaler; in fact, they generally deliver them to civic amenities sites if they are open, or to private waste collection and recovery points.

In 2012, **21 928 collection points** set up by distributors were registered, 19 808 pick-up points (where waste flows are taken by WEEE Compliance Schemes, including for example the logistics platform of the group). Out of the 19 808 pick-up points, there are **8 855 which were active** (e.g. they have had at least one pick-up request per year²³).

As for **collection points provided for professionals** and which are usually installed on the premises of specialised retailers, there were **2 107 in 2012, and very few were active**.

¹⁸ ORDIF

¹⁹ Supermarkets with a surface starting at 400 m², hypermarkets of more than 2 500 m². Examples: Carrefour, Auchan.

²⁰ Examples: Fnac, Darty, Conforama, King Jouet.

²¹ Examples: Amazon, Cdiscount, RueDuCommerce.

²² « Nouvelle année noire dans l'électronique grand public », LSA, 6 February 2013

²³ ADEME indicators that consolidate the data of the four compliance schemes.

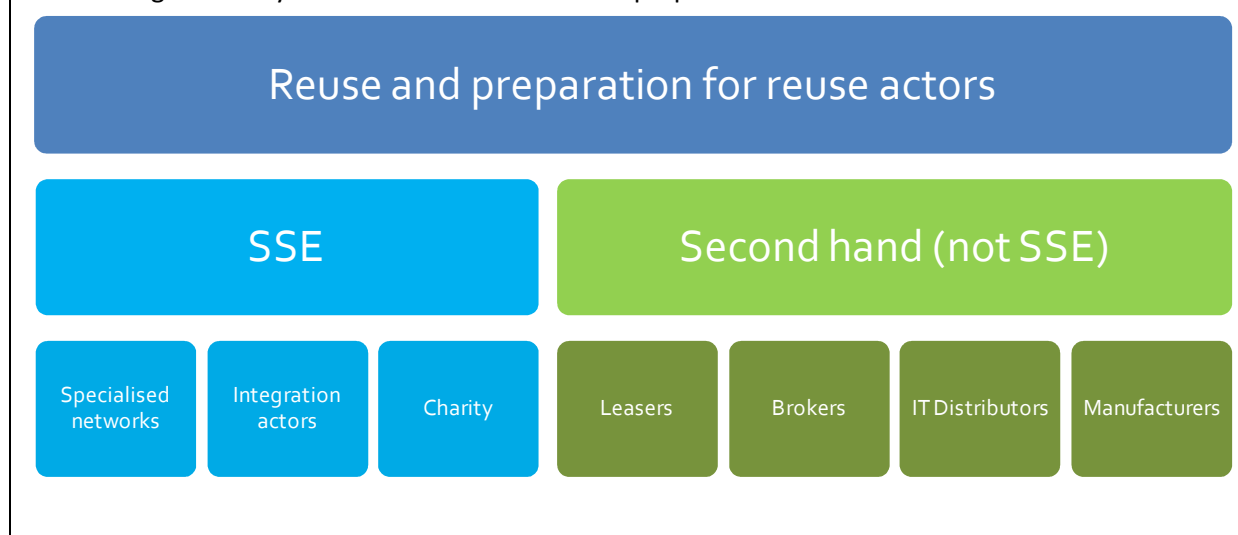
Having the obligation to recover WEEE in stores or at the delivery point, retailers play an important role in WEEE collection, representing **26% of flows collected by WEEE Compliance Schemes** in 2012²⁴.

II.2. REUSE AND PREPARATION FOR REUSE ACTORS

According to article L 541-1-1 of the French Environmental Code, **reuse** (*réemploi*) is a prevention action by which equipments or products that are not waste are used again for the same purpose for which they were designed. For example, second-hand shops, consignment shops, junk shops and even online resale are reuse operations.

On the contrary, preparation for reuse (*réutilisation*) is always preceded by a preparation or at least by a control operation. The equipment or products left at a voluntary waste drop-off (except for those left in a reuse zone, including the ones linked with a civic amenity site), are considered waste. Therefore, a faulty electrical oven left in a voluntary waste drop-off and which is resold after refurbishment, is a reuse operation.

The next figure briefly outlines the main reuse and preparation for reuse actors.



II.2.1. SOCIAL AND SOLIDARITY ECONOMY (SSE) ACTORS

The French social economy sector not only plays a very important social role but it also stands out thanks to its significant network of non-profit organisations and charities. The reuse sector is mainly dominated by three networks: Emmaüs, the ENVIE Federation and the Réseau des Ressourceries, plus other reuse charities and enterprises which promote the integration of unemployed people and of those subject to exclusion from the labour market. Independent actors, which are not part of a network (specialised or not), represent around 22% of the social and solidarity sector.

²⁴ Data from the 2012 Annual Report on the implementation of the WEEE legislation, drafted by BIO Intelligence Service for ADEME in Juin 2013 (not yet published).

Social and solidarity economy actors work with municipalities and businesses to recover second-hand goods (in general, these goods were donated). If the equipment is still in good condition, it is resold, (if necessary after preparation for reuse), either within the national territory, or outside the country through exports. For example, the product can be sent by charities to educational programmes in developing countries, such as French-speaking Sub-Saharan Africa. Electrical and electronic equipment which cannot be used any more is usually sent to waste collection centres or to recycling points under agreements with WEEE Compliance Schemes. In the rare case when a social economy enterprise does not have an agreement with a WEEE Compliance Scheme, the companies sell their WEEE to a scrap metal collector, who then sells the product either in one piece or in detached pieces.

In the social and solidarity field, Emmaüs performs mainly reuse activities, while the ENVIE Federation and the Réseau des Ressourceries perform both reuse and preparation for reuse and recycling.

The social and solidarity economy actors represent 6% of the total WEEE collected by Compliance Schemes in 2012²⁵.

II.2.2. IT AND OFFICE EQUIPMENT REFURBISHMENT ACTORS

The resale sector of second-hand equipment gives a second life to equipment and is a competitive market with different objectives from the social and solidarity economy. Made up of 80% independent actors, this sector is very scattered²⁶.

In the case of commercial WEEE, the refurbishment actors who are in charge of recovering information and communication technologies (ICT), are IT retailers, service providers and leasers who most of the time resell the equipment to French or foreign “brokers”. French brokers also obtain supplies from businesses that own their equipment.

Other actors involved in refurbishment operations are social enterprises and the above-mentioned associations which, mainly for fiscal reasons, have direct contracts with businesses, like ATF Gaia (a Dell and Apple exclusive contract) and the Ateliers du Bocage.

If the equipment collected by the actors of this market is too old, it is dismantled and certain pieces are detached, like hardware or electronic cards which are sold separately. Some refurbishers can manage (dismantle, and sometimes, depollute) by themselves their obsolete materials or otherwise subcontract the recycling process.

²⁵ Data from the 2012 Annual Report on the implementation of the WEEE legislation, drafted by BIO Intelligence Service for ADEME in Juin 2013 (not yet published).

²⁶ 2nd national conference on re-employment, reuse and reparation, summary made by ADEME, 2012.

II.3. REGROUPING, SORTING, DEPOLLUTION AND RECYCLING

II.3.1. WEEE REGROUPING AND SORTING CENTRES

Through a contract with WEEE Compliance Schemes, WEEE collected at public local collection sites or by retailers, generally joins regional regrouping and sorting platforms in order to concentrate WEEE flows and optimise logistics. From these platforms, WEEE is then transported to treatment centres.

II.3.2. WEEE TREATMENT CENTRES

According to an ADEME inventory carried out in 2010²⁷, in total there are 215 WEEE treatment centres on the French territory (including the overseas departments of France). These centres are spread around the territory depending on the type of the waste stream.



Figure 8 – The distribution of WEEE treatment centres in France (ADEME, 2010)

WEEE “treatment” covers various processes which are necessary for the recycling of electrical and electronic equipment²⁸:

- **Preparation for reuse:** ADEME counted 22 sites with this type of treatment.
- **Depollution** consists of extracting dangerous components from the equipment such as cooling fluids and insulation foams in cooling LHA, lead glass in screens, batteries, plastics which can contain brominated fire retardants, etc. More than half of the WEEE treatment sites perform depollution operations.
- **Dismantling** operations were performed in 108 treatment centres in 2010. This operation is a step of a manual pre-treatment process which precedes shredding and which consists in separating different elements (electronic cards, etc.), in order to make possible their recycling in specific centres. Their reuse is also a possibility.
- **WEEE shredding operations** reduce the size of elements in order to ensure the separation of certain fractions and their delivery to the corresponding recycling centres. In France, there are 51 shredding installations called ELV shredders (because they shred end-of-life vehicles) but there are also other types of shredders (WEEE,

²⁷ ADEME (2012), Inventaire 2010 des centres de traitement de déchets électriques et électroniques.

²⁸ ADEME (2012), Inventaire 2010 des centres de traitement de déchets électriques et électroniques.

cables, rubbers and factory shredders which only shred their own waste, etc.). The so-called 51 “ELV shredders” are members of the FEDEREC network (The Federation of Recycling Enterprises)

- Finally, 6 sites in France perform **physico-chemical treatment** for the polluting elements of WEEE (some of them have shredding plants). These treatments (e.g. decyanidation) are very important as they ensure that the dangerous components have been extracted and that the recycling objectives are being met.

II.3.3. SCRAP METAL COLLECTORS

Scrap metal collectors collect, sort and sell ferrous metals (steel, cast iron) and non-ferrous metals (copper, aluminium, zinc, lead, stainless steel). There are approximately **2 000 metal collection sites** in France, of different sizes. **1 000 of them represent 90% of the market and are members of FEDEREC.**

Some scrap metal collectors, also members of FEDEREC, are under a treatment contract with WEEE Compliance Schemes certified for household WEEE and thus can receive this type of waste. Since the Decree of 2 May 2012²⁹, collectors who do not have a contract with a Compliance Scheme cannot collect or sort WEEE which comes from separate collection.

Collectors which are not bound by a contract with a household WEEE Compliance Scheme are allowed to collect commercial WEEE only if they have an agreement to manage this type of waste either with the owner, an individual system set up by the producer or a professional WEEE Compliance Scheme. Very often, WEEE is dismantled on the site.

Finally, most scrap metal collectors buy non-shredded mixed scrap metal, i.e. scrap metal which needs to be shredded, made out of 30% steriles (waste such as dust, plastic fragments, water-heating foam, washing machines concrete etc.), which will be sent to landfill. **Occasionally, these flows contain WEEE.** The non-shredded mixed scrap metal comes from smaller collection centres or metal containers of public collection centres, from identified or not identified individuals or small local authorities looking for profit out of scrap metal (thus sometimes WEEE) which they find in bulky waste. Some collectors own a shear press which cuts and compacts WEEE with the rest of the mixed scrap metal.

II.3.4. SCRAP METAL SHREDDERS

WEEE shredders³⁰ and ELV shredders which accept small household appliances (SHA) and large household appliances (LHA - excluding cooling appliances) receive electric and electronic equipment already sorted (dismantled or not), or flows composed of one or two categories of WEEE only. Only certified installations can depollute large cooling household appliances, by releasing the gas from the cooling circuits and from the insulation foams. These installations have a contract with WEEE Compliance Schemes.

ELV shredders receive WEEE but also scrap metal which needs to be shredded (mixed scrap metal, light metal and ELVs) and scrap steel (new or coming from demolition sites). Mixed scrap metal

²⁹ Décret 2012-617 of 2 May 2012

³⁰ Around 10 for the cooling LHA, 11 for the SHA and 1 for non cooling LHA.

comes from regional metal collectors who may, in some cases, be part of the same company as the shredder itself. They can also come from local public authorities (scrap metal containers), from industries and artisans or to a lesser extent (i.e. for smaller tonnage), from individuals.

WEEE which is (sometimes illegally) in the mixed scrap metal will be shredded without going through the depollution process even though this is a necessity (greenhouse gases, batteries, toner cartridges, and mercury contactors).

Shredders are concentrated in regions with a high urban density (Ile de France, PACA, Rhône-Alpes) and in border areas with Belgium and Germany.

III. WEEE DESTINATIONS

Summary: Based on the WEEE arising estimated by this study, between 10 and 16 kg per inhabitant, or between 650 000 and 1.1 million tonnes of household and similar WEEE are not collected by WEEE compliance schemes. This chapter aims to track and quantify household WEEE which is collected and treated via alternative pathways.

The graphs below illustrate the distribution of WEEE arising by flow (excluding solar panels) and collection origin (based on the WEEE arising reference estimations of 20 kg/inhabitant).

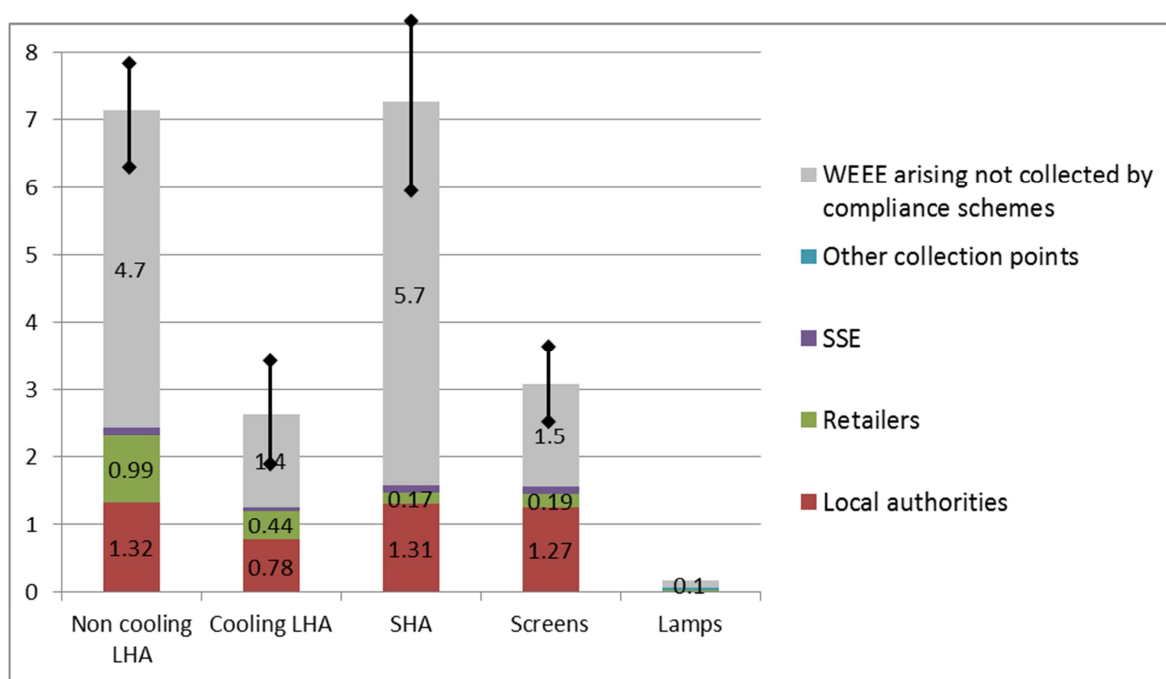


Figure 9 – WEEE arising distribution in 2012 (kg/inhabitant) by collection origins and flow

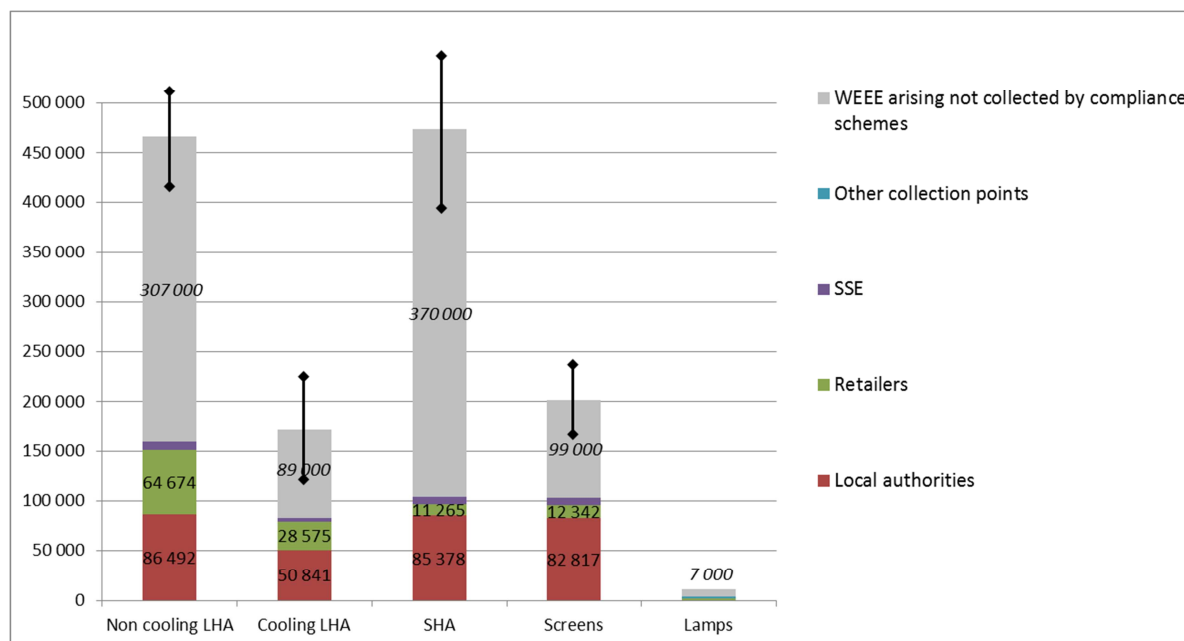


Figure 10 – WEEE arising distribution in 2012 (tonnes) by collection origins and flow

In order to identify who collects and/or treats WEEE which was not collected by WEEE Compliance Schemes, how they do it and in what amounts, BIO Intelligence Service contacted:

- Collection and sorting actors:
 - Local authorities
 - Retailers and the Federation of Commerce and Distribution (FDC)
 - Social and Solidarity Economy enterprises and “brokers”
- Representatives from the public sector (ADEME, Ministry of Environment) ;
- Members of the Federation of Recycling Enterprises (FEDEREC); recovery, recycling and/or scrap metal valorisation companies).

Other types of actors were contacted, like **customs representatives** (who unfortunately could not give extra information for this study) and the French Steel Federation, in order to obtain some information on the exports of scrap metal. This chapter will present the results of our investigation.

III.1. WEEE IN RESIDUAL HOUSEHOLD WASTE

In the framework of this study, 11 regional and local authorities, covering 4.5 million French people, shared their characterisation results (annual or half-yearly, between 2006 and 2012) of residual household waste. These characterisations reveal that there are 1 to 2 kg of WEEE per inhabitant and per year in residual waste, essentially SHA (chargers, headphones, toys, irons, coffee machines, calculators, remote controls, etc.). Local variations are very high, particularly in the case of a densely populated areas. Variations also exist depending on the sample, most likely because of the heterogeneity of the flow. At a higher scale, there is little difference from one region to another³¹.

In 2007, the MODECOM campaign evaluated the presence of WEEE in RHW at 1 kg per year and per inhabitant, with 0.8 kg coming from households and 0.2 kg from commercial activities. This national campaign was led in 100 randomly selected local authorities and since it offers a more representative sample than the 11 local campaigns led between 2006 and 2012, its results will be used in this study.

³¹ Interview of Sylvie Courbet, consultant at Citéxia, in charge of the MODECOM campaign in 2007.

III.2. WEEE IN SCRAP METAL AND BULKY WASTE CONTAINERS

■ WEEE IN SCRAP METAL CONTAINERS

Only one actor interviewed, SMICVAL (the Intermunicipal Waste Organisation of Libournais Haute-Gironde) performs characterisations in scrap metal containers. Nevertheless, the result given by SMICVAL (22% of WEEE in scrap metal containers) is not considered representative because some waste collection centres, under its responsibility, did not have a contract with a WEEE Compliance Schemes at the time of the characterisation (2011). According to AMORCE³² and CNR³³, 4.7% of the population is not covered by local authorities who have a contract with compliance schemes; it is therefore probable that an important volume of WEEE is in the metal scrap containers of these authorities.

According to the AMORCE association, in local authorities equipped with dedicated spaces for WEEE, “the use of scrap metal containers may be possible in the particular case where the local and regional authority is certain that the container is emptied during the day, which is not always the case for separately collected WEEE”. Some local authorities do choose this option because they fear that the WEEE will degrade as a consequence of thefts and plundering in the waste collection centres.

In fact, according to the surveys addressed to FEDEREC actors, there are around 10% of WEEE in the municipal scrap metal containers, or **0.7 kg per inhabitant**, representing 46 000 tonnes at the national scale³⁴.

■ WEEE IN THE BULKY WASTE CONTAINERS OF CIVIC AMENITY STIES



According to ADEME's latest figures, there are 3.6 million tonnes, or 55 kg/year/inhabitant of bulky waste collected in municipal waste collection centres and 0.8 million tonnes, or 12 kg/year/inhabitant in door-to-door collection in 2009³⁵.

Five intermunicipal waste management organisations, covering in total 690 000 inhabitants and with different geographical formats (rural, semi-rural and urban habitats) characterised their bulky waste flows from waste collection centres between 2011 and 2013. Even though the 2011 numbers should be considered with caution because there could have been some changes since and a larger sample is needed so as to better represent the French situation, the amount of bulky WEEE brought to waste collection centres is **around 0.5 kg to 1.5 kg per year and per inhabitant**, or 35 000 to 100 000 tonnes³⁶. According to a recent study carried out by ADEME and the CAP3P consultancy³⁷, this number is evaluated at 0.7 kg per inhabitant, per year.

Some local authorities or businesses managing the waste collection centres send mixed bulky waste to sorting centres in order to sort wood, cardboard, rubble and ferrous and non-ferrous scrap metal

³² AMORCE: National association of local authorities, for waste and energy management

³³ CNR: Cercle National du Recyclage, national association promoting waste sorting and recycling

³⁴ On the basis of the total tonnage of scrap metal collected in civic amenity sites (472 500 tonnes, out of which 10% are WEEE, or rather the equivalent of 47 000 tonnes of WEEE); according to a SINOE site.

³⁵ Enquête collecte 2009, ADEME

³⁶ Based on the hypothesis that France has a population of 65.4 million (according to INSEE).

³⁷ ADEME, Characterisations of bulky waste collected in local collection centres, 2012

and then send it to their specific recycling centres. If WEEE is recovered during the sorting process, it goes back to waste collection centres and goes straight to a recycling centre under contract with a Compliance Scheme. Nevertheless, according to the interviewed local authorities, bulky waste is rarely sorted and therefore little recovered as most of the time it is either incinerated or ends up in a landfill.

As for the door-to-door bulky waste collection, valuable waste such as WEEE is more often recovered on footpaths by informal collectors before it can be collected by bulky waste municipal collection services. No strong data is available regarding the amount of WEEE found in the bulky waste collected door-to-door.

III.3. THEFT IN WASTE COLLECTION CENTRES

There are two types of theft³⁸:

- Whole equipment theft: e.g. the theft of old washing machines recently brought in to municipal waste centres. These equipments contain a lot of metal.
- Vandalism, plundering: e.g. TV deflectors, copper coils and cathode ray tubes are recovered by thieves after the destruction of the appliance in order to remove the copper.

There is potentially a correlation between theft and vandalism frequencies and raw materials prices (E40³⁹ and copper⁴⁰).

OCAD3E's working group⁴¹ which focuses on the fight against theft estimated that at least 20 to 25% of the large electronic appliances dropped off by users at municipal waste centres get stolen. This average rate, which can hide local differences, was estimated thanks to a field study led by OCAD3E⁴². This study revealed that collective actions are more efficient than isolated ones and that the prohibition on paying for metals in cash (article 51 of the Amending Finance Law, published in the Official Journal on 30th of July 2011) had a significant impact on the increase of the quantities which were collected at the national level as well as the ones which were considered in this study (+18% between the fourth semester of 2010 and 2011).

The majority of screens collected in waste collection centres are screens with a cathode ray tube. The cathode ray tubes themselves, which are not of great interest for thieves, represent around 90% of the screen's weight. The screens are rarely stolen in one piece, and they are instead destroyed in order to recover the copper deflectors. Therefore, around 10% of the vandalised screens' weight will actually be removed and sold. The amount of vandalised screens could not be determined in this study but the interviewed regional authorities argue that the phenomenon is very frequent and thus 10% of the total weight of screens collected in waste collection centres is potentially removed.

³⁸ This classification was made by Thomas Deshoulières, in charge of South-East Regional Operations at Ecologic.

³⁹ The "E40" classification refers to fragments which result from shredding operations of ferrous scrap metal.

⁴⁰ Copper is one of the most coveted. It is sold on the market for a price comprised between 5 and 6 €/kg (see www.coursducuivre.com; average between January and September 2013).

⁴¹ Led by Eco-Systèmes, EcoLogic, ERP France et l'AMF.

⁴² Study carried out by OCAD3E with a panel of 63 civic amenity sites (27 local authorities) spread around the French territory (and representing all the sectors: urban, semi-rural, rural) in 2011.

When it comes to small appliances, only a part is targeted by thieves: the ferrous ones like steel microwaves and lawnmowers, representing around 15 to 20% of the SHA in municipal waste centres. This estimation should be confirmed by a statistical study or a survey conducted in waste collection centres.

It can therefore be concluded that around **0.8 and 1.2 kg per year and per inhabitant** (50 000 to 80 000 tonnes) are being stolen in municipal waste centres every year.

III.4. LOW VOLUMES AND LEAKS OF WEEE COLLECTED BY DISTRIBUTORS

During the study, 14 retailers were interviewed: 6 major food retailers (including 2 independent networks), 4 do-it-yourself stores (including 3 independent networks), 2 large specialised retailers and 2 pure players (e-commerce only). The first three qualify as “click-and-mortar”, meaning that they have shops both physically and online.

- According to the Trade and Retail Federation: The “mortar” channel (shops) of the “click-and-mortar” have a rate of WEEE returns evaluated at about 15% to 40% of total sales depending on the group, and even more in some areas;
- The “click” channel (online sale) of the “click-and-mortar” recorded a return rate of 10% to 25%, depending on businesses;
- The “pure player” channel (e-commerce without shops, which represent 15% of the household EEE sales according to GfK panellists) has a return rate of 0 to 5%, depending on the merchant websites.

Major food retailers and DIY stores account for 63% of household EEE sales, according to GfK. According to the conducted surveys, WEEE leaks in stores and during delivery are estimated at between 4 and 25%; the higher percentage corresponds more to the reality of independent supermarkets or franchises. No information could be found in the case of “pure players”.

Amongst the interrogated retailers, only one initiated for its Parisian stores an IT system for tracking the flow of WEEE collected in stores and during deliveries. The volume of WEEE collected in the Parisian region by this retailer was multiplied by three during the months which followed the setting up of the tracking system.

To conclude, the amount of WEEE “leakage” at retailers was estimated between **0.1 and 0.8kg/year/inhabitant** (5 000 to 50 000 tonnes).

III.5. WEEE COLLECTED BY ICT REFURBISHMENT ACTORS

According to the ECOLOGIC study in 2008 and the actors interviewed for this study⁴³, leasers resell 91% and brokers resale 73% of their units⁴⁴ (supposedly functional equipment); the rest of the 9% of the equipment collected by leasers and 27% of equipment collected by brokers is waste and

⁴³ Interviews were carried out with 3 « brokers » (members of SIRRMIÉ), a distributor of IT and office equipments (which also participates in leasing, ECONOCOM) and 6 actors representing the SSE sector.

⁴⁴ Generally, a unit is an equipment and its accessories sold in the main packaging. For example, a PC which is sold with a keyboard, mouse, screen and its central processing unit counts as one unit (because it was paid as one unit).

therefore handed over to treatment operators. As for the producers of ICT equipment⁴⁵, they resell 75% of their units (fabrication scraps or unsold products which are still functional).

Leasers resell them to “brokers” and sometimes directly to wholesalers, French or foreign. 90% of the units which are resold by the “broker” actors is exported⁴⁶ and thus does not appear later in the volumes of French WEEE arising. The functionality of two-thirds of these exported products is not verified before they are dispatched. Economic and Social Solidarity actors refurbish 35 to 80% of the donated equipment, depending on the typology of their clients, and they only represent 5 to 10% of the refurbished computers in France (in units).

According to an IT service and retail company, which represents 25% of the refurbishment of IT and office equipment, around 500 000 computers which come from businesses pass through the “broker” market each year in France. If we estimate that at least 10% of computers received by “brokers” are WEEE, then a minimum of 50 000 computers will join the French WEEE arisings. Very little data is available such as the amount of desktop PCs or laptops, therefore it is impossible to convert this data into tonnage. As a matter of fact, the data is very approximate and should be treated with caution.

III.6. WEEE COLLECTED BY SCRAP METAL COLLECTORS AND SHREDDERS

Out of the 100 FEDEREC member companies which were contacted, 35 interviews were conducted and 6 visits were made. All the data gathered from exchanges and field observations are only estimations.

■ WEEE AND SCRAP METAL COLLECTORS

On the basis of the data collected at the level of regional scrap metal businesses, (supplying themselves from multiple actors at the level of one region or even multiple regions, without covering the national territory), it proved impossible to evaluate the volume of WEEE collected by these actors. There are two reasons which explain this phenomenon. Firstly, it was impossible to have a good sense of the origins and the destination of scrap metal without avoiding double-counting. Indeed, a large number of deliveries take place between regional scrap metal companies, and these deliveries could not be documented. Secondly, the study was based on a very low sample of companies compared to the 2 000 regional scrap metal collectors active on the French territory, and other important actors were not willing to share such pieces of information. Given the difficulty in quantifying the flows which circulate between scrap metal collectors and the coverage of the small sample size, it was decided to focus on the information given by shredding installations, where, according to FEDEREC, most of the collected scrap metal goes.

Nevertheless, numerous and very interesting quantitative and qualitative feedbacks were gathered, especially on the outbreak of alternative flows and on the reason why these flows are left outside the compliance schemes network. For example, various regional scrap metal collectors confirmed that

⁴⁵ Some producers also practice leasing but they represent less than 1% of French IT.

⁴⁶ Especially to Northern Africa and Eastern Europe.

they receive WEEE which is mixed in small quantities with the mixed scrap metal. According to them, it is more profitable to negotiate the price outside the WEEE Compliance Schemes networks, as complying with the technical specifications laid down in the contract documents (e.g. levels of sorting and depollution), will add complementary costs.

In fact, regional scrap metals collectors receive more often dismantled WEEE, which most likely was not legally dismantled. For example, the cooling liquids which are inside the compressors of refrigerators were removed, or the condenser was removed from the washing machine. Depollution is thus sometimes compromised by the deliverer even before the equipment reaches the pile of scrap metal. There was no information on the final destination of these dangerous components which were taken out of the equipment.

Finally, regional scrap metal collectors confirmed the existence of an export flow. This aspect will be further examined in the study.

■ WEEE AND SHREDDERS

Scrap metal shredding installations are well represented in this study which collected and consolidated results from **31 out of 51**, or 60% of the shredding installations members of FEDEREC.

These 31 shredding installations represented **71% of the total scrap metal shredding power** installed in France in 2012⁴⁷. The above-mentioned centres are spread across 16 different regions⁴⁸.

Furthermore, large capacity French shredders as well as post shredding actors accepted a visit to their centre, allowing the declarations of shredders to be challenged with field observations.

WEEE in mixed scrap metals

By balancing the estimations made by shredders with the observations made on site, on average, there is at least **10% of WEEE in the mixed scrap metals**. In order to estimate the tonnage, it was necessary to evaluate the quantities of the scrap metal shredded in France.



Figure 11 – Mixed scrap metal (excluding ELV)

⁴⁷ For more details on the shredding power, please refer to the Annex.

⁴⁸ Regions covered by the study (par BIO IS ou Derichebourg) : Alsace, Aquitaine, Auvergne, Bourgogne, Bretagne, Centre, Franche-Comté, Ile-de-France, Languedoc-Roussillon, Lorraine, Midi-Pyrénées, Nord-Pas-de-Calais, Pays de la Loire, Poitou-Charentes, Provence-Alpes-Côte-d'Azur, et Rhône-Alpes.

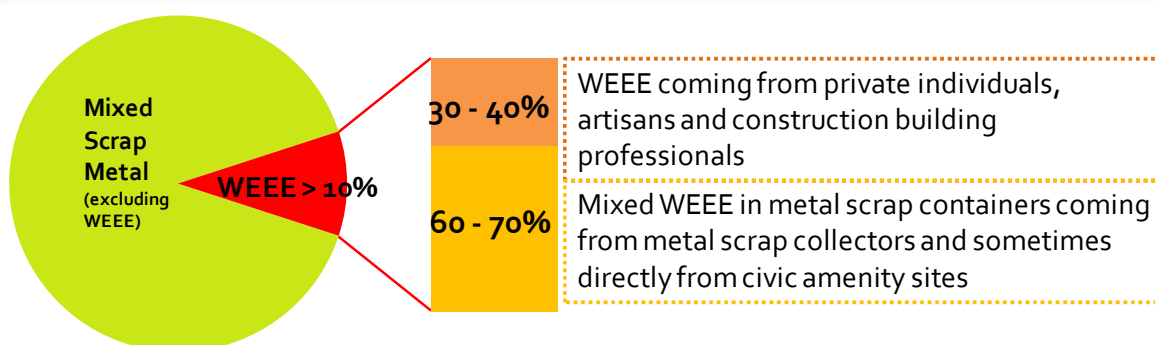


Figure 12 – WEEE volumes in the mixed scrap metal bought by shredders, distributed by its origins

The mixed scrap metal arising and the shredded quantities in France

The mixed scrap metal recovered in France is not necessarily shredded in France. Indeed, the fractions which result from shredding such as shredded mixed scrap metal, are normally sent in bulk by ships (up to 30 000 tonnes per boat) and not on maritime containers. Therefore it is more interesting to shred the mixed scrap metal near ports if the residues need to be exported by sea. This is why several groups have shredding installations in Belgium, the Netherlands or Germany next to the river Ruhr in order to export their shredded parts from ports such as Anvers, Rotterdam and Hambourg. The shredded scrap metal is then sent to countries where the demand of steel is high like Turkey, Maghreb, Egypt and Asia (China, Vietnam, etc).

In regions near borders, the mixed scrap metal collected in France can be sold to Belgian or German scrap metal collectors who, unlike the French ones, have the right to pay the deliverers in cash. Therefore, large quantities of non-shredded mixed scrap metal cross the French frontiers, legally or illegally.

According to FEDEREC, the French Federation of Steel and the data of the 31 studies shredders, mixed scrap metal collected in France represents approximately 3.2 million tonnes, out of which 2 million is shredded in France.

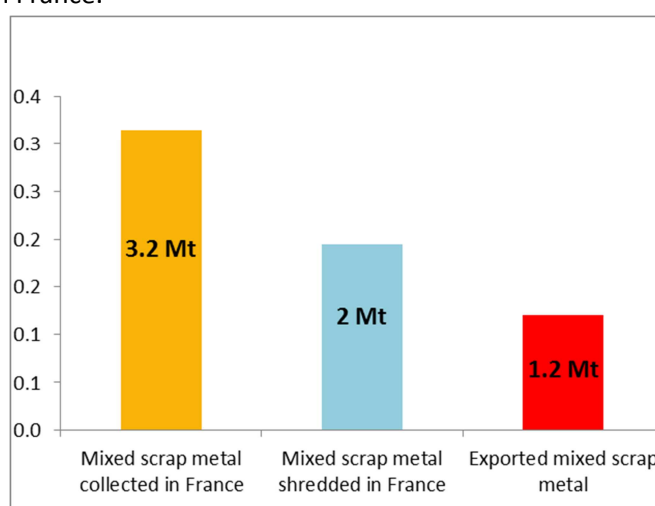


Figure 13 – The volumes of mixed scrap metal recovered, shredded in France and exported in 2012

Quantities of WEEE in mixed scrap metal

There are therefore at least 200 000 tonnes of WEEE in the mixed scrap metal shredded in France, or **3.1 kg per year and per inhabitant**. Moreover, an estimated 120 000 tonnes of WEEE is found in the exported mixed scrap metal, which is the equivalent of **1.8 kg per year per inhabitant**.

The types of WEEE found in mixed scrap metal and their origins

The classification by category of WEEE found in mixed scrap metal was estimated on the basis of the information gathered by the survey, combined with observations from visits. Table 4 illustrates these results:

WEEE type	Deliverers	frequently	sometimes	rarely	% of the found tonnage
Boilers (LHA non-cold)	Installers&repairmen, scrap metal containers collectors	X			>30%
Other LHA non-cold	Private individuals, scrap metal containers collectors	X			20 - 30%
SHA and big equipments	Private individuals, artisans, local associations (bulky waste or moving out collectors)		X		15 - 20%
LHA cold	Other metal collectors and scrap metal containers collectors (but less and less)		X		5 - 10%
Screens	Other recyclers and scrap metal containers collectors			X	<1%
Automatic retail	Artisans & construction building professionnels			X	<5%
Industrial kitchen	Artisans & construction building professionnels			X	<5%
Others	Other recyclers and scrap metal containers collectors			X	<5%

Table 4 – Types of WEEE found in mixed scrap metal and their origins

Concerning cooling LHA found in the mixed scrap metal, a non-estimated share of refrigerators is already emptied of their polluting components (some individuals detached the compressor and sold it separately). The majority of the interviewed scrap metal collectors and shredders declared having forbidden their operators from accepting cooling LHA. Also, when they find it in the mixed scrap metal, some put it aside in box-pallets but that introduces a very significant cost, around EUR 100 for a pallet of 4 refrigerators.

III.7. WEEE EXPORT

■ EXPORT OF WEEE FOUND IN MIXED SCRAP METAL

France imports and exports large volumes of scrap metal from and to its neighbouring countries. It mainly exports to Spain, Belgium, Luxembourg, Italy and Germany⁴⁹. As the shredding capacity in Europe and North-West Europe is superior to the quantities of recovered scrap metal, this sector is very competitive, especially in border regions where the shredders fight over volumes.

As around 1.2 million tonnes of mixed scrap metal is exported from France, then around 120 000 tonnes of WEEE (10% of mixed scrap metal), or 1.8 kg/year/inhabitant, are exported with the mixed scrap metal. These exports potentially include exports of shredded scrap metal sent straight from a “scrap yard” equipped with a shear press, towards Northern Europe and more regularly, towards Turkish steel companies (especially from the port of Marseille or via Belgium).

■ EXPORT TO NEIGHBOURING COUNTRIES OF WHOLE WEEE

During the interviews with the different scrap metal collectors, it was confirmed that these exports exist (imports too, but to a smaller extent), but the firms questioned declared not to be active in this area. A priori, this is not considered double counting, but rather exports made by local actors which were not consulted. Nevertheless, there was no sufficient data in the area to estimate these flows.

■ EXPORT OF WEEE (USED EEE)

Currently, the definition of used EEE is rather ambiguous: are they second-hand goods or are they waste? There is a lack of national or international, unequivocal, universally accepted and binding to define the difference between used EEE and electric and electronic waste. This especially impedes the work of law enforcement officials during field inspections or during the examination of documents which accompanies the EEE convoys. Finding proof which shows that the used EEE are second-hand goods and not electronic waste is a very complex process and it requires collaboration between the different participating parties such as customs, exporters, and importers. The General Secretary of the Basel Convention supports the elaboration of the technical directives on the trans-border movements of WEEE, especially with regards to the distinction between waste and non-waste (last provisional draft, February 2011). The new revised WEEE Directive introduces on this topic (annex VI) minimal requirements on the control procedures which verify whether the exported EEE is not in fact WEEE.

No quantitative data was obtained from the French custom inspection. Nevertheless, some hypotheses were communicated by a representative of the Customs Directorate. According to this person, control operations regularly find containers with all sorts of household equipment, including (W)EEE. Usually, these transports have as final destinations Eastern Europe, Northern Africa and Western Africa (Ghana, Nigeria⁵⁰). The exported equipment are generally refrigerators, TVs and screens (for computers). Non-cooling LHA is less often exported, except to Eastern Europe. As for WEEE exported to Asia, there are mainly fractions of WEEE, such as electronic cards⁵¹.

⁴⁹ Recycling balance sheet 2001-2010, ADEME study 2012 – see Annex

⁵⁰ *DEEE en Afrique : Etat des lieux*, Résultats du Programme E-waste Africa de la Convention de Bâle, Juin 2012

⁵¹ *Exporting Harm, The High-Tech Trashing of Asia*, rapport du *Basel Action Network* (BAN), Silicon Valley Toxics Coalition (SVTC), J. PUCKETT, 2002

Therefore, beyond the 1.8 kg/year/inh of WEEE exported with mixed scrap metal, it is very difficult to quantify the WEEE which is exported outside France.

IV. CONCLUSIONS AND RECOMMENDATIONS

The table below and the two figures summarise the quantitative (in kg/inhabitant and in %) and qualitative distribution of the generated WEEE flows in France in 2012, from their collection to their treatment, or export in case treatment is done outside France.

kg/inhabitant	Non cooling LHA		Cooling LHA		SHA		Screens		Lamps		Solar Panels	TOTAL (kg/inhabitant)		TOTAL (thousands of tonnes)	
	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX		MIN	MAX	MIN	MAX
EEE Put On Market 2012 (POM)	8,4		3,9		7,0		1,8		0,2		1,6	22,9		1 498	
Household WEEE volumes												244		15 957	
WEEE arising 2012	6,4	7,9	1,9	3,3	5,9	8,6	2,6	3,6	0,15	0,20	0,04	17	24	1 113	1 542
WEEE / POM	76%	94%	49%	85%	84%	122%	146%	200%	89%	120%	3%	74%	103%	74%	103%
WEEE collected (Register)	2,4		1,3		1,6		1,6		0,07			6,9		453	
WEEE not collected by compliance schemes	3,9	5,4	0,7	2,1	4,3	7,0	1,0	2,0	0,09	0,14		10	17	660	1 089
WEEE in mixed scrap metal in France	1,8		0,3		0,6		Category "others": ~0.3					3,1		200	
WEEE in the exported mixed scrap metal	1,1		0,2		0,4		Category "others": ~0.2					1,8		120	
WEEE in MSW	0		0		1							1,0		65	
WEEE in the bulky waste containers	0,5		0,3		0,1		0,10					1,0		68	
WEEE from construction building prifessionals									0,05			0,1		3	
Documented flows not covered by the Register	3,4		0,8		2,0		0,7					6,9		456	
Undocumented flows not covered by the Register	0,5	2,0		1,3	2,3	5,0	0.5 to 1.5					3,2	9,7	204	633
% of total undocumented arising	8%	26%	0%	38%	39%	58%	18% to 40%					19%	57%	19%	57%

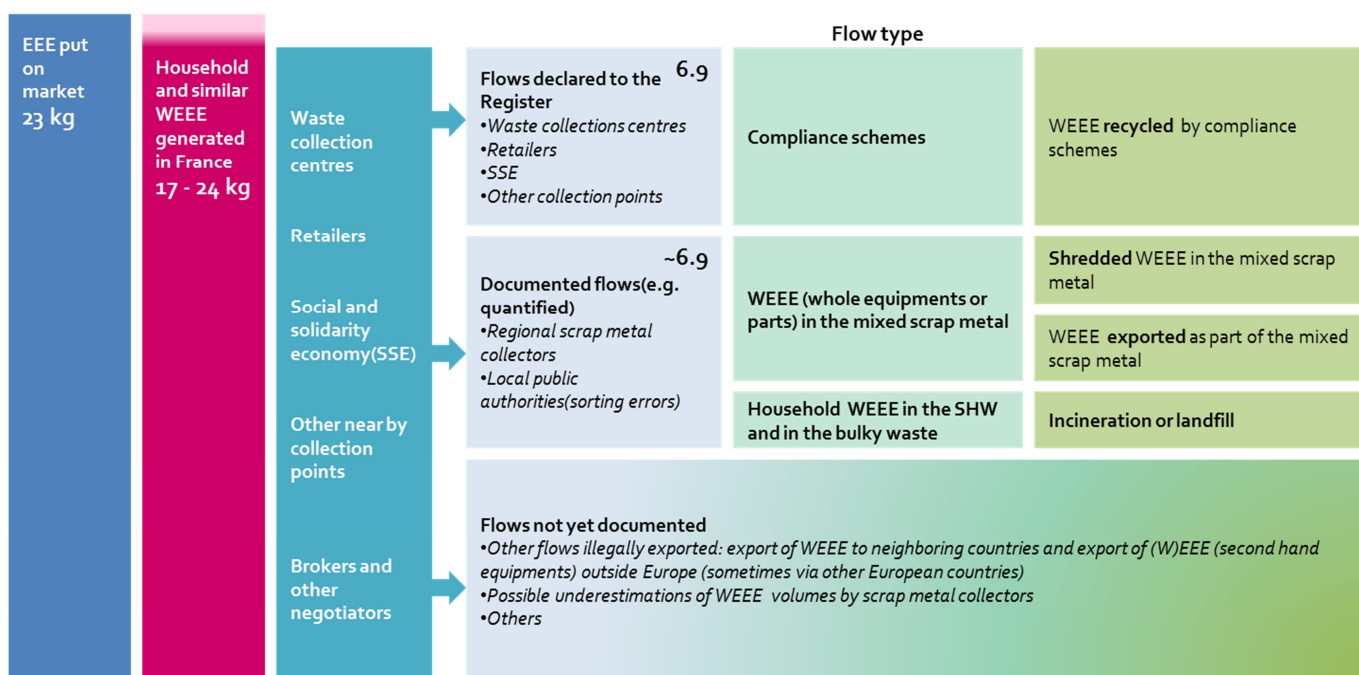


Figure 14 – Distribution (in kg/inhabitant) of WEEE flows in France, excluding professional appliances (2012)

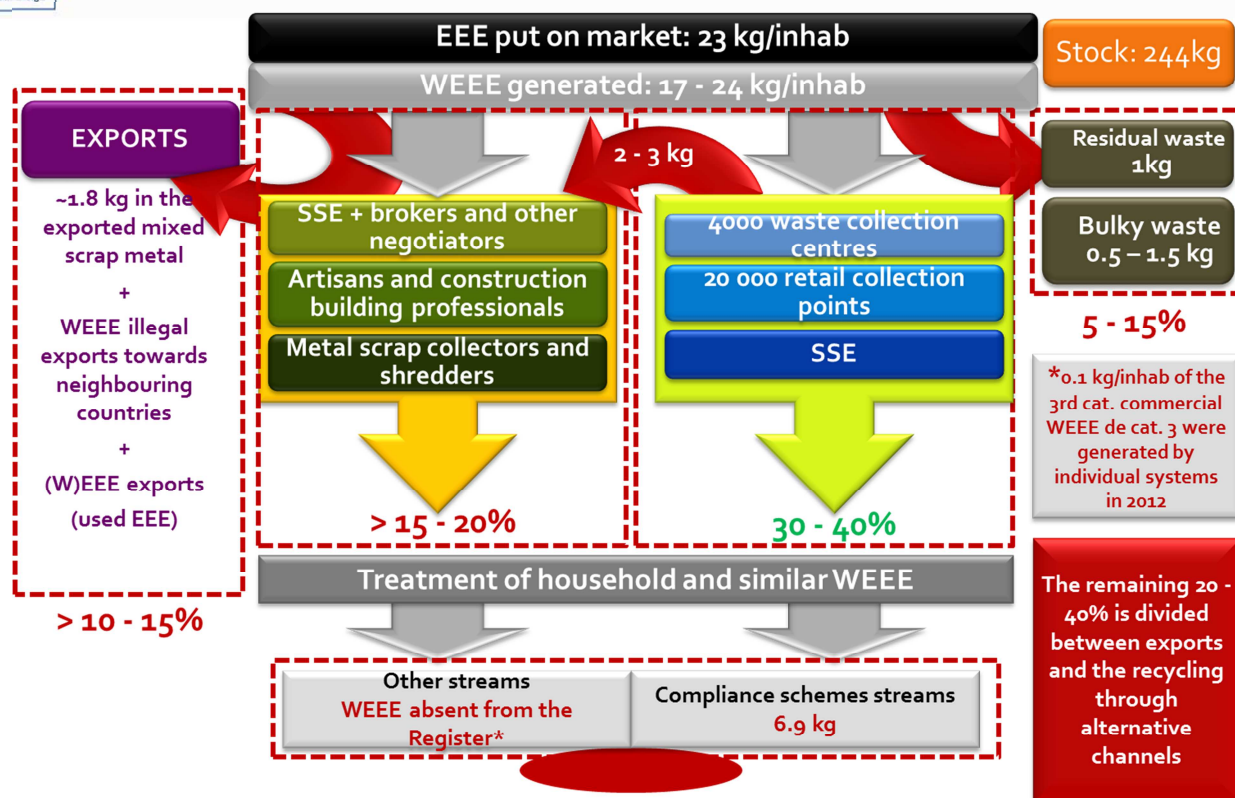


Figure 15 – Distribution (in %) of WEEE flows in France (2012)

Figure 15 illustrates that only around a third of the WEEE generated on the French territory is treated by the WEEE Compliance Schemes. At least 15 to 20% of the arisings are treated through alternative channels and 10 to 15% are exported (i.e. WEEE in mixed scrap metal which is exported and shredded outside France; the export of used EEE and whole WEEE to neighbouring countries could not be quantified), and at least 5 to 15% ends up in a landfill or are incinerated. Finally, the 20 to 40% which is left is split between exports and treatment through alternative channels.

The collection targets of the WEEE Directive are :

- Until 2015: 4 kg/year/inhabitant,
- By 2012: an average of 45% of EEE put on the market,
- Starting from 2019: an average of 65% of EEE which put on the market in the three previous years, or 85% of generated WEEE.

In 2012, WEEE Compliance Schemes collected 6.9 kg/year/inhabitant. In order to reach the objectives indicated above, it is necessary to:

- Increase collection by 50% (+3.4 kg) by 2016,
- Increase by 115% (+8.0 kg), or 145% (+10.1 kg) by 2019, depending on the calculation method.

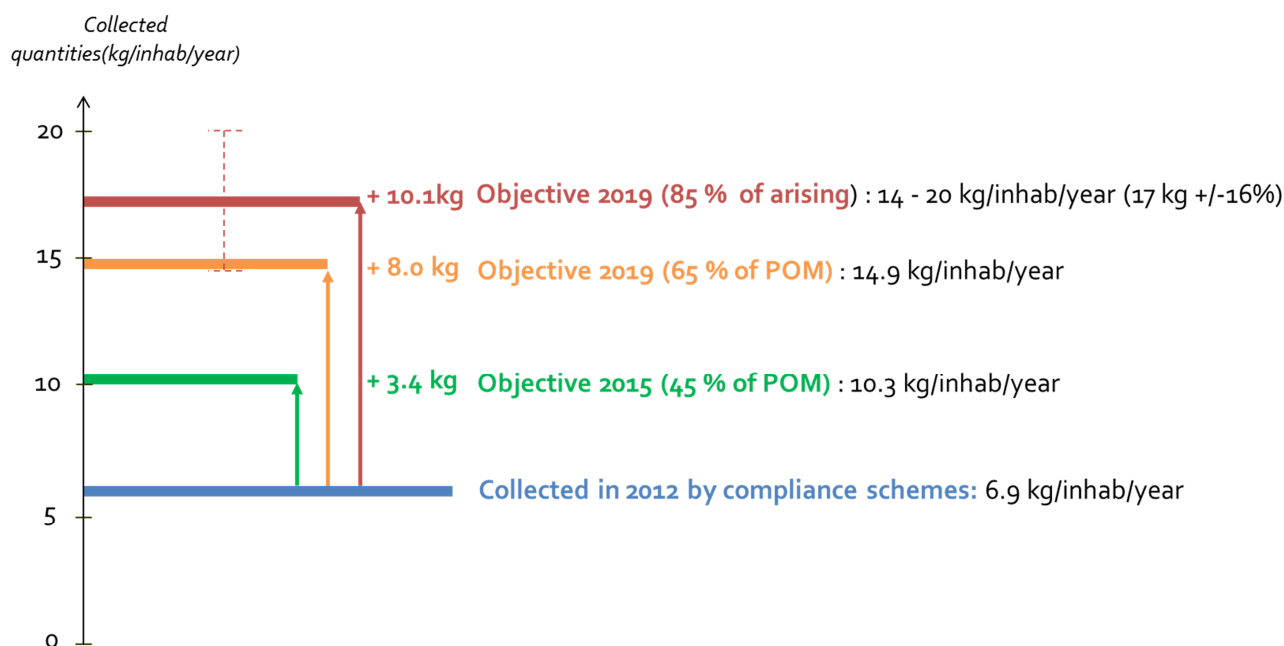


Figure 16 – WEEE collected in France and gaps with the future legislative targets

The above diagram shows that the 85% of WEEE arising target (14 to 20 kg) is more ambitious than the objective of 65% of EEE put on market.

This section:

- Identifies ways to increase the household WEEE collection rate by WEEE Compliance Schemes, in order to ensure the proper implementation of the existing regulations. A double approach is proposed:
 - Upstream, by optimising and securing collection and sorting “at source”, with the existing collection partners,
 - Downstream, through provisions regarding the actors at the end of the chain, meaning the scrap metal collectors and shredders.
- Identifies future courses of action to improve the quantification of EEE put on market and generated WEEE.
- Highlights the flows which have not yet been documented.

Taking into account the lack of experience and documented results coming from local initiatives, the recommendations outlined below aim mostly to serve as a basis for further reflection rather than operational action plans.

IV.1. IMPROVE WEEE COLLECTION

IV.1.1. IMPROVE COLLECTION AT EXISTING WEEE COLLECTION POINTS

■ REDUCE THEFT AT WASTE COLLECTION CENTRES (COLLECTION POTENTIAL : 0.8 TO 1.2 KG /YEAR/INHABITANT)

In order to reduce theft at waste collection centres, it is important to take operational measures (systems of video surveillance, WEEE tagging, etc.), financial measures (incentives to exceed the average national collection rate of large appliances), as well as technical and juridical measures, such as those recommended by OCAD3E's working group fighting against theft since 2008.

A number of regional authorities were favourable to creating an investment aid which will improve the performance of their security systems (for example, the provision by WEEE Compliance Schemes of maritime containers that protect WEEE)

A complementary action plan would deal with the removal frequency of WEEE collected at municipal collection centres in cities like Marseille where the collection rate is particularly low.

These recommendations should be further explored, especially by taking into account possible strategies for looters to adapt. A costs-benefit analysis will also be necessary to confirm their relevance.

■ IMPROVE WEEE SORTING IN WASTE COLLECTION CENTRES (COLLECTION POTENTIAL: UP TO 2.2 KG/YEAR/INHABITANT)

Sorting errors in waste collection centres contribute to a large extent to the non-captured WEEE: up to 1.5 kg/year/inhabitant ends up in bulky waste containers and around 0.7 kg/year/inhabitant in scrap metal containers.

Awareness raising actions directed to guardians and users of municipal waste collection centres are necessary, along with a more precise characterisation of scrap metal containers which could improve the analysis of sorting errors. However, according to AMORCE, "it is not certain that the regional authorities will be interested because the scrap metal containers do not represent a specific recovery challenge."

■ AVOID WEEE DISPOSAL ON FOOTPATHS

In cities like Paris or Marseille where low rates of return in civic amenity sites are observed, or with a weak network of collection centres, the door-to-door collection is maybe not the best solution, as that will generate parallel collection networks.

One recommendation would be to develop new solutions to offer the possibility for inhabitants of big cities to dispose of their WEEE close to their household: for example via exceptional collections organised in front of their residences, mobile waste collection points, etc.

In addition to the development of alternative collection systems adapted to the situation of dense urban areas, a further reflection can be carried out on the schedules for door-to-door collection. For example, as private individuals work during the week, the collection of WEEE after 7pm could be a good idea because WEEE is usually left on the sidewalk the evening before the scheduled delivery or during the weekend.

■ DECREASE THE "LEAKS" AT RETAILERS (COLLECTING POTENTIAL: UP TO 0.8 KG OF WEEE/YEAR/INHABITANT)

The implementation of an information system which can trace WEEE flows especially at collection points in stores and during deliveries, would allow a better monitoring of WEEE flows.

Faced with the rise of the “pure players” among the distribution channels, it will be necessary to ensure that they respect their obligation of “one-to-one” take back, with the implementation of efficient solutions for the take back of equipment, especially for small appliances (e.g. free postal delivery, etc.). Sanctions should be applied for those who do not obey this obligation outlined in the French Environmental Code.

■ **IMPROVE WEEE SORTING IN HOUSEHOLDS (COLLECTION POTENTIAL : ~1 KG/YEAR/INHABITANT)**

Finally, a large amount of WEEE is not well sorted by households. That concerns especially small appliances thrown away with household trash. These quantities can certainly still be reduced, via awareness raising actions in order to educate households to improve their practices.

IV.1.2. RECOMMENDATIONS FOR SCRAP METAL COLLECTORS AND SHREDDERS

Collection potential: at least 4.8 kg of WEEE in mixed scrap metal, with 3 kg shredded in France

! Warning: a part of the flow which arrives at the scrap metal collectors is either stolen, or leaked from retailers, etc. The collection potential at this level, does not add to the collection potential estimated earlier.

With regards to the WEEE tonnage recovered by metal collectors and shredders, it seems essential to ensure that WEEE is correctly depolluted and that their origins and outlets are monitored.

There is a triple challenge:

- The quantities which circulate via these actors, in addition to the quantities collected by Compliance Schemes, would help meet the collection targets set by the WEEE Directive;
- A significant part of the flows diverted from existing collection points (see previous paragraphs) are in the end treated by these actors; it will thus be interesting to involve them in the fight against this misappropriation;
- The treatment of WEEE within mixed scrap metals does not ensure correct depollution.

It would be relevant for the scrap metal collectors and shredders to work together with Compliance Schemes, in the framework of the existing legislation (in particular, the Decree of 2 May 2012).

There are three complementary lines of work:

- Include these actors as WEEE collection points, in order to be able to account for complementary WEEE collection (direct intake by the owners, by the artisans/installers who do not work for distributors, the private collection services of scrap metal which recover WEEE from private individuals, etc.);
- In return, implement stricter control of the illegal intake which is diverted from the compliance schemes' separate collection, such as theft at waste collection centres, intake by installers who deliver on behalf of the retailer in the framework of the “one-for-one” obligation, etc.);

- Ask for evidence of a recycling rate and a level of depollution consistent with the regulation.

IV.2. IMPROVE THE QUANTIFICATION METHOD OF EEE PUT ON MARKET AND OF GENERATED WEEE

IV.2.1. CARRY OUT STATISTICAL STUDIES TO FILL IN THE KNOWLEDGE GAPS

Consumer surveys will improve the representativeness of the total lifespan of equipment (at the moment based on the results of the Belgian study). These surveys could aim at obtaining quantified data on the behaviour of French households (and of those business which generate similar WEEE), vis-à-vis EEE (evolution, age and average weight of the EEE owned by households, the age of different appliances at the moment of their disposal or of their reuse) and to have complementary information on the amount and the lifespan of EEE in secondary houses. As a matter of fact, the stock level (including household appliances which are in use and the ones which are not), across the whole perimeter (household and similar, including solar panels), is around 240 kg/year/inhabitant. A consumer survey could describe this stock in detail, and distinguished between EEE in use and used EEE located in the households.

IV.2.2. ADAPT THE DATA WHICH IS BEING DECLARED IN THE WEEE REGISTER TO THE NEEDS OF WEEE ARISING ESTIMATION

The Register's declarations are made according to the SH4 nomenclature and do not have a sufficient level of precision to be directly linked to the types of equipment considered for the evaluation of WEEE arising. For this study, it was thus necessary to rely on the declarations made to Eco-Systèmes, which are more precise (SH8 nomenclature). For the upcoming evaluations, two possibilities are feasible:

- As in the case of the present study, the split of the SH4 declarations in the Register according to the declarations made by Eco-Systèmes, and its extrapolation to all the EEE put on the market;
- One option which can improve the evaluation is to ask all producers **to declare the equipment they put on the market using the SH8 nomenclature.**

IV.3. HIGHLIGHT UNDOCUMENTED FLOWS

IV.3.1. THE CHARACTERISATION OF MIXED SCRAP METAL

The surveys carried out by this study showed that it is very difficult to determine the exact volume of WEEE in mixed scrap metal. The characterisation of mixed scrap metal would show with more precision the exact quantity of WEEE it contains.

IV.3.2. UPDATE KNOWLEDGE ON THE REFURBISHMENT MARKET AND ON THE EXPORT MARKET OF ICT

According to SIRRMIET (trade union for the ICT equipment refurbishers), the “broker” market has changed considerably since the first study on this topic in 2008.

Moreover, one of the main retailers and leasers of the French market, active on the broker market (~25% market shares), stated that two-thirds of the equipment exported by all French brokers are not tested before their export.

It would therefore be interesting to gather more information on:

- The volumes of WEEE which pass through the “broker” market, their final destinations and the way this equipment is transported;
- Individual systems (when a producer organises the take back of WEEE itself, without transferring this responsibility to a compliance scheme) or delegation to the user (a possibility offered by the French regulation for professional equipment), particularly in the context of the revised WEEE Directive which requires the integration of household and similar equipments in the household WEEE collection.

IV.3.3. GATHER DATA ON THE EXPORT OF USED EEE

It is necessary to better identify the destinations of used EEE exports from France to other countries. Nowadays, exports are very poorly documented and taking into consideration the sources used to build up the hypothesis of this study, it is impossible to make quantitative statements in this regard.

In order to identify this data, it is necessary to reinforce co-operation with the authorities qualified to fight against illegal sectors (home affairs ministry, customs, and the ministry of the environment). With the objective of reinforcing custom actions, it could be possible to make the transmission of information coming from WEEE Compliance Schemes systematic, information which need to reach the ministries, especially concerning:

- Those institutions which perform management practices that do not comply with the national legislation;
- Documented suspicions of illegal export such as WEEE exported as used EEE.

ABOUT ADEME

The French Environment and Energy Management Agency (ADEME) is a public agency under the joint authority of the Ministry of Ecology, Sustainable Development and Energy, and the Ministry for Higher Education and Research. The agency is active in the implementation of public policy in the areas of the environment, energy and sustainable development.

ADEME provides expertise and advisory services to businesses, local authorities and communities, government bodies and the public at large, to enable them to establish and consolidate their environmental action. As part of this work the agency helps finance projects, from research to implementation, in the areas of waste management, soil conservation, energy efficiency and renewable energy, air quality and noise abatement.

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