Quantifying WEEE in Romania

2019 vs 2015

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Consumer survey made by GBD Research in July-August 2019 to 2002 repondents.

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LIST OF ACRONYMS AND ABBREVIATION

CE	Consumer equipment
CRT	Cathode ray tube
C&F	Cooling and freezing
EC	European Commission
EEE	Electric and electronic equipment
ICT	Information and communication technology
LHHA	Large household appliances
POM	Put on the market
PRO	Producer responsibility organization
SHA	Small household equipment
WEEE	Waste of electric and electronic equipment
WG	WEEE generated

EXECUTIVE SUMMARY

Romania, like many other Member States, **is facing challenges in achieving WEEE collection targets**, irrespective whether they are based on put on the market (POM) or WEEE generated (WG) indicators. This is mainly linked to a combination of effects:

- **Target based on POM** (45% or 65%) **in an expanding market might be hard to achieve**, as it is not always the case that every sale of a new product would entail the discarding of the old one: **stock of EEE** in the Romanian household grew from 71 kg/person in 2015 to **91 kg/person in 2019** and 80% of the stock (in weight) consists of six products (washing machines, fridges, flat panel TVs, Ovens, Freezers and CRT TVs). More than **55% of the stock** is of products that are **less than 5 years old**.
- **Target based on WG** (85%) **does not consider** the fact that a relevant share of the **waste discarded by the household is being donated** to relatives or sold: this accounts for **34% by weight**; another **25% by weight is not discarded properly** and 4% of the consumers do not remember exactly how they disposed of the waste. This is undermining already any chance to achieve the 85% target.
- A relevant share of the appliances generated as waste are kept at home for an extended period of time: **7.2 kg/person** (which is approximately 7.5% of the stock) are **stored at households** and this amount is almost equivalent to the estimations of WEEE Generated in one year.

Both the target based on POM and WG largely depend on having correct sales data. Currently the E-tool made available by the European Commission is pre-loaded with data generated using the apparent consumption methodology and thus not necessarily aligned with real industry data. In this case, E-tool data appears to be higher: between 14 and 61%, considering the years 2006 to 2018 with official data reported by the National Register of Romania. National Register data also appears to contain errors such as the over-reported peak of large household appliances registered in 2008, which might lead to an overestimation of WG of up to 4% per year (equal to 6,100 t in 2018). **In both cases there are clear errors and inaccurate data: it is paramount to rely on accurate POM data for the future assessment of targets. Extrapolations from the E-tool led to a potential target of 6.9 kg/person** (45% POM) for 2018 **with a total WG equal to 11.9 kg/person** (including non-household waste which anyway is a minority), while **National Register data led to a target of 4.6 kg/person and WG equal to 7.8 kg/person**. **Data from consumer survey** revealed a total amount of **household WG equal to 8.3 kg/person (30% lower** compared to E-tool WG**)**. When looking at the discard patterns, the following conclusions can be drawn:

- **only 3 kg/person are potentially available for collection** by compliance schemes (36% of WG according to survey);
- **2.8 kg/person** (34% of WG) **are being reused/donated/refurbished** and thus their life is extended; the hand-over of such appliances to relatives/friends or third party will not necessarily generate discarded equivalent equipment;
- **2.1 kg/person** (25% of WG) are discarded trough channels that are **not reachable** to compliance schemes **or** are leading to **sub-standard treatment**.

Considering the market dynamics in Romania, **a target based on WG appears to be better** than a target based on POM. But no matter what the target setting mechanism is, it will be **impossible** for Romania **to meet the collection target** without:

- **drastic improvement** on the quantities that currently cannot be reached by compliance schemes due to **bad-habits of consumers and lack of proper discarding solutions**;
- **exclusion from the WG estimations the quantities of products that are donated/reuse**, which are currently accounted as waste.

1. Background and current situation in Romania

The EEE market in Romania has been growing since 2010.. There are currently 9 PROs (Producer Responsibility Organization) to fulfil producers' obligations (only 5 are set-up and managed by Producers). They will face strong challenges ahead, as reaching the national target is solely on producers' shoulders. The target to achieve is 45% of the average placed on the market in the three preceding years until 2020 and 65% from 2021 (alternatively 85% of the WEEE Generated if Romanian Government decide to adopt this option mentioned in WEEE Directive).

The law stipulates a "mandatory hand-over" system: WEEE should be collected only by operators under contract with Producers (or PROs) or under contract with a treatment operator that treats WEEE for producers or PROs. Unfortunately, this is not enforced and from more than 800 collectors and 70 treatment operators who have waste permits, many of them handle WEEE without any formal connection or contract with Producers or PROs.

The strongest enforcement in the EU for Producers and PRO's came into force in 2016, and with that came a lot of pressure:

- If a PRO misses collection target for 2 consecutive years, their license will be revoked (and producers' responsibilities related to what they previously put on the market are vanishing);

- 4 Lei/kg (0.8 €/kg) penalty for missed collection targets (contribution to Environmental Fund Administration - AFM) for PROs, to be enforced from 2020;

- 4 Lei/kg penalty for missed reports of EEE put on the market by Producers;

- from 2019 2 Lei/kg penalty for collection operators over-reporting WEEE collected to PRO.

Enforcement proved to be carried out mainly at the level of PROs and Producers so far with challenges related to achievability of the target while availability of collection infrastructures still needing to be addressed.

National collection results registered a slow but steady increase: 65,000 tons of WEEE were estimated to be collected and reported in 2018, meaning 3.2 kg/pers. The main streams for household collection are the retailers (50% of the volumes collected), PRO's take back campaigns and scrap yards, with very small quantities coming from municipalities. At the end of 2018, Government through AFM launched a program to renew the old appliances in households with more energy efficient ones. Around 4,000 tons will be accounted in 2019 from this program.

To date one of the weaknesses of the system is the low quantities collected by municipalities with very few examples of suitable solutions for citizens wanting to discard WEEE, while scrap informal collectors are proving to be an effective channel, despite not resulting in formal treatment of the waste. The situation might improve in conjunction with the strong government pressure to increase the recycling results in municipal waste.

As far as recycling infrastructures are concerned, there are 76 authorized treatment plants but only 3 plants have WEEELABEX certification. Many scrap dealers have waste permit but mainly focus on extraction of valuable fractions without proper depollution activities carried out and limited reporting.

2. The common methodology to calculate WEEE Generated

2.1 Collection targets and the common methodology

The need for estimating the WEEE generated (WG) in a country originates from the legal requirements of WEEE Directive article 7, and in particular from the need to calculate the quantity of WG by weight to establish the baseline for the definition of collection targets; from 2021 onwards, Romania has the option to establish collection target either on the basis of put on market (POM) or WG according to the table below. The alternatives for Romania are:

- 65% of the annual average of POM of the three preceding years, or

- 85% of the estimated WG for the year.

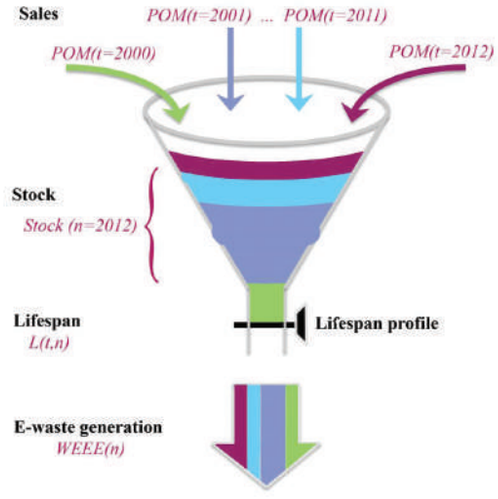
Table 1: Collection targets in the WEEE Directive and derogations granted to Romania.

Year	2014	2015	2016	2017	2018	2019	2020	2021
Original Target WEEE Directive	Min. 4 kg/inhabitant ***or*** average kg/inhabitant collected annually over the previous 3 years (whichever is greater)		Min 45% PoM (annual average from 3 preceding years)			65% PoM (annual average from 3 preceding years) or 85% WEEE generated		
Target Romania	*Min 4 kg/inhabitant **or** average kg/inhabitant collected annually over the previous 3 years (whichever is greater)*		*Min 40% PoM (annual average from 3 preceding years)*	*Min 45% PoM (annual average from 3 preceding years)*				***65% PoM** (annual average from 3 preceding years) **or 85% WG***

The study[1] to establish the common methodology, commissioned by EU DG Environment, which was launched in 2013 and completed in 2014, aimed not only at developing the methodology, but also at investigating the potential for setting individual collection targets as well as analysing the implementation difficulties faced by Member States. The study highlighted how most Member States might face challenges in achieving the targets, and in some cases, this achievement might be unfeasible. The main difficulties reported by Member States and key stakeholders were linked to the high rate of collection that remains unaccounted for, which is further amplified by the limited enforcement and monitoring capacities of Member States.

In 2016 the EC also completed a Compliance promotion exercise[2] that highlighted how the majority of Member States are still far from the objective of reaching the ambitious collection targets of 65% POM or 85% WG.

The common methodology has been officially adopted with the Commission Implementing Regulation (EU) 2017/699 of 18 April 2017 and is based on the "sales/lifespan distribution": the quantity of WEEE generated in a specific year is calculated by a collective sum of discarded products that were placed on the market in all historical years multiplied by the appropriate lifespan distribution, modelled as Weibull function.



The common methodology also introduced the definition of WG, which is in line with the definition of waste in the Waste Framework Directive and aligned with the way the Weibull functions are created:

> *'WEEE generated' in a Member State means the total weight of WEEE resulting from EEE within the scope of Directive 2012/19/EU that had been placed on the market of that Member State, prior to any activity such as collection, preparation for reuse, treatment, recovery, including recycling, or export.*

This means that the output of the methodology is an estimation of the waste potentially generated by users (waste holders) but not necessarily the amount that is available for collection as various alternative routes are still available.

Figure : How the sales-lifespan methodology works.

Those two parameters needed for the calculations of WG - sales data and lifespan profiles - have direct impacts on the final results of waste generated in a country:

- The historical amount of POM mainly defines the overall quantity of waste arising. All products introduced on the national market will sooner or later be discarded by users and eventually become waste. This is the key driver.

- Lifespan profiles describe the probable distribution of a product being discarded over time. The main role of the lifespan profile is to project in the future, according to the profile of the specific product and the amount of past sales. They are indeed responsible for moving over time the moment of discard, while the amount of EEE POM are having a greater effect on the overall quantity of waste generated.

[1]See: https://ec.europa.eu/environment/waste/weee/pdf/Final_Report_Art7_publication.pdf

[2]See: https://publications.europa.eu/en/publication-detail/-/publication/09c7215a-49c5-11e8-be1d-01aa75ed71a1/language-en

2.2 The methodology, the E-tool and current limitations

The common methodology developed in 2014 has been implemented in an Excel-based tool (E-tool), available for Member States on EC website[3] allowing to calculate the WG in a given year on the basis of the two variables (POM and lifespan profiles).

The E-tool has been pre-loaded with historical sales data from 1980 to 2014 and the lifespan profiles have also been included for all products over time (54 different product type - so called UNU-KEY - linked to the 10 product categories or the 6 collection categories of the WEEE Directive). POM data in the E-tool has been calculated using the so called "apparent consumption" methodology which uses available statistical data as the central data source. In the EU, the figures of domestic production can be taken from the PRODCOM statistics. EEE products produced domestically can also be sold also, and they need to be corrected by subtracting for exports. Imports of EEE, on the other hand, can also be consumed in the country of import, thus need to be added to the total; POM for a certain type of equipment in a territory can be calculated with the following equation:

Apparent consumption = Domestic Production + Import - Export

For both the production and the import/export official statistics exist and are available in Eurostat. For some PRODCOM and CN codes, the data is available in weight. In other cases, pieces are used as the primary unit and average weight has been used as conversion factor[4].

The results obtained using the E-tool need to be considered with the following aspects:

- ***Limitations in the methodology***

The common methodology was not developed to predict the waste collected or available for collection in a given year. This is because in each market, various dynamics exist and influence the effective collection of waste (see chapter 5). There are in many cases various economic operators, other than the Compliance Scheme set up by Producers having access to the waste; in many cases once the consumer decides to discard an old appliance (becoming waste, according to WFD definition), the appliance will be passed to relatives, neighbours, sold online or given to repair shops; for small appliances in particular, often a share of WG ends up (mixed) with municipal solid waste (waste bin).

> **All those dynamics are not reflected in the methodology, therefore there is a need to understand and trace the flows of waste trough dedicated instruments, such as surveys.**

- ***Limitations in the E-tool***

The calculations in the tool are based on 54 UNU-KEY. This is to reflect different disposal habits but also the average lifetime. The results are clustered according to the 10 product categories or the 6 collection categories after the calculations have been completed. Input data need to be consistent with the 54 UNU-KEY. If new POM data are inserted (after 2014) or past data are edited and the user inserts data using the 10 product categories or the 6 collection categories, the E-tool will split the data entered into the 54 UNU-KEY using the same breakdown of year 2014 (the last available year in the original E-tool). Thus, this means that market dynamics of recent years might not be reflected.

> **More accurate results might be obtained by inserting the POM data using the 54 UNU-KEYS, despite being more time consuming for the user of the E-tool.**

With the entry into force of the "open scope", new EEE are now part of the scope of the WEEE Directive. The E-tool does currently not have any lifespan profile associated to those new EEE and any kilogram of EEE belonging to the open scope will be allocated to the former 54 UNU-KEY, potentially causing deviations in the results.

> **Assessment of the appliances in the open scope and their lifespan profiles need to be carried out to evaluate the impacts on the resulting WG.**

- ***Accuracy in the data***

WG is mainly influenced by POM rather than lifespan profiles. In the study for the development of the common methodology this effect has already been highlighted[5]: POM from all historical years collectively influence the

[3] See: https://ec.europa.eu/environment/waste/weee/data_en.htm

[4] See Annex 9.3 of the "Study on collection rates of waste electrical and electronic equipment (WEEE)"

[5] See chapter 4.6 of the "Study on collection rates of waste electrical and electronic equipment (WEEE)"

magnitude of WG generated in a target year. In some cases, however, the relationship between POM and WG is not always linear: this is the case of non-saturated or expanding markets (like Romania) or technological jumps or replacement (CRT to LCD). Inaccuracy in lifespan profiles might simply delay (or anticipate) the moment waste is generated but the magnitude in a given year is much more influenced by POM rather than lifespan.

Accuracy in POM data is much more important than precision in lifespan profiles when calculating WG.

The apparent consumption methodology that was used to pre-load the E-tool used the average weight constant in all EU28. For some products (particularly large household appliances) significant differences are observed, especially for products with large market penetration: for washing machines the average weight is 62 kg/unit instead of 72 in the E-tool (in some parts of the country washing machines sold are even lighter), Microwaves are 12 kg/unit instead of 22 kg/unit of the E-tool, Flat screen TV are 8kg/unit instead of 14 kg/unit, Fridges are 66kg/unit instead of 54.

Adoption of apparent consumption to pre-load the E-tool might lead to some inaccuracy in the POM data for the average weight used in the initial calculations, due to the market dynamics and products sold in Romania.

3. EEE Placed on the market

3.1 Potential data sources and different results

The E-tool, as described in previous chapter, calculates POM based on the apparent consumption method. This data is based on official trade statistics and provides time series 1980 to 2014.

POM data can also be derived from the National Registers of Producers set up in 2006, according to WEEE Directive's legal provisions. National Registers receive annual declarations from producers and are responsible for reporting EEE POM in each Member States and to Eurostat. In Romania, the National Register has been active since 2006, and it is operated by the National Environment Protection Agency. Data is available up to 2018.

A comparison of the two data sources is provided in , which lists the time series of total POM per person in Romania from 2006 to 2018. For this comparison, E-tool POM were extrapolated from 2014 to 2018, assuming a realistic growth scenario for each of the 54 UNU-KEYs. The data shows significant differences between the two data sources, ranging from 14 to 61%.

Table 2: Comparison of National Register POM data and POM data derived from the E-Tool (based on the apparent consumption method, excluding PV-panels, extrapolated from 2014 to 2018)

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
POM data E-Tool (kg/person)	13.9	16.5	16.5	11.9	13.8	15.1	15.3	14.8	14.9	15.1	15.3	15.5	15.7
POM data National Register (kg/person)	7.3	9.7	11.5	6.2	7.3	5.9	6.7	6.7	6.5	8.7	10.4	12.3	13.5
Difference E-Tool vs National Register (%)	48%	42%	30%	48%	47%	61%	56%	55%	57%	42%	32%	21%	14%

Comparisons of the E-tool and National Register time series from 2006 to 2018, split into the four main product categories, are shown in . They show the following characteristics:

• The apparent consumption methodology appears to lead to higher POM data for all product categories except information and communication technologies (ICT), where in 2007 and 2010, POM data from the National Register was higher.

• Time series for ICT from the National Register show highly fluctuating POM data, while the data from the E-tool appears to be more stable.

• For small household appliances (SHA) and consumer electronics (CE), time series from both data sources follow the same general trend.

• For large household appliances (LHHA), National Register data shows a high peak in 2008. As LHHA account for 50 – 70% of all appliances, such a peak has a high influence on subsequent WG calculations.

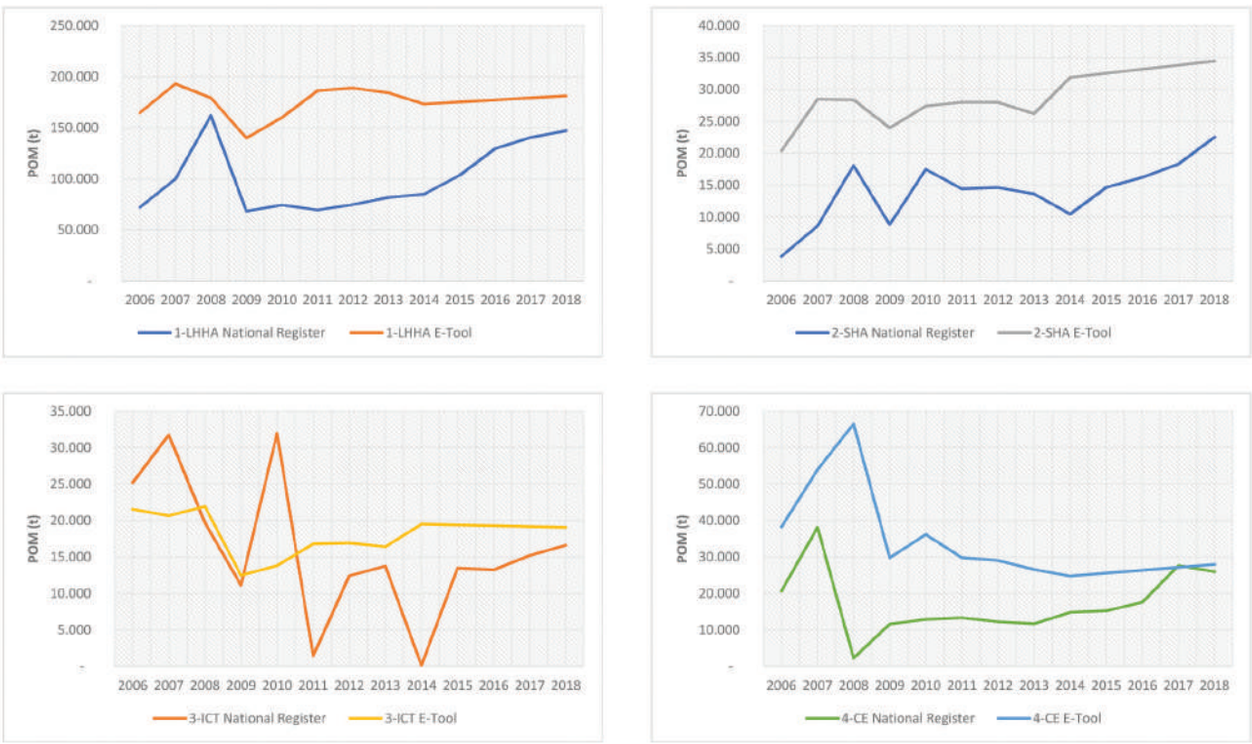


Figure 2: Comparison of National Register POM (reported to Eurostat) and POM derived from the E-Tool (based on the apparent consumption method) for a) large household appliances (LHHA), b) small household appliances (SHA), c) information and communication technologies (ICT) and d) consumer electronics (CE).

In order to simulate the influence of the high peak of National Register LHHA POM in 2007/2008 on the WG, a data set with only this peak was created and the resulting WG calculated.

As shown in, the peak POM leads to WG in the next years, according to the lifespan distribution. The influence is highest in 2018, with a total additional WG of 6,100 tons or 4%.

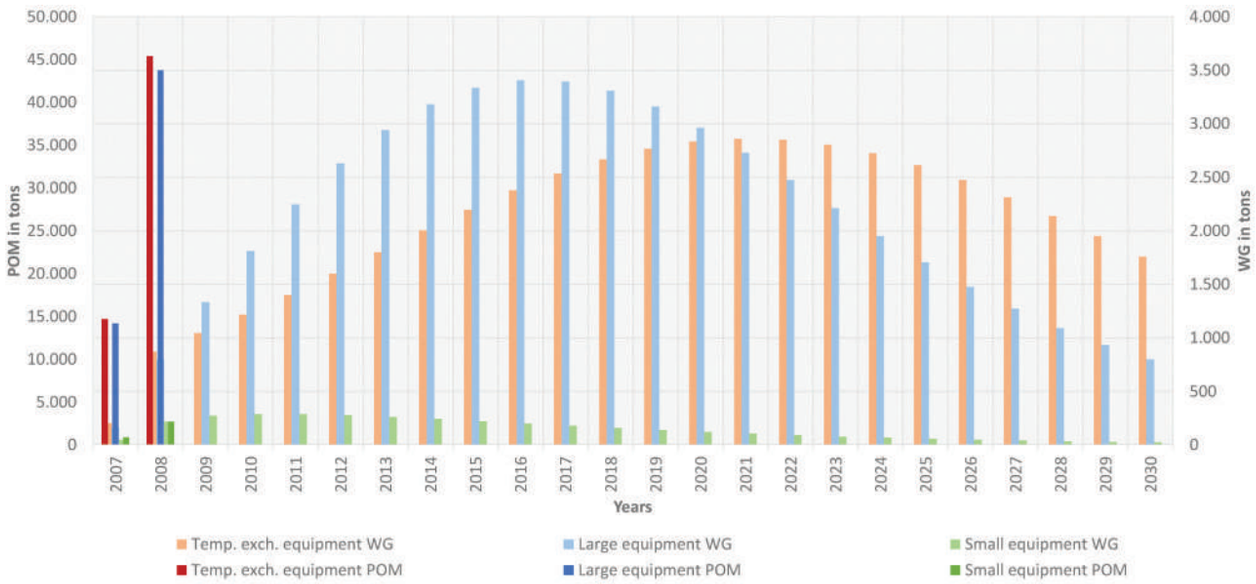


Figure 3: Influence of the peak of National Register LHHA POM in 2007/2008 on WG in the coming years.

3.2 Limitations of various data sources

The National Register data is the most obvious starting point for retrieving POM data, even though there are some limitations, including:

- Data can be incomplete for certain products due to free riding effects, as reporting POM data leads to financial obligations;

- Data does not cover a sufficient time series to reflect the WEEE generated from products having a long lifetime, but timelines are getting longer and by 2021, when WG can be adopted, 15 years of POM data will be available;

- Although EEE POM may be subject to high fluctuations, the high peak of LHHA in 2008 and the fluctuations of ICT from very high POM in 2010 to almost no POM in 2011 may not be justifiable. They indicate most probably errors in the dataset, usually linked to wrongly used units such as kg instead of tons, units instead of kg etc.

While the National Register POM data is based on actual sales data, the E-tool POM data is based on the apparent consumption methodology and thus on trade statistics. The limitations of this approach, in addition to the limitations discussed in chapter two are the following:

- For some codes, the scope might slightly differ from the WEEE Directive (might include non-electric products);

- There might be used equipment included, as there is no distinction between new and used equipment in trade;

- Many producers have branch offices and manufacturing facilities in Romania that are also managing neighbouring countries: some quantities might be imported and re-exported as whole products or imported and exported with different CN codes;

- The new dataset of the E-tool (2016 update) shows some obvious errors (e.g. POM data for fridges: no fridges placed on the market prior to 2002) that might impact the accuracy of the final results;

• The apparent consumption method is based on units and converted using average weights. For some appliances the average weight in the E-tool is not reflecting the average weight of appliances sold on Romanian market.

> However, converting the E-tool POM data to average weights of appliances sold on the Romanian market only resulted in a 1% lower POM due to the following reason: for washing machines, the average weight in the E-tool (72 kg/unit) is significantly higher than the average weight of appliances sold on Romanian market (62 kg/unit). However, for fridges, the average weight in the E-tool (54 kg/unit) is lighter than the average weight of fridges sold in Romania (66 kg/unit). These two appliance types account for more than 30% of the total POM quantity and cancel out the effect of different average weights.

POM data has a direct impact if the collection targets are calculated based on EEE POM. POM data is also the major driver for waste generated (WG), if collection targets are based on WG. Therefore, the data quality of POM data is of paramount importance. The POM data used to calculate the collection targets could be improved by

• matching trade statistics data with actual sales data/industry data;

• eliminate obvious errors such as the POM data for fridges;

• finding explanations and correction mechanisms for improbable fluctuations in sales data;

• introducing average weights for main appliances relevant to the Romanian market in case the apparent consumption methodology is used.

4. Targets with various methodologies and data sources

The collection targets are either based on the annual average POM from the 3 preceding years or on WG. In order to compare the WG in 2018 resulting from the survey (see chapter) with the collection targets based on E-tool or National Register data, POM of 2015, 2016 and 2017 as well as WG of 2018 must be known. Therefore, the available data sources were prepared as described in the following.

The E-tool provides POM time series from 1980 to 2014, split into the 54 UNU KEYs

• E-tool POM were extrapolated from 2014 to 2018, assuming a realistic growth scenario for each of the 54 UNU-KEYs;

• Based on the extrapolated POM, the WG is calculated with the “sales/lifespan distribution” methodology.

National Register POM was considered for the years 2006 to 2018, split into the 10 product categories:

• National Register POM was first split into the 54 UNU-KEYs using the average breakdown of the years 2010 to 2014;

• Based on this split the data was extrapolated from 1980 to 2006, assuming similar growth scenarios as for the E-tool;

• Based on the extrapolated POM, the WG is calculated with the “sales/lifespan distribution” methodology.

Figure 4 gives an overview on the POM, WG and collection targets in kg/person. The extrapolated average E-tool POM results in 15.3 kg/person. WG based on the E-tool is 11.9 kg/person. The collection targets thus result in 6.9 kg/person (45% POM), 9.9 kg/person (65% POM) and 10.1 kg/person (85% WG).

All these figures are highly influenced by POM data which, as pointed out earlier, is most probably higher than the reality of Romanian market.

The data from the National Register results in POM and WG that are around 30% lower and add up to a total of 10 kg/person POM, 7.8 kg/person WG, targets 4.6 kg/person (45% POM), 6.7 kg/person (65% POM) and 6.6 kg/person (85% WG).

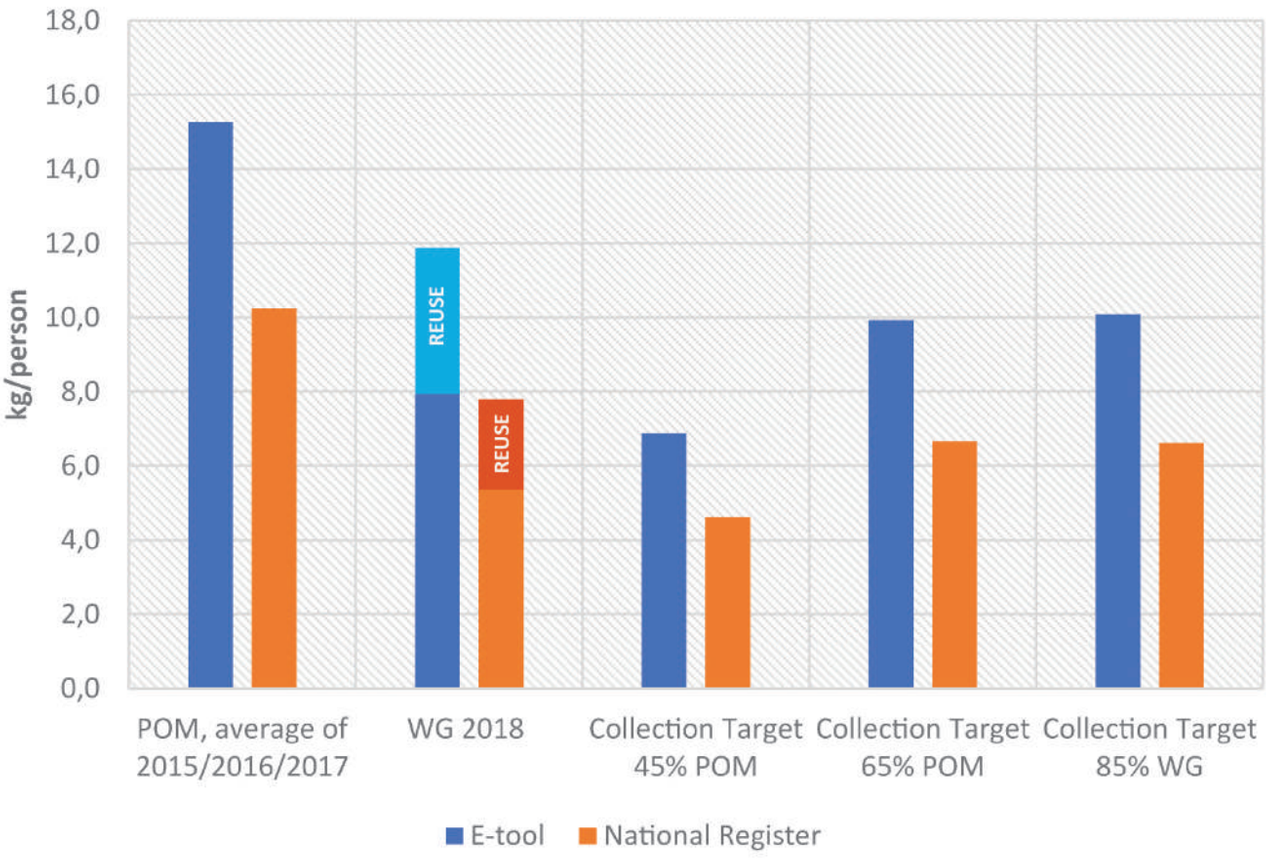


Figure 4: Comparison of POM, WG and collection targets for E-tool and National Register data in kg/person.

5. EEE in stock

5.1 Consumer survey

To understand the current market (sales, stock of EEE and its age) and consumer behaviour (disposal patterns, age of appliances discarded, awareness of collection infrastructures, etc), a consumer survey was carried out considering a sample representative of the entire country. The survey had two main objectives:

- **Understand the current stock** of appliances in each household including number of types of products in each household, age of stock, whether the product was acquired new or second-hand;

- **Identify the main disposal behaviours** and channels, including age of products at the time of disposal and the disposal channels used.

Phone interviews were carried out on a sample of 2002 individuals; the breakdown of the panel is described in the figures below. The survey focused on the products owned by the respondent, as representative of the household and included not only the primary house but also secondary houses. The resulting number of inhabitants per household resulted to be 3.2.

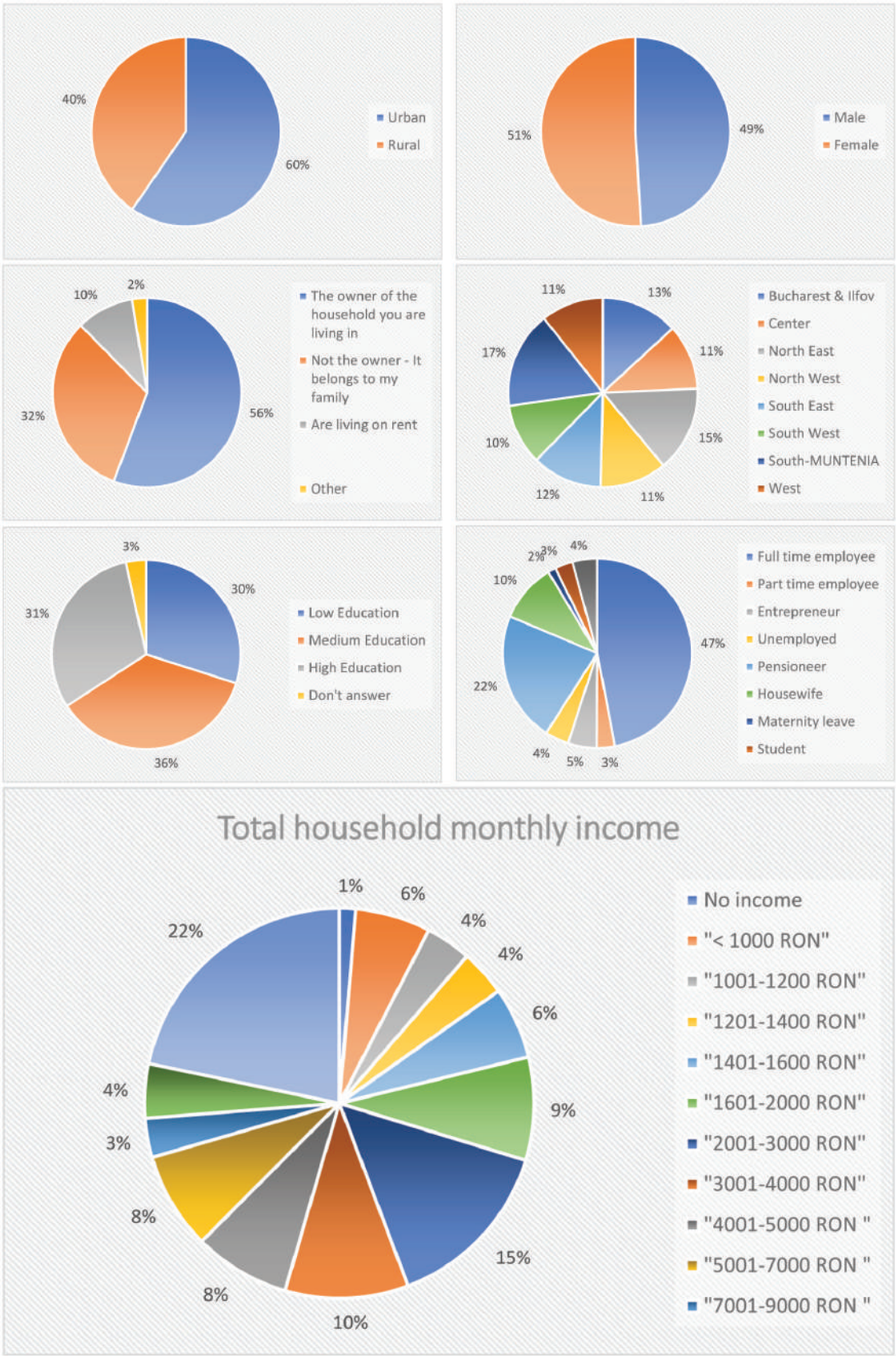


Figure 5: Description of survey panel (2002 individuals interviewed).

The survey was based on a sample of 25 products selected on the basis of the result of the previous survey conducted in 2015[6]: the products selected were the most representative by weight (e.g. washing machines, fridges, TV), by number of products present in household (e.g. lamps, mobile phones, desktop/laptop) or with growing market trend (e.g. air conditioners, tablets). Out of the sample of products, 20 were used for all the questions related to the stock of EEE and 25 were used for the questions related to the disposal habit as per the table below.

Table 3: Sample of products used in the survey.

UNU-KEY	Questions on stock cluster	Questions on disposal cluster	Products used as sample in survey
0104	A	A	Washing machine
0108	A	A	Fridges
0201	A	A	Irons
0204	A	A	Vacuum cleaners
0302	A	A	Desktop PCs
0303	A	A	Laptops
0306	A	A	Mobile phones
0309	A	A	Flat screen monitor
0407	A	A	CRT TV
0408	A	A	Flat screen TV
0111	A	A	Air Conditioner
0505	A	A	Lamps
-		A	Small household batteries (AA, AAA)
0109	B	B	Freezer
0114	B	B	Microwave
0308	B	B	CRT monitor
0103	B	B	Ovens, electric stoves
0001	B	B	Central heaters
0303	B	B	Tablets
0202		C	Mixer, blenders, robots, toasters
0205		C	Hairdryers, razors, epilators
0301		C	Keyboards and/or mice
0203		C	Electric boilers (for tea), coffee machines
0601		C	Drills, water pumps
0106		C	Ventilators (including bathroom), radiators, electric heaters

Table 4: Number of products in each survey (random selection among those in the same cluster).

Cluster	Total in survey	Coverage for stock	Products in one survey	Coverage for disposal	Products in one survey
A	12	100%	12	100%	13
B	6	50%	3	50%	3
C	6	0%	0	50%	3
	24		**15**		**19**

[6] See https://www.ecotic.ro/en/news/premiere-the-results-of-the-study-quantifying-waste-of-electric-and-electronic-equipment-in-romania/

5.2 Stock of EEE in household

In order to determine the size of household stocks of EEE, all respondents were asked how many EEE they owned among the 20 products listed.

On average, each inhabitant owned 91kg of appliances compared to 71 kg in 2015. The breakdown is given below and it can be noted that large household appliances (e.g. washing machines) and fridges already account for nearly half of the total by weight and the first six product categories amount to almost 80% of the total stock (in weight). When looking at the relevance of the stock by unit, evidently the situation changes with lamps, mobile phones, TV playing a major role.

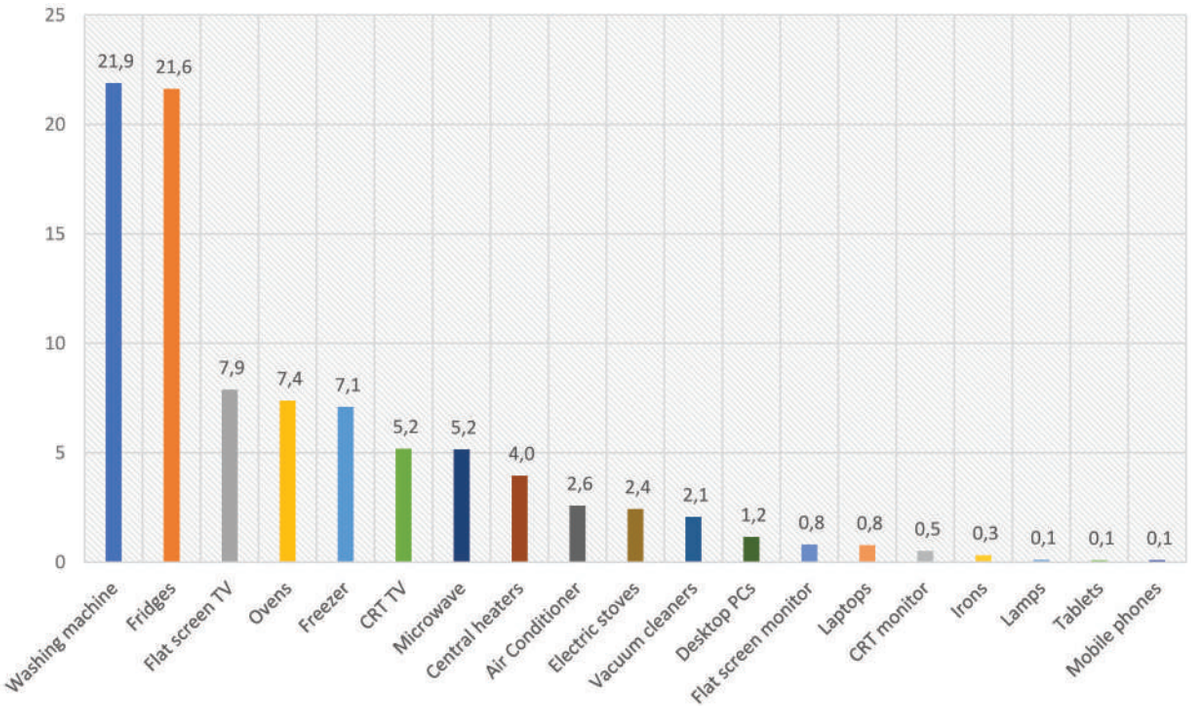


Figure 6: Stock of EEE per products (kg/person).

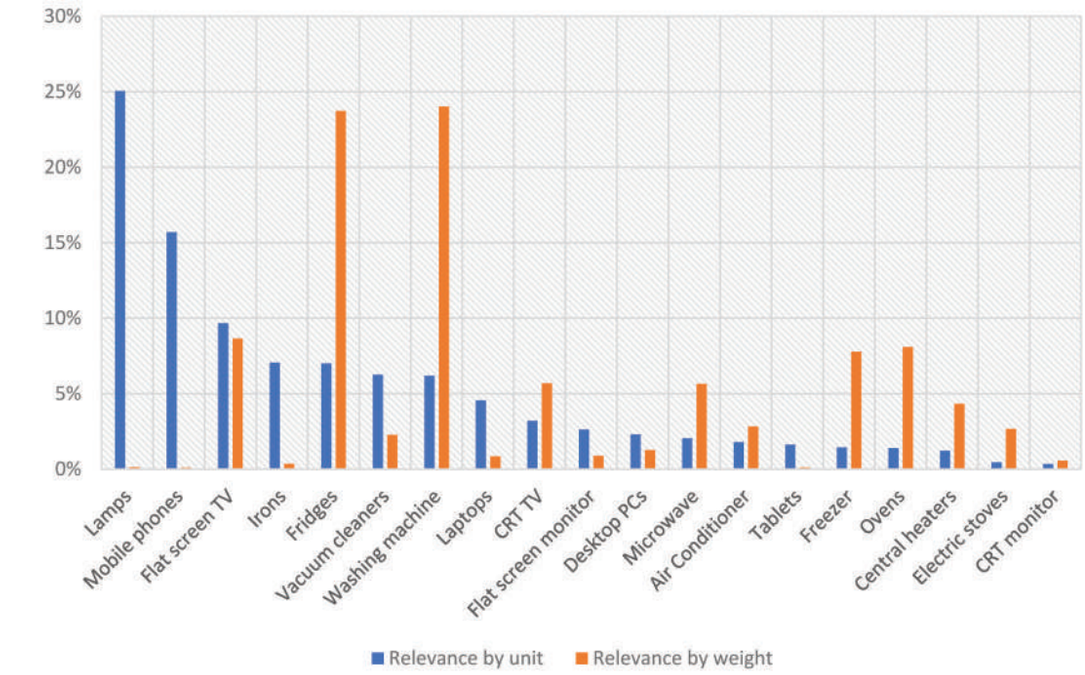


Figure 7: Relevance of stock EEE by weight (red) and by unit (blue).

According to the data derived from E-tool, Romanian households would have fewer washing machines, flat screen TVs, CRT TVs, freezers and microwaves in their households. On the other hand, they would have significantly more fridges and central heaters.

This result is again an indication, that the POM used for the E-tool is not correctly reflecting the Romanian situation as the stock measured trough consumer survey is more accurate than the stock derived from the E-tool which is the difference, in a given year, between cumulated sales and cumulated discarded appliances.

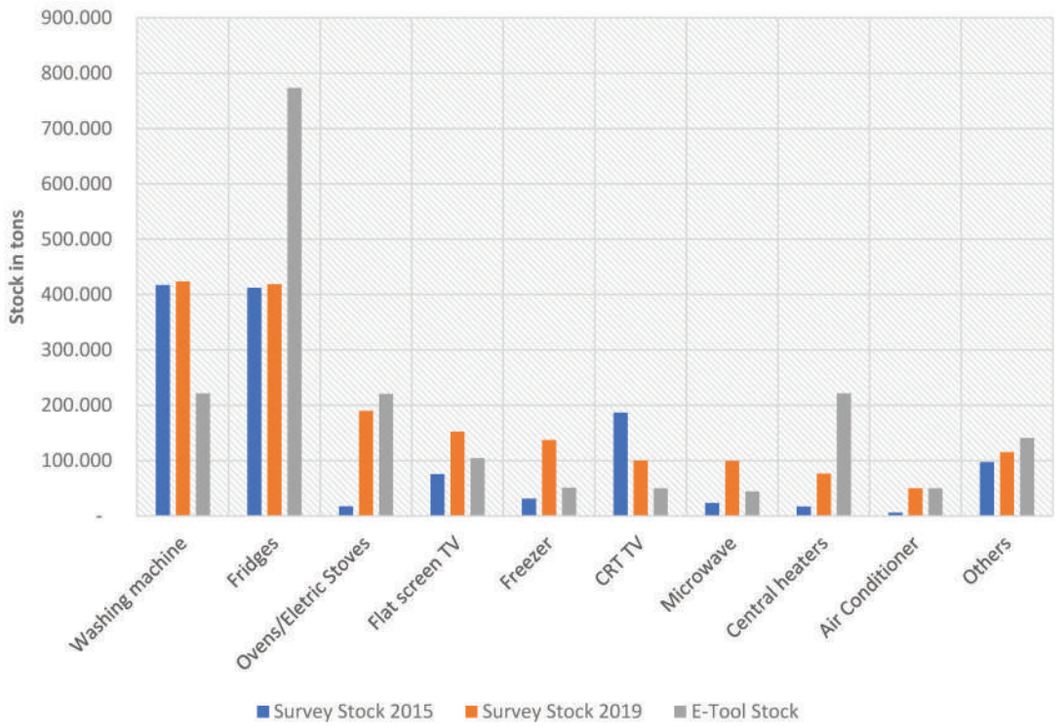
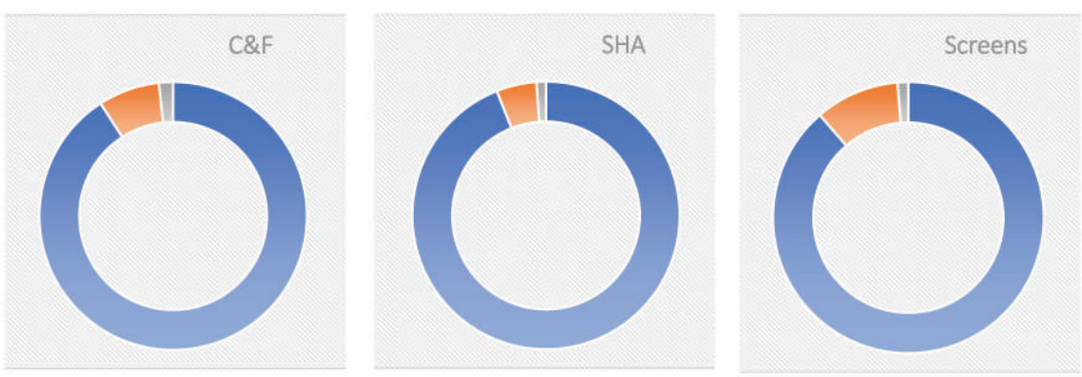


Figure 8: Comparison of the stock resulting from the two surveys in 2019 and 2015 as well as the E-tool.

5.2.1 Acquisition of EEE: new versus used

Romania is an expanding market, meaning that the vast majority of the appliances bought are new. Used/second hand products only represent 5-12% of the products purchased or acquired.



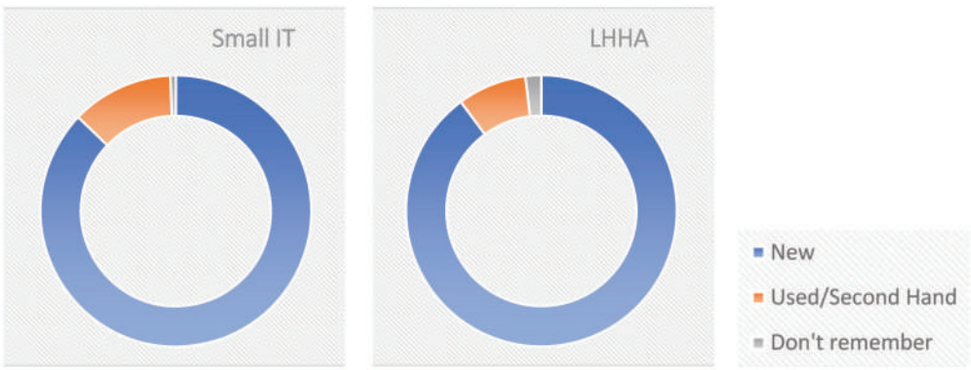


Figure 9: state (new vs. second hand) at acquisition of the products.

The highest share of second-hand products is for screens (10%) and small IT (12%) with peeks for CRT monitors (23%) and TV (17%), Desktop PC (19%), flat screen monitors (17%), laptops (13%) and mobile phones (9%).

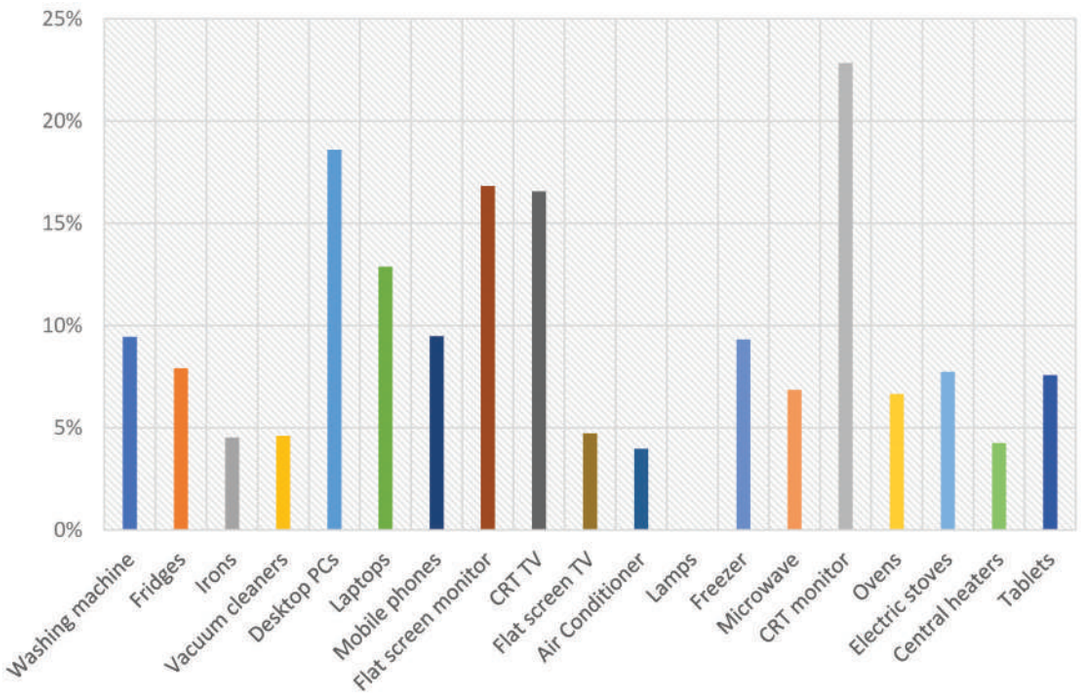


Figure 10: Share of products acquired as used/second-hand.

Compared to 2015, trends are similar except for flat screen monitors, for which the share of second-hand products increased from 9% in 2015 to 17% in 2019: this is in line with the disposal habit as 60% of Romanians that discarded a flat screen monitor in the last 2 years donated it to someone within family, friends or relatives or sold it online.

5.2.2 Age of EEE stock

As Romania is still an expanding market, there is a clear majority of relatively new products: more than 55% of the products in Romanian households are less than 5 years in each product category as shown in figures below.

Figure 11: Stock age distribution per category.

When looking at the most recent product in stock, considering the products being purchased in the last 3 years the figure below gives an indication of the main appliances/expanding markets.

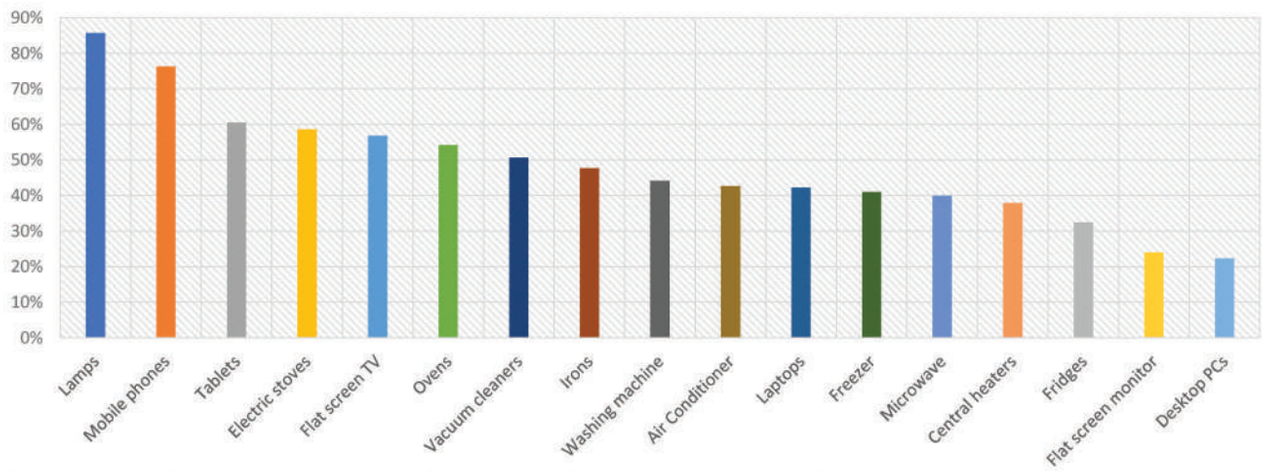


Figure 12: Appliances acquired in the last 3 years (% of the total acquired).

5.2.3 Stock of EEE: appliances working and in use versus non-working

Similar to the survey conducted in 2015, the hibernation effect has been investigated: this is mainly linked with consumer habit of keeping products at home despite the fact that those products are no longer used or are not working.

The figure below shows the results: hibernation is more visible for screens or small IT product categories, lamps excepted. Consumers keep 15-20% of products in these categories without using them as shown below.

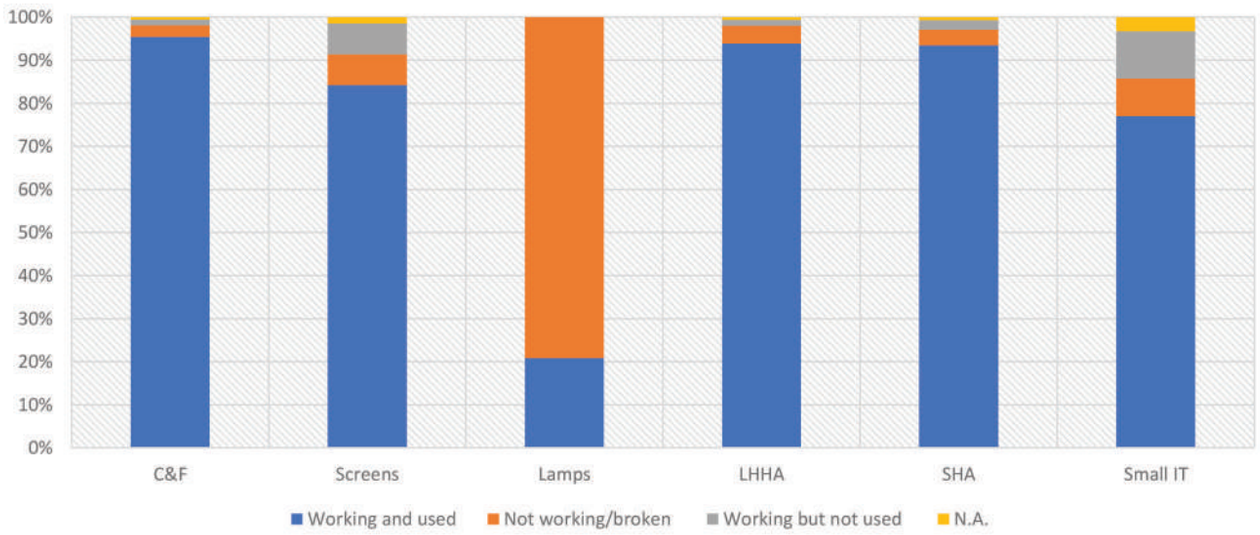


Figure 13: Effect of hibernation of EEE in stock (%).

When considering the total stock in kg per person, the figure below shows how the total amount of appliances in stock that are not working or are not in use if close to 7.2 kg/person (approx. 7.5% of the stock), which is equivalent to the amount of waste annually generated as highlighted in the following chapter.

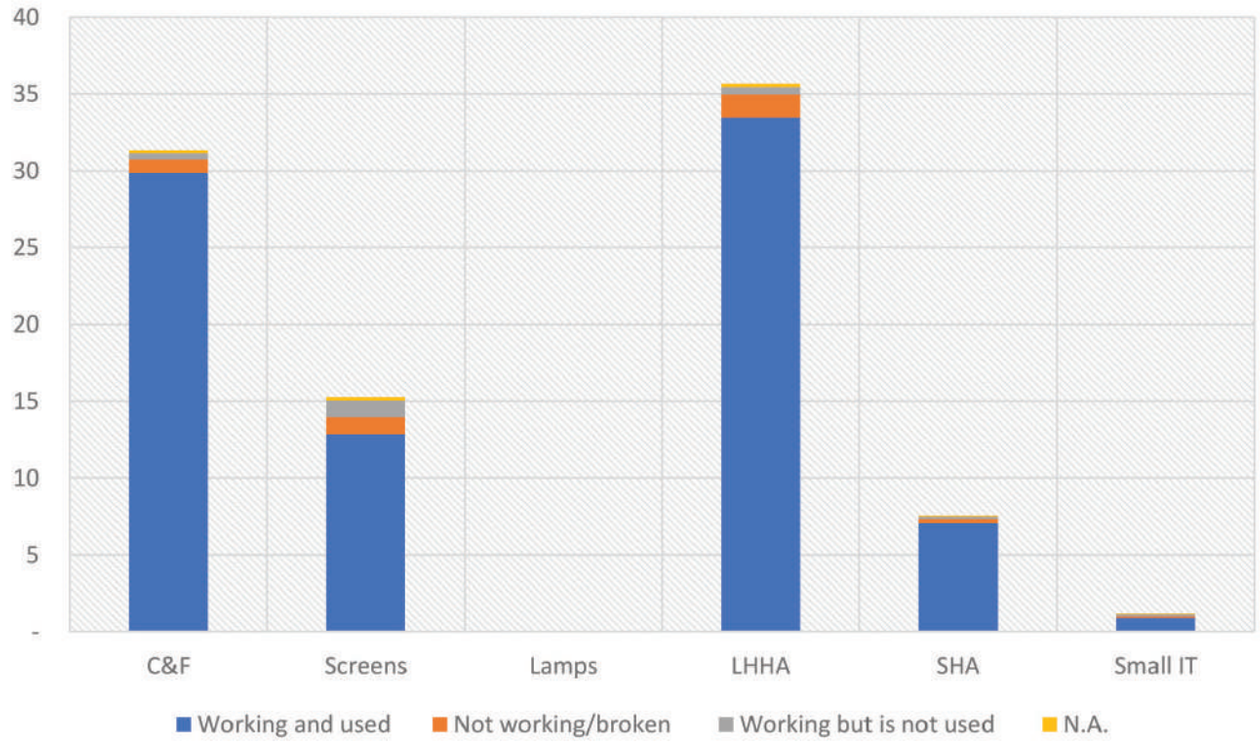


Figure 14: Effect of hibernation of EEE in stock (kg/person).

Consumers might keep at home products that are broken or they are not using several years before discarding them. Despite the plausibility of keeping products at home for some time before discarding them, the hibernation for more than 2 years only concerns 10% to 25% of the products depending on the categories: screens and small IT are kept longer than other categories.

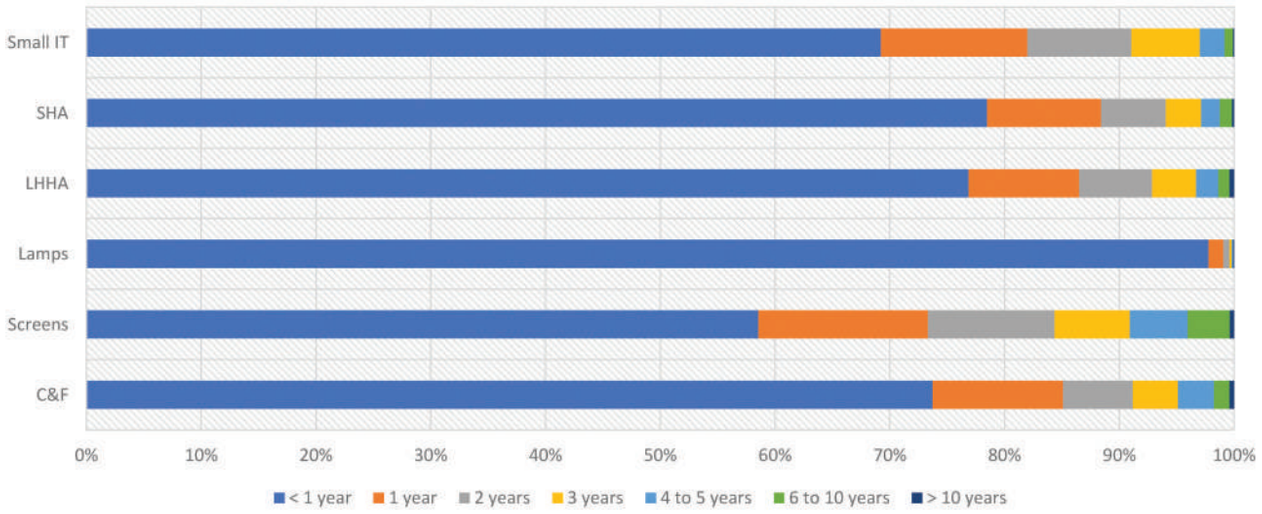


Figure 15: Hibernation time before discarding.

The main reasons for keeping these items are the lack of awareness of what to do with the products (15-35%), use as potential back-up (especially for small IT and household appliances) as well as the fact that the consumers have enough room for storage and were thinking of repairing it.

Only 30% of the respondents knew about collection points for WEEE created by local authorities.

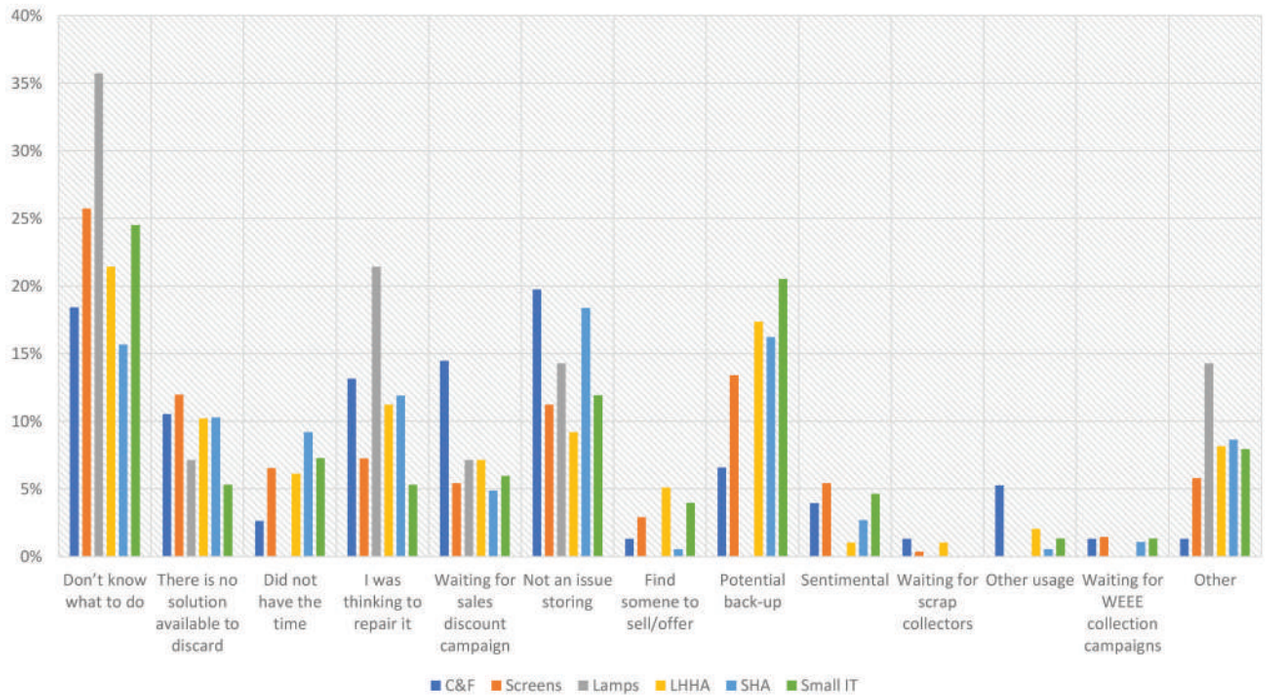


Figure 16: Reasons for keeping products at home.

6. The discard behaviour of consumers and the WEEE Generated

6.1 How consumers discard appliance

The analysis of discard processes included a random selection of 28 products submitted to each respondent. In total, 13,888 products were discarded, which is nearly 7 products per respondents.

Mobile phones represent by far the product the most discarded as it is replaced regularly by consumers (more than 75% of the mobiles phones were bought less than 3 years ago, see). CRT TVs comes up second as they are steadily being phased out to be replaced by flat screen TVs.

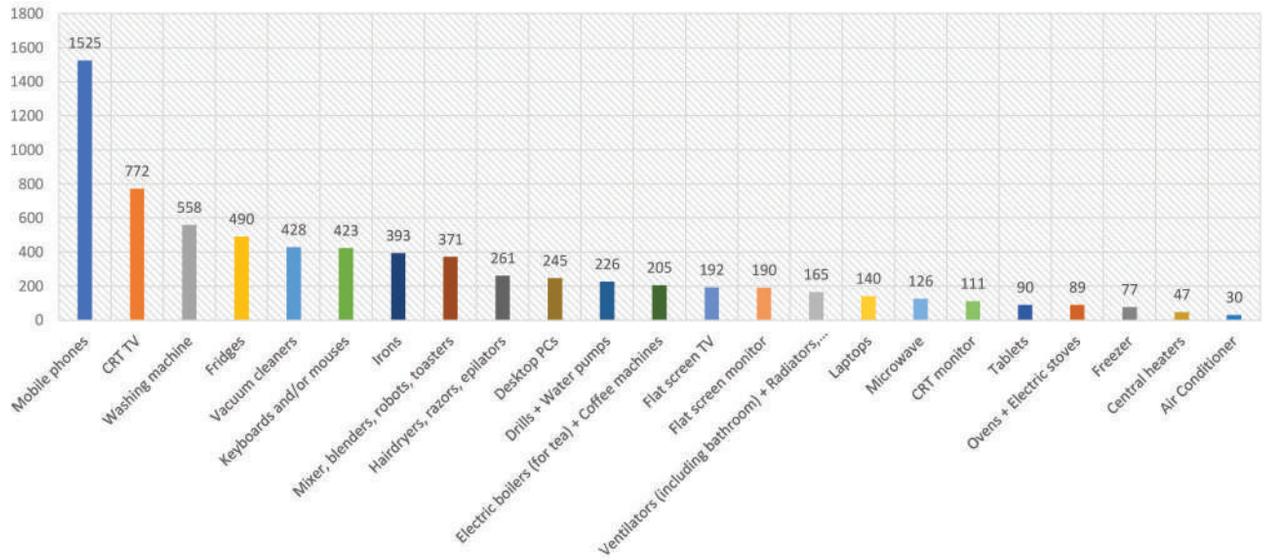


Figure 17: Products discarded the most in the last 2 years according to consumer survey.

Regarding the discard patterns of consumers, thirteen options were provided to respondents, which were then clustered in five groups for analysis.

Table 5: Discard patterns and clustering for analysis.

Disposal patterns in survey	Clustered as
Bring to the shop	Retailer - Correct
Retailer pick up at home	Retailer - Correct
Bring to Municipal Collection Point	Municipal - Correct
Municipality pick up at home	Municipal - Correct
Sold on olx.ro, okazii.ro / Sold to a refurbisher	Life-Extension
Donated to parents, friends, people in need for free	Life-Extension
Waste bin / garbage	Bad-Habit
With Plastic/other recyclable waste	Bad-Habit
Give it to iron scrap collectors	Scrap Collection
Bring it to an iron scrap yard - REMAT	Scrap Collection
Other WEEE collection points	Correct
Warranty substitution	Warranty
Specialized team pick-up it from home (Ecotic or RoREC)	Correct

The information gathered from the consumer survey indicates that out of the waste generated, 40% is available for collection by compliance schemes, mainly for big appliances and fridges which are being brought back to the shops; for smaller products the share drops to around 20%. This means that out of the waste generated, only **3.0 kg per person is available for collection** by PROs, equivalent to approximately 58,000 t in total.

Approximately 30% of the waste generated in C&F, LHHA and SHA are being donated or sold to others (life extension), the share of screens and small IT increases to around 50%.

Bad habits, including disposal in the waste bin and with other recyclable waste, are particularly high with a share of 20-25%. For lamps, the share of products discarded in the bin is more than 70% and for the small household appliances the share reaches 40% as illustrated below.

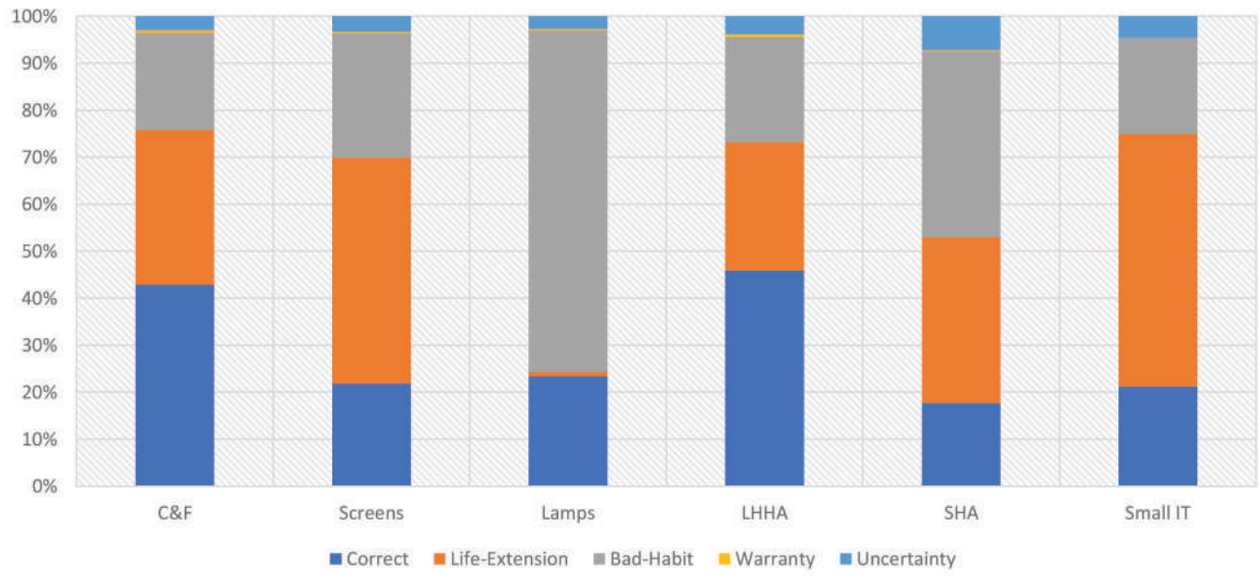


Figure 18: Discard patterns for different waste streams (in %).

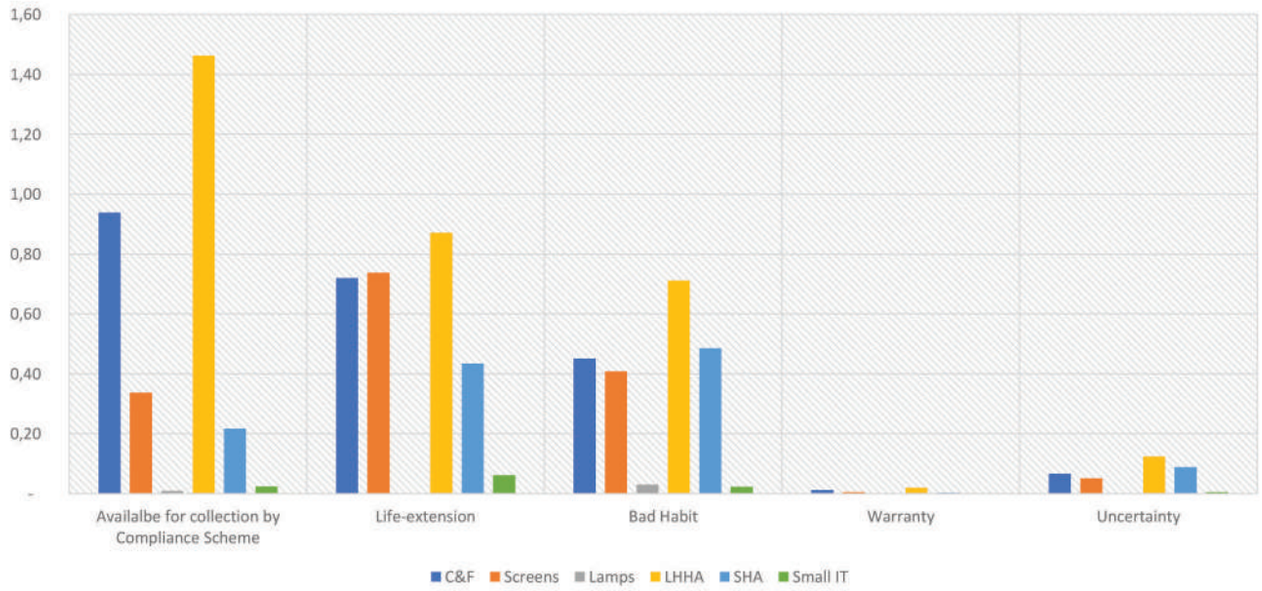


Figure 19: Discard patterns for different waste streams (in kg/person).

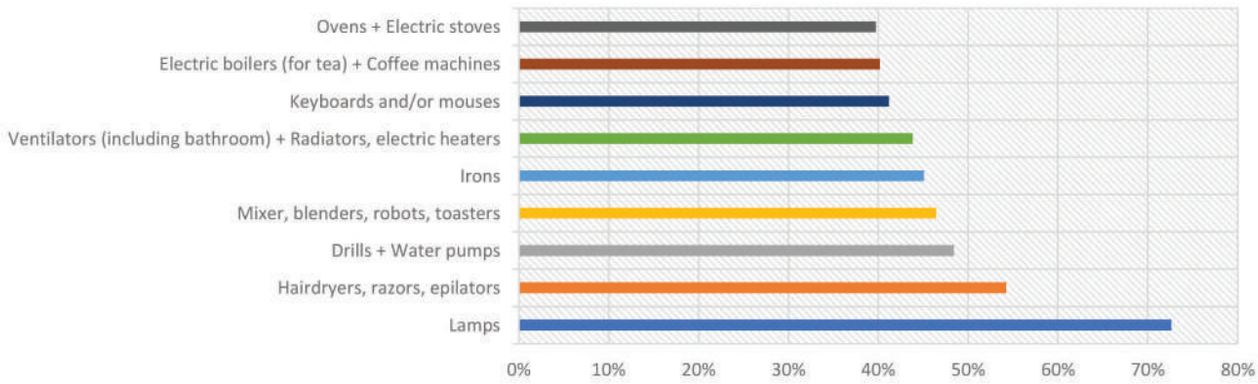


Figure 20: Products with highest bad-habits share in discard patterns from consumers.

The substantial share of WEEE ending up in waste bin or associated with other bad-habits is also linked to the low consumer awareness and the limited availability of municipal collection points. below gives an indication of the general awareness but even in the cases where the consumer declared to know the existence of collection point for WEEE, the associated disposal pattern was not necessarily correct.

Figure 21: Awareness of collection points set up by municipalities (urban areas - external circle - and rural area - inner circle).

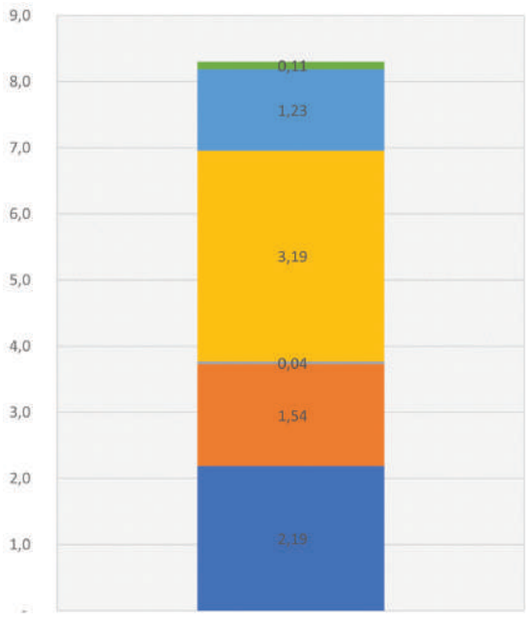


Figure 22: WEEE discarded by household in 2018.

Extrapolations from the survey led to an estimation of waste generated of **8.3 kg of WEEE per person**, including products hibernated for up to 1 year. This is slightly higher than the result of 2015 (6.90 kg/person). The total amount of WG extrapolated trough the survey is 30% lower than the results of the E-tool (11.9 kg/person) which again, point to an over-estimation of the POM data in the E-tool.

In line with the stock of EEE, C&F and large household machines represent over 65% of the appliances discarded in weight.

6.2 The impact of discard behaviour on the Weibull profiles

The age of disposal shows significant differences between the product categories (). C&F as well as LHHA have the longest lifespan, with most equipment discarded after 6-10 years. SHA and small IT are mostly discarded after 2 and 6-10 years. Lamps have the shortest lifespan and are kept for less than 1-2 years. Screens seem to have similar a lifespan to C&F and LHHA. However, this category includes CRT monitors and TVs with a very long lifespan and shorter lifespans of FPD monitors and TVs.

Figure 23: Disposal age distribution per category.

As illustrated in Figure 18, the lifespan of a large share of devices is extended by donating or selling them to others. This raises the question whether the lifespan profiles would change if equipment that is not subject to life extension would be excluded and thus the WG estimations would be more precise.

The following analysis of the lifespan profiles has shown that the distribution of the observations, including or excluding life-extension data, is not changing significantly for all the products in the survey. An example is shown in Figure 24 for FPD TVs and in Figure 25 for washing machines. Thus, the Weibull profiles created excluding the equipment that are donated or refurbished is not changing and thus the result of the E-tool is not influenced by such an effect.

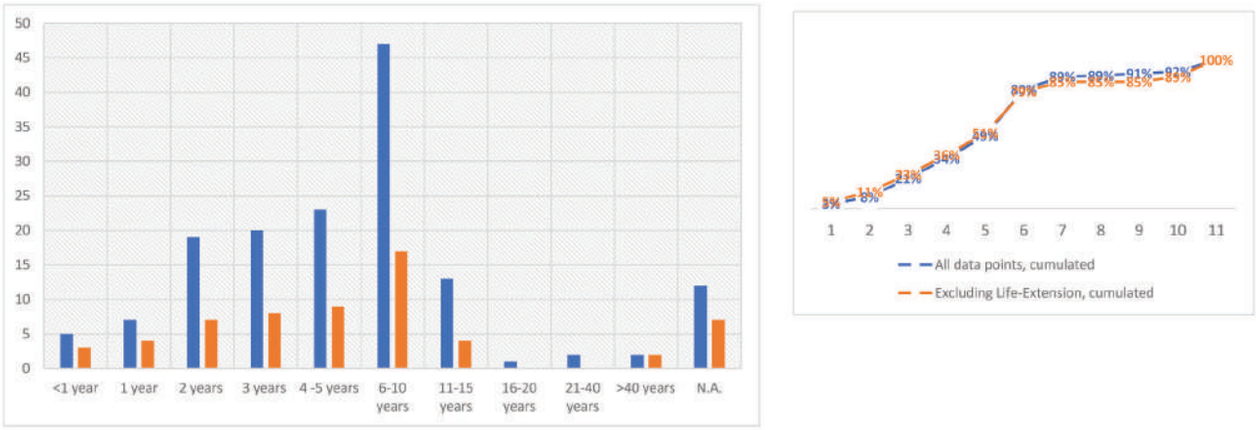


Figure 24: Comparison of the lifespan distribution of FPD TVs including and excluding life extension.

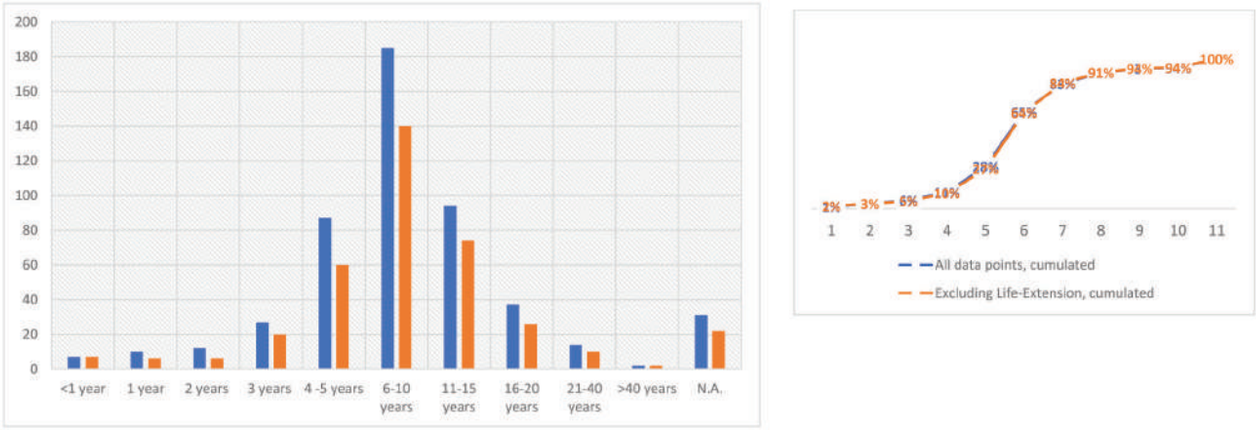


Figure 25: Comparison of the lifespan distribution of Washing machines including and excluding life extension.

However, the above conclusion is only valid if the definition of waste in the Waste Framework Directive is applied, where *'WEEE generated' means the total weight of WEEE resulting from EEE prior to any activity such as collection, preparation for reuse, treatment, recovery, including recycling, or export*.

If we look at the total lifespan of an equipment, regardless of the user it belongs to, the lifespan can be significantly extended by life extension. Such extended lifespan profiles could, for example, be modelled by considering various "life cycles" for first, second and further use. This would imply a completely different approach than the EC method.

7. Conclusions

WEEE Directive collection targets were set up to help Member State achieve the desired level of environmental protection and societal benefits. However, the efforts to achieve any collection target should not be not decoupled from the attainability of the target itself.

Right now, the target is based on POM (45%), but even if Romania decides to adopt a target based on WG from 2021, the accuracy of POM data is paramount. Any incorrect data will heavily influence the value of the target itself. For POM-based target, the major concerns are related to the configuration of the Romanian market, which is still expanding for many products. Therefore, sales will not necessarily generate corresponding waste and even with sales based on substitution, market dynamics revealed a high share of products that have an extended life.

For WG-based targets, the key issue remains the proper identification of waste available for collection: the consumer survey revealed how a substantial share of the waste generated is not directly accessible for collection and recycling:

- The share of waste that is going to direct reuse (peer-to-peer) or preparation for reuse (via refurbishment/repair companies) is much higher than expected and undermine the attainability of the target. The appliances that are donated/sold to relatives/friends or third party are not accounted for, despite corresponding to the definition of waste, but are not available for collection.

- Even when consumers declare that they discard WEEE via municipal collection points or retailers, the waste might not be reachable by Compliance Schemes as it still could be sold/transferred to scrap dealers. Other studies[7] reveal that scavenging of products/components might still happen, thus total waste is being subtracted.

- There is still a relevant share of waste (up to 25%) that is discarded with bad-habits; this, coupled with the limited awareness of collection points and proper disposal routes from consumers will further undermine the possibilities to achieve the collection targets.

These flows represent the options and habits of waste holders: any change in the Weibull profiles of the lifespan will be able to take those factors into account. The flows should rather be accounted for by using a different approach (especially those appliances being reused or prepared for reuse).

At National level, improvements are needed in order to:

- Reduce the share of WEEE that end up in “bad-habit” routes (scrap collectors, waste bin, etc..) and are not treated according to standards by qualified recyclers.

- Increase availability of collection infrastructure, by awareness raising, is key to foster collection possibilities by Compliance Schemes.

[7] See: https://www.eera-recyclers.com/files/unu-eera-brochure-online-v5-002.pdf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