Database and WEEE classification listing

Deliverable 2.3

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EXECUTIVE SUMMARY

This deliverable describes the process of data collection on electrical and electronic equipment (EEE) and waste electrical and electronic equipment (WEEE) in Work Package 2 in the CWIT project. The data is needed in Work Package 4, where the sales of EEE and the size of the market for WEEE will be assessed for the European Union. There are many different classifications and data sources that describe EEE and WEEE flows. In order to relate the data sets to each other, the so-called UNU-keys have been developed, which make it possible to link the different classifications to each other. This document describes the UNU-keys, the format requirements of the data, the process and status of data collection and the construction of a database that matches with the requirements of Work Package 4 and facilitates efficient processing of the data.

The data was collected from three different types of sources. The data was preferably collected from public registers at Eurostat. Country specific EEE and WEEE data for France, Italy, the Netherlands and Belgium was already available from previous research conducted by the United Nations University. If the data was not available at public registers or from the United Nations University, specific questionnaires[1] were designed and sent to relevant stakeholders (members of the WEEE Forum or enterprises within the WEEE recycling sector).

The stakeholders' contact details were obtained from Deliverable 2.1 where the map of WEEE actors was created. Data collection and processing will continue after Month 6 of the project. The United Nations University is also member of a consortium, which is performing a study for DG Environment on the collection rates of WEEE (ENV.A.2/ETU/2013/0035). The CWIT project is expected to benefit from the network and outcomes of that study.

After data is collected, it is stored in a database in a format that enables it to be linked with data from different sources. Consequently, the vast amounts of data can be processed efficiently. This standardization effort is very relevant to other stakeholders, since a harmonized methodology is currently lacking. Therefore a recommendation paper is also presented in ANNEX A, which will be distributed as a stand-alone paper among relevant stakeholders.

[1] http://www.cwitproject.eu/participate/

1 INTRODUCTION

Work package 2 (WP2) collects the data that is needed to assess the sales of electrical and electronic equipment (EEE) and the size of the market for waste electrical and electronic equipment (WEEE) in WP4. There are many different classifications and data sources that describe EEE and WEEE flows. These formats are not harmonized at the moment. The lack of standardization means that the available data has different coverage and is not yet suitable for quantitative cross-country research. Thus, there is a need to standardize and set requirements to describe EEE and WEEE data in the CWIT project. The standardization efforts and data requirements are described in Chapter 2.2.

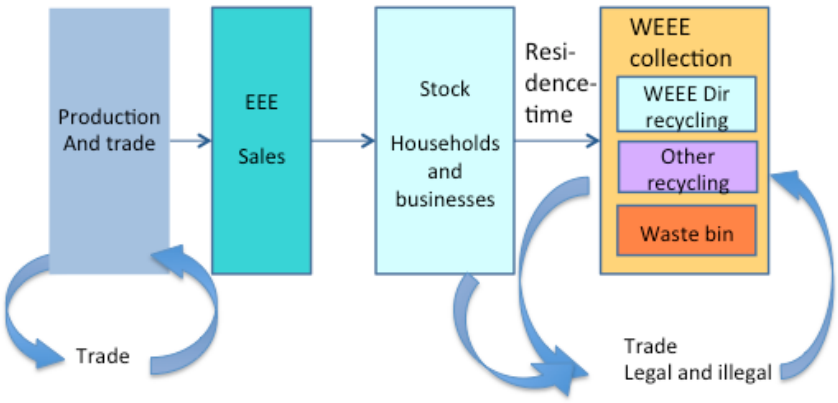

Figure 1. Flow-scheme for EEE and WEEE used in the CWIT Project

After the standards are set, the data is ready to be collected. Figure 1 shows a generic flow-scheme used in the CWIT project to measure EEE to WEEE flows for a certain territory. First, EEE products are produced and traded (left-hand side of Figure 1). After production and trading, the EEE is sold to a consumer or business, and it remains in use in households or business premises for some time. This 'in use' period, including being dormant in a closet, is referred to as 'the stock'. After a certain period of time, the item is discarded (right-hand side of Figure 1). This period of time is referred to as the 'residence time'. When the item is discarded, it can be collected into three main waste collection routes:

- The WEEE collection that is compliant with the WEEE-Directive
- Other recycling, including reuse, refurbishing, and metal scrap activities
- In practice, smaller WEEE is also discarded into the residual waste bin, instead of being collected separately.

The data collection in WP2 should cover the flows shown in Figure 1 for each country individually. The legal and potentially illegal trade (shown at the bottom of Figure 1) is investigated in WP5. Chapters 2 and 3 will describe the process of data collection and the construction of the database. The results of the questionnaires will be updated after Month 6 and provided as input to Task 1.2 Reporting.

2 DESCRIPTION OF DATA REQUIREMENTS

The data needs to comply with certain formats to ensure that data processing is efficient. It is important that the data describes the same geographic coverage and is stored in a standard classification. Those requirements are described in Chapter 2. For the sake of easy data processing, the data gathering is only conducted using four different classifications. Those are the UNU-keys (F. Wang et al, 2012), the 10 categories of the old WEEE Directive (European Commission, 2002), collection categories that represent the waste collection in practice, and the 17 categories that are

used by the WEEE Forum[2]. Those four classifications are widely used and can be relatively easily converted to each other by means of the UNU-keys.

2.1 Data coverage

Data should reflect country totals for the EU-28 nations. In cases where comprehensive WEEE producer or Eurostat registers are used, the data are extracted as national totals. However, for other data sources, the data might need the application of estimation techniques to obtain the national totals. In some cases the company can estimate their share in the national market. Another possibility is to prioritize the data gathering from the largest companies, to ensure that the most important flows are at least covered. During the project, no data will be published that can identify individual companies.

2.2 Classifications

There is no universally agreed upon standardized classification of EEE and WEEE at this moment. This makes it difficult to integrate, process, and validate available data during the project. In order to streamline this, the data was collected using different classifications that are widely used for e-waste statistics in the EU. This means that all data was converted into four classifications in a central database. Another requisite was that the classifications could be related to each other.

2.2.1 The UNU-keys

The most detailed classification used in the project is the so-called UNU-keys, developed by the United Nations University (F. Wang et al., 2012). The UNU-keys classification comprises 54 categories. Those items are listed in Table 1, and are chosen such that each code describes a single product or a range of products that have a uniform average weight, environmental relevancy and market behaviour. This classification links to harmonized classifications used by statistical offices, such as the PRODCOM and the Combined Nomenclature (CN), that are statistical standards in the EU. The first abbreviation, such as the 'LHA' in 0104 LHA washing (washing machines and combined dryers), link to the collection category of waste collection in practice. These are also described in Section 2.2.3.

UNU Key	Description
0001	PROF Central Heat (HH installed central heating)
0002	PROF PV panels
0101	PROF Heating & Ventilation (excl. cooling equipment)
0102	LHA Dishwashing (dishwashers)
0103	LHA Kitchen (large furnaces, ovens, cooking equipment)
0104	LHA Washing (washing machines & combined dryers)
0105	LHA Drying (wash dryers, centrifuges)
0106	LHA Room (large HH room heating & ventilation, hoods)
0108	C&F Fridge and combi fridges (for food, wine, ice, etc.)
0109	C&F Freezer (freezers for food, ice, etc.)
0111	C&F Aircon (HH installed air conditioners)
0112	C&F Other (dehumidifiers, heat pump dryers, etc.)
0113	PROF C&F (Prof. air conditioners, cooling displays, etc.)
0114	SHA Microwaves ((combined) microwaves, excluding grills)
0201	SHA Other (small ventilators, irons, clocks, adapters, etc.)
0202	SHA Food (kitchen, food processing, frying pans, etc.)
0203	SHA Hot water (coffee, tea, hot water, etc.)
0204	SHA Vacuum cleaners (excluding professional ones)

[2] http://www.weee-forum.org/services/key-figures-platform

0205	SHA Personal Care (tooth brushes, hair, razors, etc.)
0301	IT Small (other small IT, including components & accessories)
0302	IT Desktop PCs (excl. monitor, accessories)
0303	IT Laptop PCs (laptops, notebooks, netbooks, tablets)
0304	IT Printers (printing & imaging, scanners, MFS, faxes)
0305	IT Phones (telephones & equipment, DECT phones)
0306	IT Mobile phones (mobile phones, smart phones, pagers)
0307	PROF IT (large IT, servers, routers, data storage, copiers)
0308	SCREENS CRT monitors (cathode ray tube monitors)
0309	SCREENS Flat Display Panel Monitors (LCD, LED monitors)
0401	SHA CE (other, headphones, adapters, remote controls)
0402	SHA Portable Audio/ Video (MP3, e-readers, car nav., etc.)
0403	SHA Radio & Hi-Fi (audio sets, components, etc.)
0404	SHA Video (VCR, DVD(R), Blue Ray, Decoders, etc.)
0405	SHA Speakers
0406	SHA Cameras (camcorders, photo & dig. still cameras)
0407	SCREENS CRT TVs
0408	SCREENS Flat Display Panel TVs (LCD, LED, PDP)
0501	SHA Lamps (pocket, halogen, ex. LED & incandescent.)
0502	LAMPS CFL (compact fluorescent, retro & non-retro)
0503	LAMPS TL (straight tube fluorescent lamps)
0504	LAMPS Special (Hg, high & low pres. Na, other prof. lamps)
0505	LAMPS LED (incl. retrofit lamps, HH LED luminaires)
0506	SHA Luminaires (incl. HH incandescent fittings)
0507	PROF Luminaires (all luminaires. offices, public space, industry)
0601	SHA Tools (all HH saws, drills, cleaning, garden, etc.)
0602	PROF Tools (Professional tools, excl. dual use)
0701	SHA Toys (small toys, vehicles, small music)
0702	SHA Game Consoles (video games and consoles)
0703	LHA Toys and Sun beds (exercising, large music instr.)
0801	SHA Medical (small HH thermometers, blood pressure meters)
0802	PROF medical (hospital, dentist, diagnostics, etc.)
0901	SHA Monitoring (alarm, heat, smoke, security, excluding screens)
0902	PROF Monitoring (Prof. M&C, garage, diagnostic, etc.)
1001	PROF Dispensers (non-cooled vending, coffee, tickets, etc.)
1002	PROF Dispensers (cooled vending, bottles, candy, etc.)

Table 1. Description of the UNU categories

2.2.2 Ten categories in the WEEE-Directive

Data is also gathered in the 10 categories that are currently used for WEEE Directive reporting (European Commission, 2002). The first two digits of the UNU-keys in Table 1 correspond to the respective category of the categories. For example, the 0104 washing machine correlates to the 01 category. The description of the 10 categories with their indicative product lists as provided in the WEEE-Directive is given below. This list of categories will be in force until August 2018, according to the recast of the WEEE-Directive.

1. Large Household appliances

Large cooling appliances; refrigerators; freezers; other large appliances used for refrigeration, conservation and storage of food; washing machines; clothes dryers; dish washing machines; cooking, electric stoves; electric hot plates; microwaves; other large appliances used for cooking

and other processing of food; electric heating appliances; electric radiators; other large appliances for heating rooms, beds, seating furniture; electric fans; air conditioner appliances; other fanning, exhaust ventilation and conditioning equipment.

2. Small household appliances

Vacuum cleaners; carpet sweepers; other appliances for cleaning; appliances used for sewing, knitting, weaving and other processing for textiles; irons and other appliances for ironing, mangling and other care of clothing; toasters; fryers; grinders, coffee machines and equipment for opening or sealing containers or packages; electric knives; appliances for hair-cutting, hair drying, tooth brushing, shaving, massage and other body care appliances; clocks, watches and equipment for the, purpose of measuring, indicating or registering time; scales.

3. IT and telecommunications equipment

Centralised data processing: mainframes, minicomputers, printer units; personal computing: personal computers (cpu, mouse, screen and keyboard included), laptop computers (cpu, mouse, screen and keyboard included), notebook computers, notepad computers; printers; copying equipment; electrical and electronic typewriters; pocket and desk calculators and other products and equipment for the collection, storage, processing, presentation or communication of information by electronic means; user terminals and systems; facsimile; telex; telephones; pay telephones; cordless telephones; cellular telephones; answering systems and other products or equipment of transmitting sound, images or other information by telecommunications.

4. Consumer equipment

Radio sets; television sets; video cameras; video recorders; hi-fi recorders; audio amplifiers; musical instruments; other products or equipment for the purpose of recording or reproducing sound or images, including signals or other technologies for the distribution of sound and image than by telecommunications.

5. Lighting equipment

Luminaires for fluorescent lamps with the exception of luminaires in households; straight fluorescent lamps; compact fluorescent lamps; high intensity discharge lamps, including pressure sodium lamps and metal halide lamps; low pressure sodium lamps other lighting or equipment for the purpose of spreading or controlling light with the exception of filament bulbs.

6. Electrical and electronic tools (with the exception of large-scale stationary industrial tools)

Drills; saws; sewing machines; equipment for turning, milling, sanding, grinding, sawing, cutting, shearing, drilling, making holes, punching, folding, bending or similar processing of wood, metal and other materials; tools for riveting, nailing or screwing or removing rivets, nails, screws or similar uses; tools for welding, soldering or similar use; equipment for spraying, spreading, dispersing or other treatment of liquid or gaseous substances by other means; tools for mowing or other gardening activities.

7. Toys, leisure and sports equipment

Electric trains or car racing sets; hand-held video game consoles; video games; computers for biking, diving, running, rowing, etc.; sports equipment with electric or electronic components; coin slot machines.

8. Medical devices (with the exception of all implanted and infected products)

Radiotherapy equipment; cardiology; dialysis; pulmonary ventilators; nuclear medicine; laboratory equipment for in-vitro diagnosis; analysers; freezers; fertilization tests; other appliances for detecting, preventing, monitoring, treating, alleviating illness, injury or disability.

9. Monitoring and control instruments

Smoke detectors; heating regulators; thermostats; measuring, weighing or adjusting appliances for household or as laboratory equipment; other monitoring and control instruments used in industrial installations (e.g. in control panels).

10. Automatic dispensers

Automatic dispensers for hot drinks; automatic dispensers for hot or cold bottles or cans; automatic dispensers for solid products; automatic dispensers for money; all appliances that deliver automatically all kind of products.

2.2.3 Primary collection categories

In practice, WEEE is being collected into several primary collection routes. Those collection routes are also compatible with the UNU-keys, but not directly with the 10 categories of the WEEE-Directive. A list of those collection categories is provided below (Table 2). Please note that the description of 'professional' does not refer to the use of the appliance for business purposes. It means whether the collection is performed by professional installation companies or not. This is also true of the reverse scenario. IT equipment used in businesses can go to the same collection stream as for consumer IT equipment (namely, "G IT" in Table 2).

Primary Collection Category	Description
A LHA	Large household appliances
B C&F	Cooling and Freezing Equipment
C SHA	Small household appliances
D Screens CRT	CRT screens
D Screens LCD	Flat panel screens
E Lamps	Lamps (mostly consumer lamps)
E Lamps PROF	Professional lamps
F PROF C&F	Professional Cooling and Freezing Equipment
F PROF IT	Professional IT equipment
F PROF LHA	Professional large household appliances
F PROF Med	Professional medical equipment
F PROF Mon	Professional monitoring equipment
F PROF PV	Photo Voltaic Panels
F PROF Tools	Professional Tools
G IT	IT equipment

Table 2. Primary collection categories used in practice.

2.2.4 Classification used by the WEEE Forum

The Key Figures platform (KF), managed by the WEEE Forum (WF), allows member organizations to benchmark their performance and to provide solid, comparable data to stakeholders. Every year, around Easter, members are asked to provide their statistics and country data to a web-based software platform on the quantities of electrical and electronic equipment that their client producers have put on the market, the quantities of WEEE that they have collected, and the costs related to WEEE management. The platform is currently being upgraded; hence most of the data was collected via questionnaires.

The classification used by the WF comprises 17 categories for the products put on the market. The groups are a more detailed list based on the 10 WEEE categories defined in the original WEEE-Directive. Table 3 displays the list of KF categories and their correspondence to those in the WEEE-Directive.

10 WEEE cat (Directive)	KF category	Description of KF category
	1a	Large household appliances (ex C&F's)
	1b	Cooling & freezing appliances (incl. air con.)
1	1	Total LHHA + C&F
2	2	Total Small Household Appliances
	3a	IT&T equipment (excluding monitors)
	3b	All monitors - IT&T
3	3	Total IT&T equipment + monitors
	4a	Consumer equipment (excluding TV's)
	4b	All TV's - CE
4	4	Total CE + Screens + PV
	5a	Luminaires
	5b	Lamps
5	5	Total Lamps & Luminaires
6	6	Electrical and electronic tools
7	7	Toys, leisure and sports equipment
8	8	Medical devices
9	9	Monitoring and control instruments
10	10	Automatic dispensers
	PV	Photovoltaic panels
	Other	"Other" WEEE

Table 3. List of Key Figures categories

Data regarding WEEE collected has been grouped in the collection/treatment streams. Table 4 shows the collection/treatment streams and their correspondence with the Key Figures categories.

Collection streams	KF Category
Large Household appliances (White goods)	Cat. 1a
Cooling and freezing appliances	Cat. 1b
Mixed WEEE	Cat. 2+4a+5a+6+7+8+9+10
IT	Cat. 3a
Screens	Cat. 3b+4b
Lamps	Cat. 5b
Photovoltaic panels	PV

Table 4. Most frequent treatment/collection streams and their correspondence to KF categories

2.2.5 Other EU relevant waste classifications that are not used in WP 2

There are also waste classifications that are used in Europe for administrative purposes: the List of Wastes (LoW) and the Basel Codes. The LoW defines 839 waste types, which are structured into 20 chapters, mainly according to the source of the waste (i.e. the economic sector or process of origin). Only nine LoW codes refer to e-waste. They are subdivided into hazardous and non-hazardous waste. Since there are no registers available at EU-level and the classification is very aggregated for e-waste statistics, data has not been collected in this format in WP2. More details on the LoW can be found in Deliverable 2.2.

Transboundary movement of waste is registered under the Basel Convention under certain circumstances. There are four codes in the classification of the Basel Convention that relate to e-waste. The waste shipments can be obtained from the secretariat of the Basel Convention. However the data is very aggregated, thus cannot be directly related to UNU-codes. As a consequence, data has not been collected in this format in WP2. More characteristics on the Basel codes of e-waste can be found in Deliverable 2.2.

2.3 Quality assurance

For some of the registers, the data is not collected with the aim for making WEEE statistics, but the data can be converted into meaningful parameters. When those data sources are used, additional cross-country validation steps are required in order to obtain good quality results. The collected data should be preferably unbiased. This counts for all of the data used from Eurostat. Companies reporting to comply with the WEEE-Directive, however, might have a financial incentive to underreport their numbers, as their expenses might depend on the EEE amounts they put on the market. Some actors, known as free riders, sell EEE without reporting to their national governments in order to avoid recycling fees and responsibilities imposed by the WEEE-Directive. Additional checks have to be made to assess the extent of this phenomenon, for instance by using unbiased data sources.

Most of the quality assurance will be done by cross-country comparison of the data, and by comparing various data sources for comparable countries. This will be mostly done by means of automated statistical techniques for the detection of outliers and regression analysis in Microsoft Access and SPSS. If the datasets are small, manual analysis in Microsoft Excel will also be performed.

The United Nations University is also in a consortium to perform a study for DG Environment on the collection rates of WEEE – possible measures to be initiated as required by Articles 7(4), 7(5), 7(6) and 7(7) of Directive 2012/19/EU on WEEE (ENV.A.2/ETU/2013/0035). It will be ensured that the outcomes of both projects are aligned where needed. The CWIT project is expected to benefit from the network and outcomes of that study.

3 DATA COLLECTION

The data in WP2 is collected from three different types of sources. Ideally, the data is collected via public (free) registers. Other easy-to-use data sources are the studies recently conducted by the United Nations University, in which the EEE and WEEE markets of France (BIOIS, 2013), Italy (F. Magalini et al., 2012), the Netherlands (J. Huisman et al., 2012) and Belgium (J. Huisman et al., 2013) were assessed using a comparable methodology as the one adopted in the CWIT project. If the necessary data is not available from those sources, questionnaires (ANNEX B, C, D and E) were designed and sent to relevant stakeholders. The recipients of the questionnaires were members of the WEEE Forum and enterprises within a specific WEEE recycling sector. Those contacts were obtained from Deliverable 2.1 of WP2 where the map of WEEE actors was created.

The collected data will be used in WP4, where the magnitude of the flows previously shown in Figure 1 will be quantitatively researched. The following parameters were collected:

- Sales
- Stock levels
- Lifetimes
- WEEE collection: reported to WEEE-Directive
- WEEE collection: Other recycling
- WEEE collection: WEEE in residual waste bin

An overview of the data collection undertaken and the current status is provided in Table 4, where the data sources are shown along with their time coverage, geographical coverage, classification, and the status of data gathering.

Data source	Parameter (unit)	Geographical coverage	Time coverage	Classification of data gathering	Institute	Status of data gathering	More information
Prodcom + International trade statistics	Sales (pieces and kg)	All in EU-28 All in EU-15	1999-2012 1995-1998	All 54 UNU-keys	Eurostat	All data is in database	Chapter 3.1.1
EU-SILC	Stock levels per household (unit per household)	All countries in EU-27	2004-2011	UNU code: 0104	Eurostat	All data is in database	Chapter 3.1.2
WEEE Directive reporting	Sales and WEEE arising (kg)	All countries in EU-27	2006-2010	10 cat in WEEE Directive	Eurostat	All data is in database	Chapter 3.1.3
Existing studies from UNU-studies	Sales, Stock-levels, waste generated (pieces and units) life-time parameters (weibull function)	FRA, ITA, BEL, NLD	1980-2014	All individual UNU-keys	See references	All data is in database	Chapter 3.2
Questionnaire to WEEE Forum members	Sales, WEEE-collection, WEEE to waste-bin (kg)	WEEE Forum member countries (22 EU countries) + DEU, HUN, LUX	2006-2013	17 and 10 categories. Where available, per UNU-key.	See Annex	17 categories are collected: Questionnaires are sent out	Chaoter 3.3 and ANNEX B
Questionnaire for non-EERA pre-processors	WEEE amounts collected (kg)	All 28 EU countries	2012	6 collection categories in table 3	Eurometrec members and IERC participants (+/-480)	Questionnaires are sent out	ANNEX E
Questionnaire for EERA pre-processors	WEEE amounts collected (kg)	All 28 EU countries	2012	6 collection categories in table 3	EERA	Questionnaires are sent out	ANNEX D
Direct questionnaire in XLS for EERA end-processors	Copper/ printed circuit board fractions of WEEE pre-processed in Europe (kg)	All 28 EU countries, probably clustered in 5 – 7 regions	2012	Total WEEE amounts	EERA	Questionnaires are sent out	Chapter 3.4
Questionnaire to refurbishers	Other WEEE recycling (kg)	RReuse	2012 or otherwise the most recent year	UNU codes 03xx	See Annex	Questionnaires are sent out	ANNEX C
EITO	Sales (pieces)	EU-27 aggregate	1996-2007	UNU-code: 0301	Purchased previously	All data is in	Chapter 3.5

					from EITO	database
		All countries in EU-27, CHE, NOR, TUR, RUS	1996-2012	UNU-codes: 0302- 304, 0307		
		EU-27 aggregate	2005-2012	UNU-code: 0306		
		All countries in EU-27		UNU-code: 0309		
		EU-27 aggregate	2008-2012	UNU-codes : 0401-404, 0406-408		
			2000-2012			
Collaboration with Czech compliance scheme Retela	Lifetime (weibull function)	2012	CZE	Most UNU-keys		Cooperation is set up

Table 5. Overview of data sources, parameters, time coverage, geographical coverage and classification.

3.1 Existing Registers at Eurostat and Member States

3.1.1 Prodcom statistics and International trade statistics

Foreign trade (import and export) statistics for each product are registered under the Harmonized Commodity Description and Coding System (HS codes) developed by the World Customs Organization. In Europe, a more detailed and fully compatible coding system named Combined Nomenclature (CN codes) is used, in which the first six digits correspond with the HS codes with the seventh and eighth digits relating to EU specific subheadings (Eurostat, 2011). In parallel, domestic production is registered under the Community Production system (PRODCOM codes). In most cases, one PRODCOM code corresponds to one or more CN codes, and a linkage table with coding details is available annually in the EU Ramon database (Eurostat, 2011).

There are around 4000-6000 PRODCOM codes and 8000-9000 CN codes for all commodities per year. From this, there are around 160-250 PRODCOM codes to be regarded as EEE relevant, according to their literal descriptions. Meanwhile, descriptions that refer to parts of EEE were excluded, as it would create double counting. By using the linkage tables, the corresponding CN codes can be traced from EEE-related PRODCOM codes. A database containing annual changes and inclusion of codes for new goods has been jointly developed by United Nations University (UNU) and Statistics Netherlands. The sales can be calculated using the 'apparent consumption approach' in which the sales volume (= domestic production + import – export) is calculated for each UNU-key.

3.1.2 European Union Statistics on Social Income and Living Conditions (EU-SILC)

European Union Statistics on Social Income and Living Conditions (EU-SILC) is an instrument to collect comparable micro data on income, poverty, social exclusion and living conditions. A part of the micro data describes the penetration level per household (percentage of households that possess the item) for the following durable goods: washing machines (0104), computers (0302 and 0303 together), phone connections (0305 and 0306 together) and possession of a colour TV (0407 and 0408 together). This data can be used as an indicative measure of the stocks in households for those goods.

3.1.3 Official WEEE Directive reporting

Every two years, Member States of the European Union are obliged to report to DG Environment the amounts of EEE put on the market and WEEE collected in the 10 categories of the WEEE

Directive. The data are typically published 3 months after the submission deadline by Eurostat and contains both uneven and even years as separate entries. The next deadline for data submission is June 2014, where data is collected for the years 2011 and 2012 separately.

3.2 Existing studies performed by the United Nations University

The United Nations University has conducted four studies in 2011 and 2012 for Italy, France, the Netherlands and Belgium. In those country studies, input-output modelling was used to establish EEE sales, stock levels, lifetime parameters, calculated WEEE–generation, and WEEE-collection data for all 54 UNU-keys. At the time these studies were performed, the grouping of the UNU-keys differed slightly compared with the current one, but the data can easily transferred to the latest version of the UNU-keys.

3.3 Questionnaires to WEEE Forum Members

WEEE Forum members are collective compliance schemes, which are a group of EEE producers to comply with the WEEE Directive requirements for producers. Compliance schemes facilitate the reporting obligations for their members, usually by standardising the reporting process via an e-platform and providing a specific product list compatible with the national reporting requirements. EEE producers provide information about their sales to the collective schemes regularly (usually quarterly) using the format as for table 2. In parallel, compliance schemes gather information from the pre-processors hired to treat the collected WEEE under the control of the compliance scheme. The information collected from WEEE Forum members in this respect can be displayed in a variety of collection groups that differ from one member to another. Furthermore, compliance schemes need to report regularly (usually annually) the amounts put on the market and the WEEE collected to the national authorities.

EEE Producers that have chosen to deal with the WEEE Directive obligations by themselves (not via a collective scheme) are obliged to report to the national authorities the same data reported by Compliance Schemes. The national authorities report the data every two years to Eurostat. This data flow for put on the market amounts is shown in figures 2 and 3.

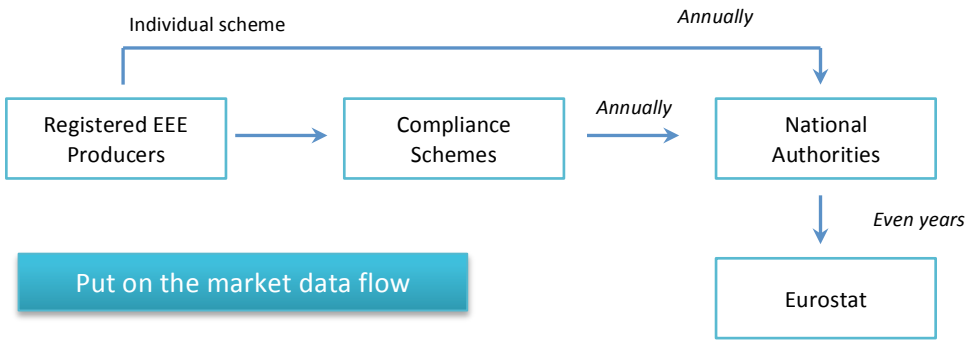

Figure 2. Data flow for the put on the market data related to the WEEE Directive requirements

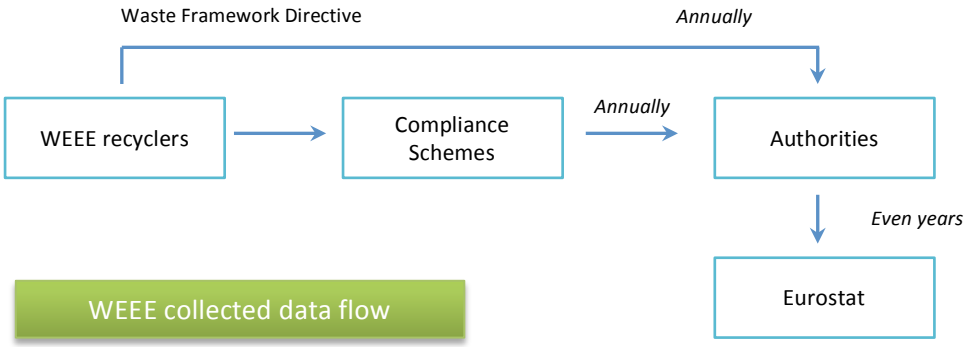

Figure 3. Data flow for the WEEE collected amounts related to the WEEE Directive requirements

WEEE Forum members were requested to provide data about the EEE sold by their producers and the WEEE collected and treated under their management for the 2010-2012 time frame. Data on 2013 will be available by mid-2014, and this information will be used as well as input for WP4.

In addition, WEEE Forum members provided data on the reported amounts at country level where available. In order to increase the geographical coverage of the survey (WEEE Forum members represent 22 EU countries), the national government of Hungary and compliance schemes from Finland, Luxembourg and Iceland were contacted.

The result of this exercise is a database of EEE put on the market classified according to the Key Figures categories (table 2) and WEEE collected grouped in the treatment/collection categories. Where available, members reported the information in the UNU codes as well.

3.4 Questionnaires to end-processors of copper/ circuit board materials

For the large end-processors of copper/printed circuit board materials, a specific questionnaire was developed and addressed individually to all of these smelters. The data is requested per country of origin, and can be used as the total collection volume of copper/printed circuit board fractions. Since the data gathered is commercially very sensitive, possibly also towards EU competition authorities, the data will be aggregated prior disclosure.

UNU combines the gathered data with other sources and de-identifies the end results. Aggregated data may be published by UNU as totals per 7 groups of countries, which resembles the market for e-waste (1. Germany, Austria, Switzerland, Denmark; 2. Netherlands, Belgium, Luxembourg, France; 3. Eastern EU; 4. Central EU; 5. Southern EU; 6. Scandinavia; 7. Great Britain, Ireland). Where needed, non-disclosure agreements covering data confidentiality are provided by UNU. Importantly, the data derived here can be used to cross-check the total reported quantities supposedly treated in the EU, since a rough percentage of these materials are known per UNU key.

3.5 European Information Technology Observatory (EITO)

The European Information Technology Observatory (EITO) offers data for physical volumes on global markets on information technology. The United Nations University had purchased some licences to use their data for earlier projects and can reuse those for the CWIT Project.

4 CONSTRUCTING THE DATABASE

After the data is gathered, it needs to be stored in a central place, where data analysis can take place. The data is stored in a Microsoft Access database, where the records are stored in this structure.

UNU_Key	Country	Parameter	Value	Year	Source
0302	NLD	EEE_pieces	302000	2010	From_PCC_CN calc
0305	POL	PenetrationLevel	0,949	2008	Eurostat_EU_SILC
01	CZE	WEEE_collected	7,1	2008	Eurostat_WEEE_report
0305	POL	PenetrationLevel	0,953	2009	Eurostat_EU_SILC

Table 6. Example of records in the database

4.1 Correlation Tables

This data is further checked for cross-country consistency. The micro data on UNU-keys level is statistically checked by comparing the outcomes with those of similar countries. In a second stage, the UNU data is aggregated to the 10 categories of the WEEE Directive reporting or the aggregate from the WEEE forum and further analysed for cross country consistency. As a final step, consistency will be checked per collection category. As mentioned before, data is collected using four different classifications. Thus, in order to compare the data, correlation tables between the different classifications were made. Those correlations are listed below:

UNU Key	Primary Collection Category	WEEE Annex I	Key Figures classification
0001	F PROF LHA	0	1a
0002	F PROF PV	0	PV
0101	F PROF LHA	1	1a
0102	A LHA	1	1a
0103	A LHA	1	1a
0104	A LHA	1	1a
0105	A LHA	1	1a
0106	A LHA	1	1a
0108	B C&F	1	1b
0109	B C&F	1	1b
0111	B C&F	1	1b
0112	B C&F	1	1b
0113	F PROF C&F	1	1b
0114	C SHA	1	1a
0201	C SHA	2	2
0202	C SHA	2	2
0203	C SHA	2	2
0204	C SHA	2	2
0205	C SHA	2	2
0301	G IT	3	3a
0302	G IT	3	3a
0303	G IT	3	3a
0304	G IT	3	3a
0305	G IT	3	3a
0306	G IT	3	3a
0307	F PROF IT	3	3a
0308	D Screens CRT	3	3b
0309	D Screens LCD	3	3b
0401	C SHA	4	4a
0402	C SHA	4	4a
0403	C SHA	4	4a
0404	C SHA	4	4a
0405	C SHA	4	4a
0406	C SHA	4	4a

0407	D Screens CRT	4	4b
0408	D Screens LCD	4	4b
0501	C SHA	5	5a
0502	E Lamps	5	5b
0503	E Lamps	5	5b
0504	E Lamps PROF	5	5b
0505	E Lamps	5	5b
0506	C SHA	5	5a
0507	A LHA	5	5a
0601	C SHA	6	6
0602	F PROF Tools	6	6
0701	C SHA	7	7
0702	G IT	7	7
0703	A LHA	7	7
0801	C SHA	8	8
0802	F PROF Med	8	8
0901	C SHA	9	9
0902	F PROF Mon	9	9
1001	F PROF LHA	10	10
1002	F PROF C&F	10	10

Table 7. Detailed description of the relations of the UNU categories to other WEEE classifications

Please note that other data sources, such as the Prodcom/combined nomenclature also link to the UNU-54 classification (top right in Figure 4) and that the UNU-54 can also be linked to the classifications used by the compliance schemes in several countries. This is shown for Belgium (Recupel), Ecodom (Italy), Ocad3E (France) and Wecycle (Netherlands) in the top left corner in the figure below.

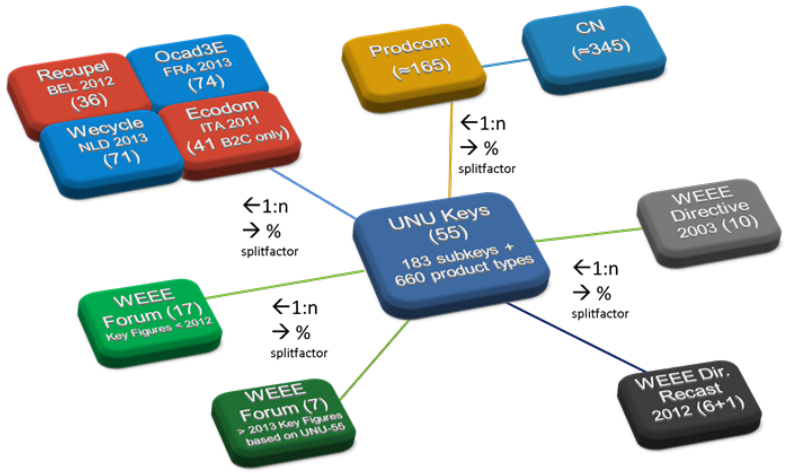

Figure 4. Indicative relations between relevant EEE and WEEE classifications and the central role of the UNU-Keys

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Annex A
Recommendation paper to actors

Executive summary

There is no uniformity in scope and listing of appliances types. To ensure the comparability between data sources a proper definition is needed to group the broad variety of appliance types. The proposed classification has been developed by the United Nations University and clusters appliances according to functionality of the appliance and end-of-life characteristics of e-waste. The CWIT Project will use this classification to avoid mismatches throughout the project. By using these codes, the following novel possibilities arise.

1. The UNU-keys can be connected to other classifications such as the 10 WEEE categories, the 6 WEEE II categories, WEEE Forum Key Figures and the harmonized combined nomenclature (CN) that is used by custom organizations in Europe.

2. Harmonized aggregates can be constructed from the data from Eurostat (10 WEEE categories, 6 WEEE II categories), and the Key Figures from the WEEE-Forum with the UNU-Keys as intermediate classification. Thus, using the UNU approach leads to better quality data, where data differences cannot be attributed to data or scope inconsistencies.

3. The UNU-keys can be grouped, and split to the existing data formats. This enables backward/ forward comparisons of data originally structured in different manners. Consequently, total market and WEEE systems data will be more comparable and detailed than the current available data. This greatly improves policy analysis of the WEEE-Directive.

4. The UNU-keys allow collecting data from importers and producers using the PRODCOM and Combined Nomenclature classifications from for instance Eurostat, national statistical institutes, or directly from importers and producers.

5. The products within a UNU category are homogeneous in weight and display uniform market behaviour. This allows very detailed assessments on future WEEE arising and future potential to collect and recycle WEEE.

6. The use of the UNU classification will refine the calculation of return ratios per category.

1.1 Introduction

There is no universal agreement on the definition and scope of electronic waste (e-waste). In Europe, the definitions are adopted and formulated in the WEEE-Directive (see annexes I and III of Directive 2012/19/EU). In addition, the European waste catalogue[3] provides a list of codes usually serving to identify WEEE in transfer notes and reports from collection points and recyclers to competent authorities. WEEE stands for Waste of Electronic and Electrical Equipment. However, in Europe, differences in scope are still observed due to national implementations and in practice due to individually developed product lists used by Producer Responsibility Organisations. The change in categorisation from the old WEEE Directive into the recast of the WEEE Directive may again lead to various interpretations in practice. In order to avoid that national differences reflect inconsistencies in reporting, the data needs to be harmonized. By doing this, national differences will not reflect inconsistencies in reporting, but provide insight in real differences in markets' performance. This paper proposes a conceptual classification, developed by the United Nations University that overcomes these previously mentioned issues (F. Wang et al., 2012). The classification consistently groups 'Functions' and 'End-of-Life' characteristics and has a link with other harmonized statistical classifications.

[3] Commission Decision 2000/532/EC.

1.2 Classifying e-waste

1.2.1 Criteria for selecting the classification

There is a large variety of electrical products on the market, which makes it difficult to group them into sensible and practically useful categories. There are many criteria to which the categories should comply. In general, the categories should not be defined too detailed. This leads to too many codes and consequently imposes an unnecessary administrative burden to respondents. Moreover, there will be very little open data sources available to collect free data in the desired classification. On the other hand, it should also not be too aggregated, as the previously mentioned practical differences between countries inevitably arise. Consequently, inconsistencies in reporting will affect the data quality, which hampers the usability of the results for international benchmarking and effective policymaking. In the classification developed by the United Nations University, the criteria are based on maximal grouping of products with similar function, comparable material composition (in terms of hazardous sub-stances and valuable materials), sales channel, and related end-of-life attributes. In addition, products within the same category should preferably have identical average weight and lifespan distribution, which can simplify quantitative assessment for similar products. Finally, large, single type or environmentally relevant WEEE products like fridges or mobile phones, for which usually a lot of data are available, are assigned to a separate key.
In the meanwhile, the new classification should be linkable to other existing classifications, or should even act as an intermediate step to link previously un-linkable classifications. This allows to convert data from different organisations and WEEE-systems to each other and to compare them. Such data that is highly desired to convert is the EU WEEE Directive and Recast, WEEE Forum and EU WEEE Directive Impact Assessment and Review Study of UNU (J. Huisman et al. 2008). From the legislation perspective, it is essential to maintain the major 10 categories of the old WEEE Directive and the 6 of the recast version for backwards compatibility and monitoring in the EU.

1.2.2 The UNU-Keys

When all these criteria are combined, it leads to a minimum of 54 categories, shown in the first table in the ANNEX. Those 54 categories can be grouped into 10 primary categories, according to the original EU WEEE Directive (please note that the UNU categories contain additional categories that were previously 'out of scope equipment'). This link is shown in the third column of table in the ANNEX and in Figure 6. The 54 categories can also be clustered into the 6 collection categories of the WEEE-Directive[4], as shown in the second column in the Table in the ANNEX, and illustrated in Figure 6 Those collection categories match as close as possible with observed actual e-waste collection practices and reporting for the recast of the WEEE-Directive.

When going into more detail, the resulting UNU-54 comprises all possible EEE (about 900 products, clustered in 660 main product types). Here it closely follows the harmonized statistical coding of the product classification (CPC) and international trade codes (CN) (Eurostat, 2013). In the ANNEX the correspondence tables per UNU category to the product classification used in the EU-28 (Prodcom) and the combined nomenclature (CN) can be found. National statistical institutes or custom organisations document all commodities and economic activities in the society. Independently of current WEEE registers, this data can provide consistent and harmonized sales figures for all products through historical years and thus an alternative data source for the estimation of WEEE generation.

The same approach is taken for various country assessments in France, Italy, the Netherlands and Belgium. For those countries, their respective national product lists could be linked to as well as to

the so-called 17 categories of the Key Figures classification used by the WEEE Forum and the 2007 WEEE Review Study. Those could be broken down into the UNU-classification. This enables for the first time in Europe, a consistent and comparable data structure for EEE and WEEE amounts.

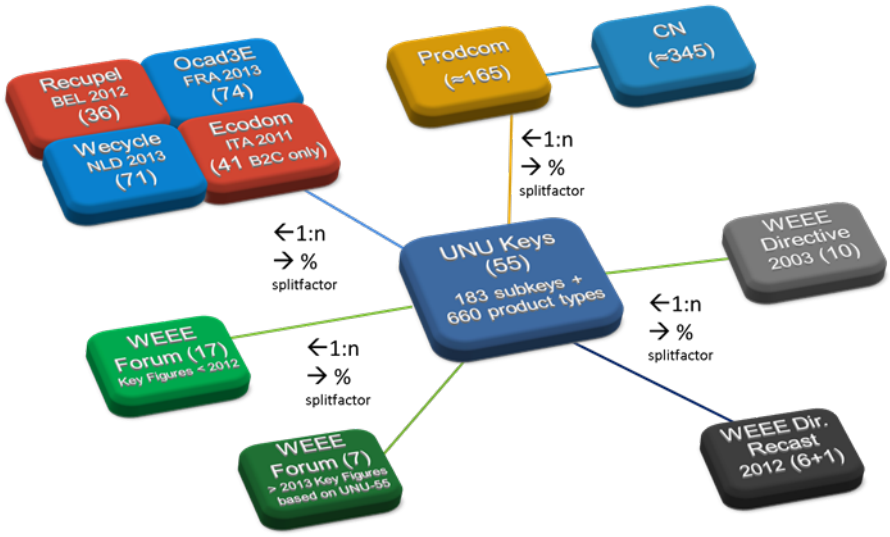

Figure 5. The relations between UNU categories to other WEEE classifications.

Relation UNU-Keys to WEEE-Directive

UNU Key	Primary Collection Category	Old WEEE-Directive	Description
0001	**F PROF LHA**	Out of scope	PROF Central Heat (HH installed central heating)
0002	**F PROF PV**	Out of scope	PROF PV panels
0101	**F PROF LHA**	01	PROF Heating & Ventilation (excl. cooling eq.)
0102	**A LHA**	01	LHA Dishwashing (dishwashers)
0103	**A LHA**	01	LHA Kitchen (large furnaces, ovens, cooking equipm.)
0104	**A LHA**	01	LHA Washing (washing machines&combined dryers)
0105	**A LHA**	01	LHA Drying (wash dryers, centrifuges)
0106	**A LHA**	01	LHA Room (large HH room heating & ventilation, hoods)
0108	**B C&F**	01	C&F Fridge and combi fride (fridges for food, wine, ice, etc.)
0109	**B C&F**	01	C&F Freezer (freezers for food, ice, etc.)
0111	**B C&F**	01	C&F Aircon (HH installed airconditioners)
0112	**B C&F**	01	C&F Other (dehumidifiers, heat pump dryers, etc.)
0113	**F PROF C&F**	01	PROF C&F (Prof. aircons, cooling displays, etc)
0114	**C SHA**	01	SHA Microwaves ((combined) microwaves, excl. grills)
0201	**C SHA**	02	SHA Other (small ventilators, irons, clocks, adapters, etc.)
0202	**C SHA**	02	SHA Food (kitchen, food processing, frying pans, etc.)
0203	**C SHA**	02	SHA Hot water (coffee, tea, hot water, etc.)
0204	**C SHA**	02	SHA Vacuum cleaners (excl. professional ones)
0205	**C SHA**	02	SHA Personal Care (tooth brushes, hair, razors, etc.)
0301	**G IT**	03	IT Small (other small IT, incl components & acces.)
0302	**G IT**	03	IT Desktop PCs (excl. monitor, accessoires)
0303	**G IT**	03	IT Laptop PCs (laptops, notebooks, netbooks, tablets)
0304	**G IT**	03	IT Printers (printing & imaging, scanners, MFS, faxes)

0305	**G IT**	03	IT Phones (telephones & equipment, DECT phones)
0306	**G IT**	03	IT Mobile phones (mobile phones, smartphones, pagers)
0307	**F PROF IT**	03	PROF IT (large IT, servers, routers, data storage, copiers)
0308	**D Screens**	03	SCREENS CRT monitors (cathode ray tube mon.)
0309	**D Screens**	03	SCREENS Flat Display Panel Monitors (LCD, LED monitors)
0401	**C SHA**	04	SHA CE (other, headphones, adapters, remote controls)
0402	**C SHA**	04	SHA Portable Audio/ Video (MP3, e-readers, car nav., etc)
0403	**C SHA**	04	SHA Radio & Hifi (audio sets, components, etc.)
0404	**C SHA**	04	SHA Video (VCR,DVD(R), Blue Ray, Decoders, etc.)
0405	**C SHA**	04	SHA Speakers
0406	**C SHA**	04	SHA Cameras (camcorders, foto&dig. still cameras)
0407	**D Screens**	04	SCREENS CRT TVs
0408	**D Screens**	04	SCREENS Flat Display Panel TVs (LCD, LED, PDP)
0501	**C SHA**	05	SHA Lamps (pocket, halogen, ex. LED & incandescent.)
0502	**E Lamps**	05	LAMPS CFL (compact fluorescent, retro & non-retro)
0503	**E Lamps**	05	LAMPS TL (straight tube fluorescent lamps)
0504	**E Lamps**	05	LAMPS Special (Hg, high & low pres. Na, other prof. lamps)
0505	**E Lamps**	05	LAMPS LED (incl. retrofit lamps, HH LED luminaires)
0506	**C SHA**	05	SHA Luminaires (incl HH incandescant fittings)
0507	**A LHA**	05	PROF Luminaires (all lum. offices, public space, industry)
0601	**C SHA**	06	SHA Tools (all HH saws, drills, cleaning, garden, etc.)
0602	**F PROF Tools**	06	PROF Tools (Professional tools, excl. dual use)
0701	**C SHA**	07	SHA Toys (small toys, vehicles, small music)
0702	**G IT**	07	SHA Game Consoles (video games and consoles)
0703	**A LHA**	07	LHA Toys and Sun beds (exercising, large music instr.)
0801	**C SHA**	08	SHA Medical (small HH thermom., blood pressure meters)
0802	**F PROF Med**	08	PROF medical (hospital, dentist, diagnostics, etc.)
0901	**C SHA**	09	SHA Monitoring (alarm, heat, smoke, security, ex. screens)
0902	**F PROF Mon**	09	PROF Monitoring (Prof. M&C, garage, diagnostic, etc.)
1001	**F PROF LHA**	10	PROF Dispensers (non-cooled vending, coffee, tickets, etc.)
1002	**F PROF C&F**	10	PROF Dispensers (cooled vending, bottles, candy, etc.)

Table 8. Detailed description of the relations of the UNU categories to other WEEE classifications

1.2.3 Previous versions, publications and future use of the UNU-Keys

The UNU classification has been used for the first time in the Netherlands. Initially a product classification comprised on 58 products. This was the basis for the calculations performed in the Netherlands (J. Huisman et al, 2012) and in Italy (F. Magalini et al, 2012), and has been the basis of the first publication specifically on the UNU-codes (F. Wang et al, 2012). These were the first of a kind of detailed country assessments where a large amount of previously undocumented e-waste flows were identified. Due to the first practical use of the codes, and the therewith gained experience, the categories have been slightly revised to 55 codes. The code changes involved grouping of sun beds to 0703 with other leisure equipment and grouping fridges and combi-fridges to 0108 and a restructuring of some lamp codes. This has been the basis for the detailed case study in Belgium in 2012 and the first peer-reviewed academic publication using the codes (J. Huisman et al, 2013) (F. Wang et al, 2013). The codes have now being used in four countries in the EU, covering a quarter of the population of the EU. For those countries, detailed assessments on future WEEE arising and future potential to collect and recycle WEEE were realized. The classifications and framework are also currently considered to be used for the Partnership on IT statistics for development, taskgroup on measuring e-waste statistics.

For the Countering WEEE Illegal Trade (CWIT) Project, the codes were further improved. This basically reduced number of codes, and created a new code for photovoltaic panels (0002) which are new in the WEEE Recast Directive scope. The changes involved grouping of sunbeds and large toys to code 0703. Also, the fridges and combi-fridges are combined into 0108. Due to these changes the codes 0107 and 0110 are now deliberately left empty, and can be used in the future when new products enter the market.

1.3 Conclusion

The here proposed classification for e-waste, the UNU classification, uses both function and end-of-life characteristics to come to a minimum set of 54 categories. Those 54 categories can be linked to existing WEEE categories, such as those used in the old and recast of the WEEE-Directive, the Key Figures from the WEEE-Forum and the classification used for the WEEE-review study. The UNU categories can also be used to link those WEEE categories to each other, which were previously unlinkable. It also links to harmonized statistical classifications and data sources such as the production statistics and the international trade statistics. Therefore, it has a huge potential to create harmonized e-waste statistics, which allows the consortium members of the CWIT project to improve the assessment of environmental policies, and research legal and illegal e-waste flows from the EU-28. Moreover, harmonizing e-waste statistics also has a huge potential to compile more comparable WEEE data. This is of interest to the WEEE-industry and Environmental Agencies, since the traceability of WEEE will be facilitated. The codes have currently been used in four countries in the EU, covering a quarter of the population, where detailed assessments on future WEEE arisings and future potential to collect and recycle WEEE were realized. In those countries, the UNU-codes aided to calculate detailed return ratios and to assess the collection targets. Moreover, the classification is currently considered to be used as a basis for measuring framework in the Partnership on measuring ICT for development in a taskforce on measuring e-waste statistics.

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Annex B
Questionnaire on Waste bin

1	**Year for data** *(Please most recent year)*	

2	**What is the amount of residual household waste collected from households?**	*Answer in tonnage*	
	Please, indicate the source of the information above		
3	**Are there sorting analysis available in your country?**	*Yes or No*	
	If yes, what is the amount of e-waste in residual household waste?	*percentage on weight basis*	
	If yes, is there a counting/ frequency analysis available on which WEEE products are found in the residual household waste *(like adapters, luminaires, speakers, desktops, frying pans, etc.)*	*Do you have a report or XLS table available*	
	Please, indicate the source of the information above		

4	**Composition of e-waste in residual waste** *(add as many rows and/or modify the options provided as you need)*				
	Small IT (excl mobile phones)	*percentage on weight basis*		*number of pieces per ton of waste*	
	Mobile Phones	*percentage on weight basis*		*number of pieces per ton of waste*	
	Small household appliances	*percentage on weight basis*		*number of pieces per ton of waste*	
	Lamps	*percentage on weight basis*		*number of pieces per ton of waste*	
	Other, …. (please specify)	*percentage on weight basis*		*number of pieces per ton of waste*	
	Other, …. (please specify)	*percentage on weight basis*		*number of pieces per ton of waste*	
	Other, …. (please specify)	*percentage on weight basis*		*number of pieces per ton of waste*	
		Automatically calculated ->	*0*		

5	**What is the first treatment step for residual household waste?** *(add as many rows and/or modify the options provided as you need)*		
	Incineration	*percentage on weight basis*	
	Landfilling	*percentage on weight basis*	
	sorting	*percentage on weight basis*	
	Mechnical biological treatment	*percentage on weight basis*	
	Other, …. (please specify)	*percentage on weight basis*	
		Automatically calculated -->	*0%*

Annex C
questionnaire on refurbishers

1. Contact details of the person filling in the survey.

2. Please select the kind of goods that your organisation is dealing with.

3. Please select the activity of your core business.

4. What is your estimated total market share (considering all markets/regions where you are active in) in the refurbishing industry (please select one option)?

5. In which country is your plant residing?

6. In the following you will be requested to provide specific data on quantities refurbished.

Please enter data covering year 2012 as default. In case you would provide data related to other years please select (or confirm) your reference year.

7. How many appliances (items) were refurbished by your company?

8. In case you process any, please describe the type of appliances included under category ''PC accessories''

9. In case information is available, can you provide the total amount of the refurbished appliances in tons?

10. Do you refurbish IT (Excl. Screens)?

11. What is your company estimated national market share in the refurbishing industry per type of product (please use pieces)?

12. From which country(ies) are you getting appliances to be refurbished?

Fill in the entire row for the country(ies) you receive appliances from. Select 0% if you do not receive a specific product type.

Leave blank the entire row if you are not receiving appliances from some of the individual country(ies) listed.

If you receive appliances from outside EU please fill in the field "OUT: Outside EU".

13. What is the percentage (in units) that are fully refurbished and resold?

14. What's the geographical distribution of the refurbished appliances?

Fill in the entire row for the country(ies) you ship appliances to. Select 0% if you do not ship a specific product type.

Leave blank the entire row if you are not shipping appliances to some of the individual country(ies) listed.

15. What is the percentage (in units) of products that are not repairable items and parts thereof?

16. What's the geographical destination of non-repairable items and parts thereof?

Fill in the entire row for the areas where you send material to. Select 0% if you do not send a specific material. Leave blank the entire row if you are not sending the specific material listed.

17. Do you refurbish Large Household Appliances (LHHA)?

18. What is your company estimated national market share in the refurbishing industry per type of product (please use pieces)?

19. From which country(ies) are you getting appliances to be refurbished? Fill in the entire row for the country(ies) you receive appliances from. Select 0% if you do not receive a specific product type. Leave blank the entire row if you are not receiving appliances from some of the individual

country(ies) listed. If you receive appliances from outside EU please fill in the field "OUT: Outside EU".

20. What is the percentage (in units) that are fully refurbished and resold?

21. What's the geographical distribution of the refurbished appliances?

Fill in the entire row for the country(ies) you ship appliances to. Select 0% if you do not ship a specific product type.

Leave blank the entire row if you are not shipping appliances to some of the individual country(ies) listed.

22. What is the percentage (in units) of products that are not repairable items and parts thereof?

23. What's the geographical destination of non-repairable items and parts thereof? Fill in the entire row for the areas where you send material to. Select 0% if you do not send a specific material. Leave blank the entire row if you are not sending the specific material listed.

24. Do you refurbish C&F equipment (Fridges, Freezers, Air Conditioners)?

25. What is your company estimated national market share in the refurbishing industry per type of product (please use pieces)?

26. From which country(ies) are you getting appliances to be refurbished? Fill in the entire row for the country(ies) you receive appliances from. Select 0% if you do not receive a specific product type. Leave blank the entire row if you are not receiving appliances from some of the

individual country(ies) listed. If you receive appliances from outside EU please fill in the field "OUT: Outside EU".

27. What is the percentage (in units) that are fully refurbished and resold?

28. What's the geographical distribution of the refurbished appliances? Fill in the entire row for the country(ies) you ship appliances to. Select 0% if you do not ship a specific product type. Leave blank the entire row if you are not shipping appliances to some of the individual country(ies) listed.

29. What is the percentage (in units) of products that are not repairable items and parts

thereof?

30. What's the geographical destination of non-repairable items and parts thereof? Fill in the entire row for the areas where you send material to. Select 0% if you do not send a specific material. Leave blank the entire row if you are not sending the specific material listed.

31. Do you refurbish Screens?

32. What is your company estimated national market share in the refurbishing industry per type of product (please use pieces)?

33. From which country(ies) are you getting appliances to be refurbished? Fill in the entire row for the country(ies) you receive appliances from. Select 0% if you do not receive a specific product type. Leave blank the entire row if you are not receiving appliances from some of the

individual country(ies) listed. If you receive appliances from outside EU please fill in the field "OUT: Outside EU".

34. What is the percentage (in units) that are fully refurbished and resold?

35. What's the geographical distribution of the refurbished appliances?

Fill in the entire row for the country(ies) you ship appliances to. Select 0% if you do not ship a specific product type. Leave blank the entire row if you are not shipping appliances to some of the individual country(ies) listed.

36. What is the percentage (in units) of products that are not repairable items and parts thereof?

37. What's the geographical destination of non-repairable items and parts thereof? Fill in the entire row for the areas where you send material to. Select 0% if you do not send a specific material. Leave blank the entire row if you are not sending the specific material listed.

38. Do you refurbish SHA?

39. What is your company estimated national market share in the refurbishing industry per type of product (please use pieces)?

40. From which country(ies) are you getting appliances to be refurbished? Fill in the entire row for the country(ies) you receive appliances from. Select 0% if you do not receive a specific product type. Leave blank the entire row if you are not receiving appliances from some of the individual country(ies) listed. If you receive appliances from outside EU please fill in the field "OUT: Outside EU".

41. What is the percentage (in units) that are fully refurbished and resold?

42. What's the geographical distribution of the refurbished appliances?

Fill in the entire row for the country(ies) you ship appliances to. Select 0% if you do not ship a specific product type. Leave blank the entire row if you are not shipping appliances to some of the individual country(ies) listed.

43. What is the percentage (in units) of products that are not repairable items and parts thereof?

44. What's the geographical destination of non-repairable items and parts thereof? Fill in the entire row for the areas where you send material to. Select 0% if you do not send a specific material. Leave blank the entire row if you are not sending the specific material listed.

45. Do you refurbish Professional Equipment (Servers, Copiers,...)?

46. What is your company estimated national market share in the refurbishing industry per type of product (please use pieces)?

47. What is your company estimated national market share in the refurbishing industry per type of product (please use pieces)?

48. From which country(ies) are you getting appliances to be refurbished? Fill in the entire row for the country(ies) you receive appliances from. Select 0% if you do not receive a specific product type. Leave blank the entire row if you are not receiving appliances from some of the individual country(ies) listed. If you receive appliances from outside EU please fill in the field "OUT: Outside EU".

49. What is the percentage (in units) that are fully refurbished and resold?

50. What's the geographical distribution of the refurbished appliances? Fill in the entire row for the country(ies) you ship appliances to. Select 0% if you do not ship a specific product type. Leave blank the entire row if you are not shipping appliances to some of the individual country(ies) listed.

51. What is the percentage (in units) of products that are not repairable items and parts

thereof?

52. What's the geographical destination of non-repairable items and parts thereof? Fill in the entire row for the areas where you send material to. Select 0% if you do not send a specific material. Leave blank the entire row if you are not sending the specific material listed.

Annex D
Questionnaire to metal scrap dealers (non EERA members)

1. Are you an EERA (European Electronics Recyclers Association) Member?

2. Please fill in the survey using the link directly received by EERA Secretariat

3. Contact details of person filling in the survey

4. Please select the WEEE stream(s) your Company is treating

5. Do you treat Small Household Appliances and IT equipment separate from each other?

6. Do you carry out any refurbishment activity? If yes, please select which kind of devices; if not, select NONE. In case you do carry out refurbishment activities, a specific questionnaire might follow if you agree.

7. In which country is your plant residing? Please fill in one questionnaire per country where treatment takes place.

8. In the following you will be requested to provide specific data on quantities treated. Please use data covering 2012 as reference year. In case you would provide data related to other years please select (or confirm) your reference year.

9. What is the TOTAL amount of WEEE processed by your Company in the residence country in the reference year (in tons)? Please note that in the following the questionnaire is structured alongside 2 main sections:

1) treatment of appliances (f.i. those directly coming from collection points) and indicated in the heading as "Treating WEEE appliances"

2) treatment of parts and pre-shredder material (f.i. material coming from other plants) and indicated as "Treating WEEE parts or pre-shredder materials"

Please include the total of both WEEE products and (if applicable) WEEE parts/ in pre-shredder in the totals treated (in tonnes)

10. To which flows are the quantities referring to?

11. How many other plants/shredder locations of your company are existing in your residence country?

12. To avoid double counting, this questionnaire excludes amounts processed for WF members (this information becomes available via the WEEE Forum Key Figures). Please note the list of WEEE Forum Members for your reference (you do NOT need to tick).

13. Do you exclusively report all amounts you treat to one or more WEEE Forum members?

14. Do you treat WEEE in your residence country that are imported from other countries?

15. Please select the country and fill in the share of amounts (in tonnes) received from which countries your company is treating in the residence country. Fill in the entire row for the country(ies) you receive material from. Select 0% if you do not receive a specific waste stream.

Leave blank the entire row if you are not receiving amounts/streams from some of the individual country(ies) listed. If you receive amounts from outside EU please state in "other" filed those country(ies)

16. Do you have data on tons treated?

17. How much WEEE appliances (in tons) are treated by your company in the reference year in the residence country?

18. How much WEEE appliances are treated by your company in the reference year in the residence country?

19. Please help us to determine complementary non reported amounts of appliances treated (still excluding WEEE Forum amounts)

What's the share of appliances treated you report directly ONLY to the stakeholders listed below?

(Please note that 100% should be on each column). Each row needs to be filled in (you can use 0% if not relevant).

20. Are you treating WEEE derived parts and pre-shredder material?

21. From sampling of pre-shredder fractions, do you know the average % of WEEE in the total mix of WEEE derived plus other sources combined generated in your country (or can you provide an estimate)?

22. Do you have data on tons of WEEE derived parts and pre-shredder materials you treated?

23. How much WEEE derived parts and pre-shredder material are processed by your company in the reference year in the residence country?

24. How much WEEE derived parts are processed by your company in the reference year in the residence country?

25. Are there any WEEE derived parts and pre-shredder materials declared to a non-WEEE

Forum Compliance Scheme or National WEEE register directly?

26. Please help us to determine complementary non reported amounts of appliances treated. What's the share of WEEE parts and pre-shredder material treated you report directly ONLY to the stakeholders listed below? (Please note that 100% should be on each column). Each row needs to be filled in (you can use 0% if not relevant).

27. Do you treat C&F (Fridges, Freezers, Air Conditioners)?

28. How much of these are (H)CFC containing (% on a weight basis)? (type NA if you are not processing)

29. What % of fridges and freezers is "without pressure" or lacking its compressor when arriving at the treatment plant (in the reference year)?

30. Do you treat IT (excl. SCREENS)?

31. What % (in units) of PC's is missing valuable components, CPUs, motherboards, memory, etc?

32. Do you treat Screens?

33. What is the % (on weight basis) of TV's in the screens category?

34. What is the % (on weight basis) of CRTs for TV's?

35. What is the % (on weight basis) of CRTs for Monitors?

36. What is the share (%, on weight basis) of the resulting copper/ circuit board/ precious metal fractions are shipped directly to modern smelters/refiners like Boliden, Umicore, Aurubis, Glencore, etc.

37. Would you be open to further discuss or provide feedbacks regarding the typology of WEEE trading from Europe by our WP5 Consortium Partners (UNICRI, CBRA and INTERPOL)?

38. Would you like to receive updates, newsletters or publications from the CWIT project?

39. Would you have any further comments or recommendations to make for the purpose of this research project?

Annex E
Questionnaire to EERA members

1. Contact details of person filling in the survey

2. Please select the WEEE stream(s) your Company is treating

3. Do you treat Small Household Appliances and IT equipment separate from each other?

4. Do you carry out any refurbishment activity? If yes, please select which kind of devices; if not, select NONE. In case you do carry out refurbishment activities, a specific questionnaire might follow if you agree.

5. In which country is your plant residing?

Please fill in one questionnaire per country where treatment takes place

6. In the following you will be requested to provide specific data on quantities treated.

Please use data covering 2012 as reference year. In case you would provide data related to other years please select (or confirm) your reference year:

7. What is the TOTAL amount of WEEE processed by your Company in the residence country in the reference year (in tons)?. Please note that in the following the questionnaire is structured alongside 2 main sections:

1) treatment of appliances (f.i. those directly coming from collection points) and indicated in the heading as "Treating WEEE appliances"

2) treatment of parts and pre-shredder material (f.i. material coming from other plants) and indicated as "Treating WEEE parts or pre-shredder materials"

Please include the total of both WEEE products and (if applicable) WEEE parts/ in pre-shredder in the totals treated (in tonnes)

8.To which categories are the flows referring to?

9. How many other plants/shredder locations of your Company are existing in your residence country?

10. Please note the list of WEEE Forum Member for your reference (you do NOT need to thick).

To avoid double counting, this questionnaire excludes amounts processed for WF members (this information becomes available via the WEEE Forum Key Figures).

11. Do you exclusively report all amounts you treat to one or more WEEE Forum members?

12. Do you treat WEEE in your residence country that are imported from other countries?

13. Please select the country and fill in the share of amounts (in tonnes) received from which countries your company is treating in the residence country.

Fill in the entire row for the country(ies) you receive material from. Select 0% if you do not receive a specific waste stream. Leave blank the entire row if you are not receiving amounts/streams from some of the individual country(ies) listed. If you receive amounts from outside EU please state in "other" filed those country(ies).

14. Do you have data on tons treated?

15. How much WEEE appliances (in tons) are treated by your company in the reference year in the residence country?

16. How much WEEE appliances are treated by your company in the reference year in the residence country?

17. Please help us to determine complementary non reported amounts of appliances treated (still excluding WEEE Forum amounts)

What's the share of appliances treated you report directly ONLY to the stakeholders listed below?

(Please note that 100% should be on each column)

Each row need to be filled in (you can use 0% if not relevant)

18. Are you treating WEEE derived parts and pre-shredder material?

19. From sampling of pre-shredder fractions, do you know the average % of WEEE in the total mix of WEEE derived plus other sources combined generated in your country

(or can you provide an estimate)?

20. Do you have data on tons of WEEE derived parts and pre-shredder materials you treated?

21. How much WEEE derived parts and pre-shredder material are processed by your company in the reference year in the residence country?

22. How much WEEE derived parts are processed by your company in the reference year in the residence country?

23. Are there any WEEE derived parts and pre-shredder materials declared to a non-WEEE

Forum Compliance Scheme or National WEEE register directly?

24. Please help us to determine complementary non reported amounts of appliances treated.

What's the share of WEEE parts and pre-shredder material treated you report directly

ONLY to the stakeholders listed below? (Please note that 100% should be on each column). Each row need to be filled in (you can use 0% if not relevant).

25. Do you treat C&F (Fridges, Freezers, Air Conditioners)?

26. How much of these are (H)CFC containing (% on a weight basis)? (type NA if you are not processing)

27. What % of fridges and freezers is "without pressure" or lacking its compressor when arriving at the treatment plant (in the reference year)?

28. Do you treat IT (excl. SCREENS)?

29. What % (in units) of PC's is missing valuable components, CPUs, motherboards, memory, etc?

30. Do you treat Screens?

31. What is the % (on weight basis) of TV's in the screens category?

32. What is the % (on weight basis) of CRTs for TV's?

33. What is the % (on weight basis) of CRTs for Monitors?

34. What is the share (%, on weight basis) of the resulting copper/ circuit board/ precious metal fractions are shipped directly to modern smelters/refiners like Boliden, Umicore, Aurubis, Glencore, etc.

35. Would you be open to further discuss or provide feedbacks regarding the typology of WEEE trading from Europe by our WP5 Consortium Partners (UNICRI, CBRA and INTERPOL)?

36. Would you like to receive updates, newsletters or publications from the CWIT project?

37. Would you have any further comments or recommendations to make for the purpose of this research project?