Assessment of EEE service lifetime, storage, and disposal in Greek households

C. Chroni[1], A. Lekkas[1], C. Drakouli[1], C. Abeliotis[1] E. Terzis[1], Ch. Angelakopoulos[2], K. Lasaridi[1]
1. Harokopio University, 2. Appliances Recycling S.A.

7TH INTERNATIONAL CONFERENCE ON SUSTAINABLE SOLID WASTE MANAGEMENT

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Waste Electrical and Electronic Equipment generation

Rapid proliferation of EEE
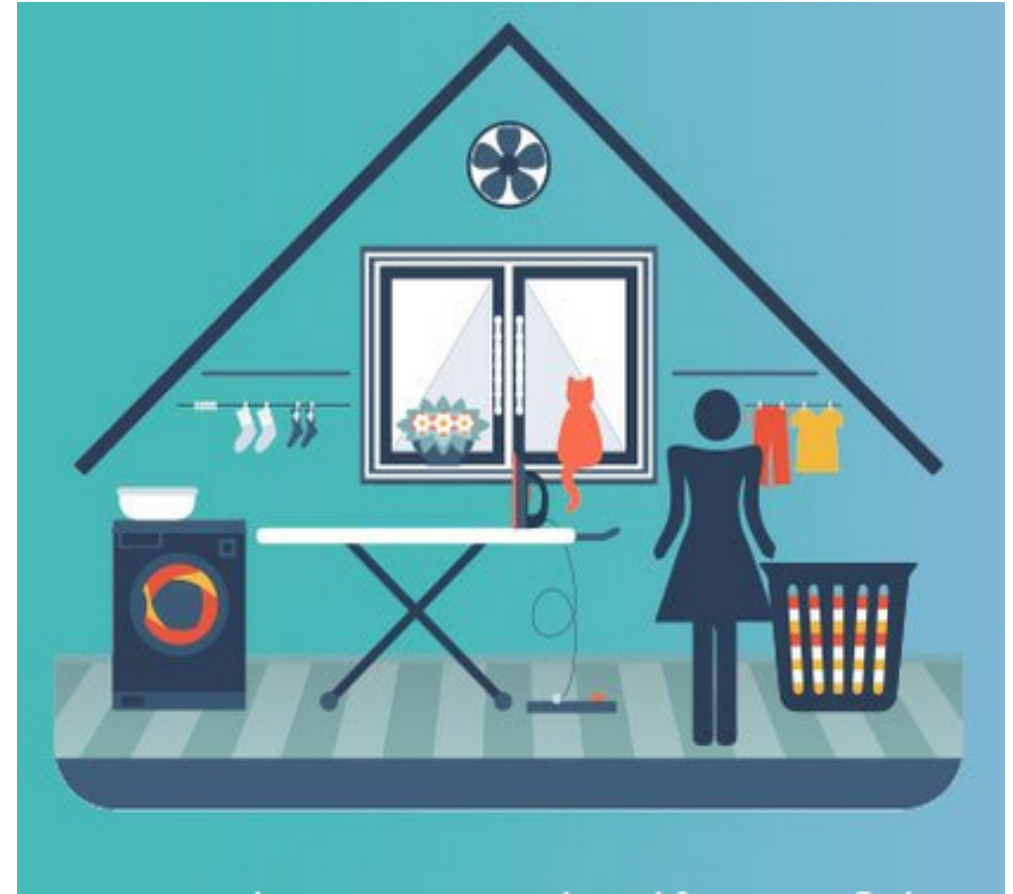- Technological innovation
- Growth of demand

Decreasing lifespans

Generation of large quantities of WEEE that need to be collected and treated properly

(W)EEE quantities

It is estimated that*:

- **There are more than 900 different types of EEE in developed countries**

- **Approximately 50 million tons of WEEE are generated annually**

(*) Huisman et al., 2012

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WEEE collection targets

The recast European Union Directive on WEEE (ED 2012/19/EU) requires Member – States to collect 65% of EEE put on the market or 85% of WEEE generated by 2019.

Prerequisites for reaching the targets

- Achievement of a more accurate assessment of the WEEE generation (present and future)
- Quantification of WEEE potential to be used as a resource

These would facilitate the WEEE management and the implementation of legislation
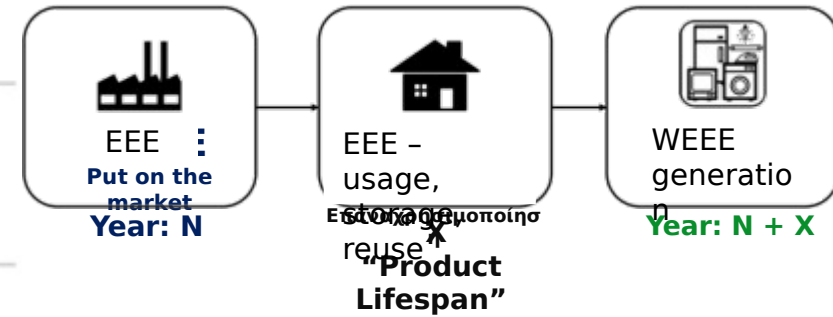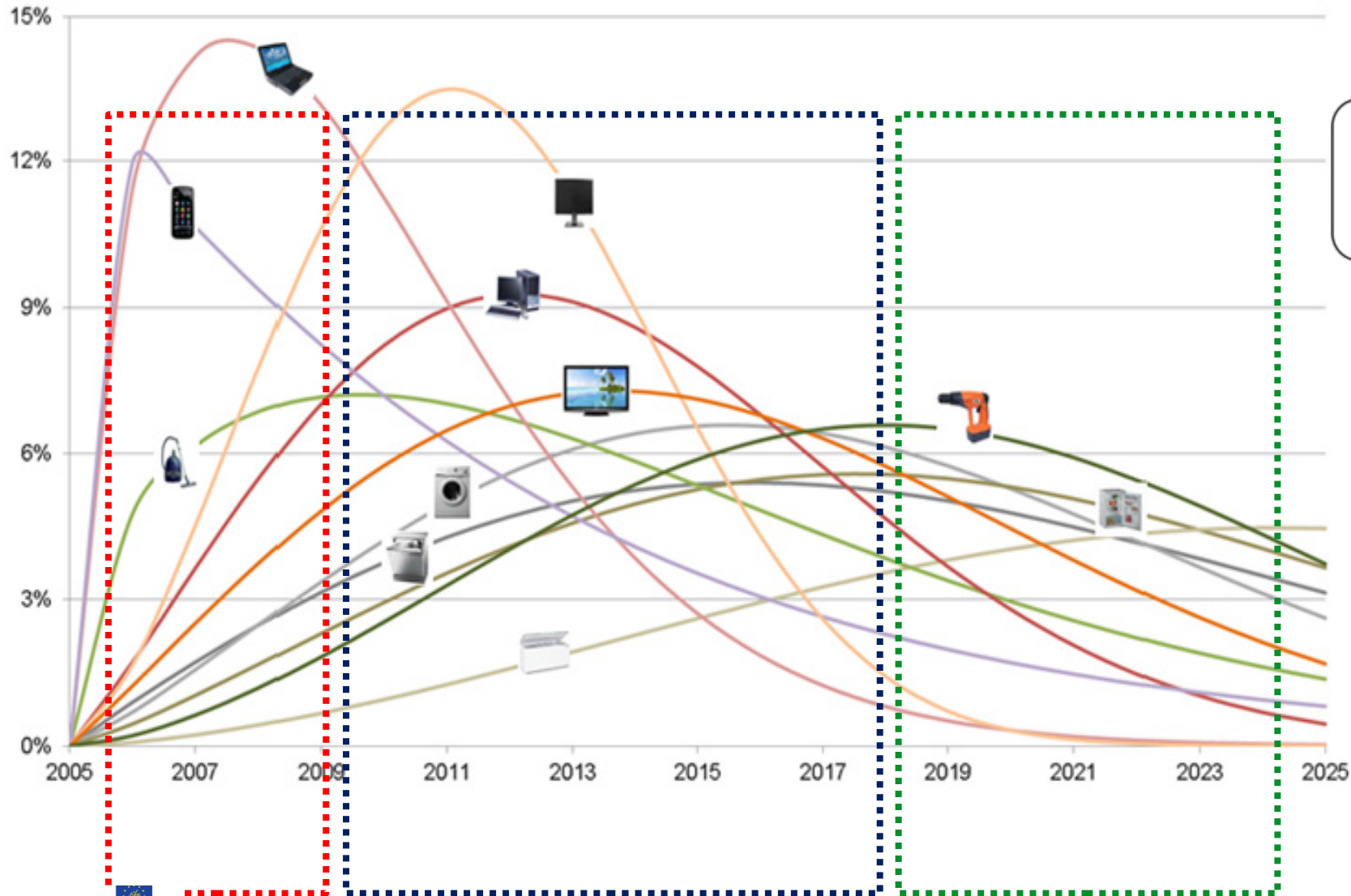
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The issue: how are WEEE quantities estimated?

The evaluation methods can be roughly classified in the following categories:

- Disposal related analysis
- Time series analysis (projections)
- Factor models
- Input-Output analysis

Predicted percentage of devices put on market in 2005 becoming WEEE

*

EEE
Put on the market
Year: N

EEE – usage, storage, reuse
Εσωτερικοποιησ χ
"Product Lifespan"

WEEE generation
Year: N + X

Short lifespan:
- **Mobile phones**
- **Laptops**

Medium lifespan
- **Washing machines**
- **TV**

Long lifespan
- **Freezers**
- **Tools**

Sources: (W)EEE Mass balance and market structure in Belgium, 2013
Study on the quantification of (WEEE) in France, 2013

Re Weee

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The issue: In order to achieve more precise estimations, a survey in households should be conducted.

The scope of this study

This preliminary study aims to define the EEE stock in Greek households through the use of a questionnaire study.
More specifically, this paper investigates both the service and storage lifetime of EEE in households.

The project at a glance
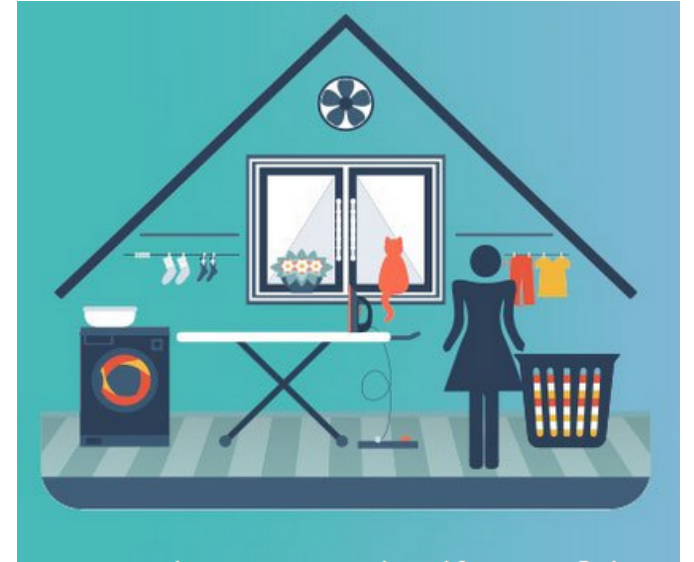
Title
"Development and demonstration of Waste of Electrical and Electronic Equipment Prevention and Reuse Paradigms – REWEEE"

Duration
January 2016 – June 2019 (3.5 years)

Project's objective
Design and implementation of WEEE prevention and reuse strategy

Budget
2,161,405 €
"REWEEE Project" (LIFE14 ENV/GR/000858) is 60% co-funded by the European LIFE + Environment programme

Areas of implementation
➢ Greece
➢ Belgium

Coordinator

Beneficiaries
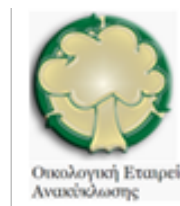
Terminology

In this study EEE stock is defined as the amount of:

i. EEE in service, regardless the frequency of its use,

ii. obsolete EEE, which may be functional or non-functional, but is not in use any longer, and

iii. non-functional EEE, which has not been discarded yet or is not intended to get discarded.

Methods employed

- ✓ bibliographic review
- ✓ search of technical reports
- ✓ scientific journals
- ✓ databases (published and unpublished)
- ✓ Implementation of a population balance model
- ✓ questionnaire

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Questionnaire designed to investigate:

➢ the quantity, and the status of EEE in Greek households
- New, old, need repair/refurbishement
- In use, in storage

➢ the attitude and behaviour of consumers regarding EEE reuse or preparing for reuse
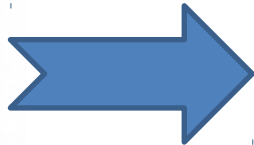
Methodology

- **Target: households**
- **Age range of the respondents: 18-80 yr**
- **Over 250 questionnaires were distributed**
- **167 were collected back (corresponding to 386 residents)**

5 sections

Social characteristics

Data for functional EEE

Data for functional EEE, which are not used

Data for non functional devices

Reasons for stocking non functional EEE

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Methodology

5 Categories of Household EEE
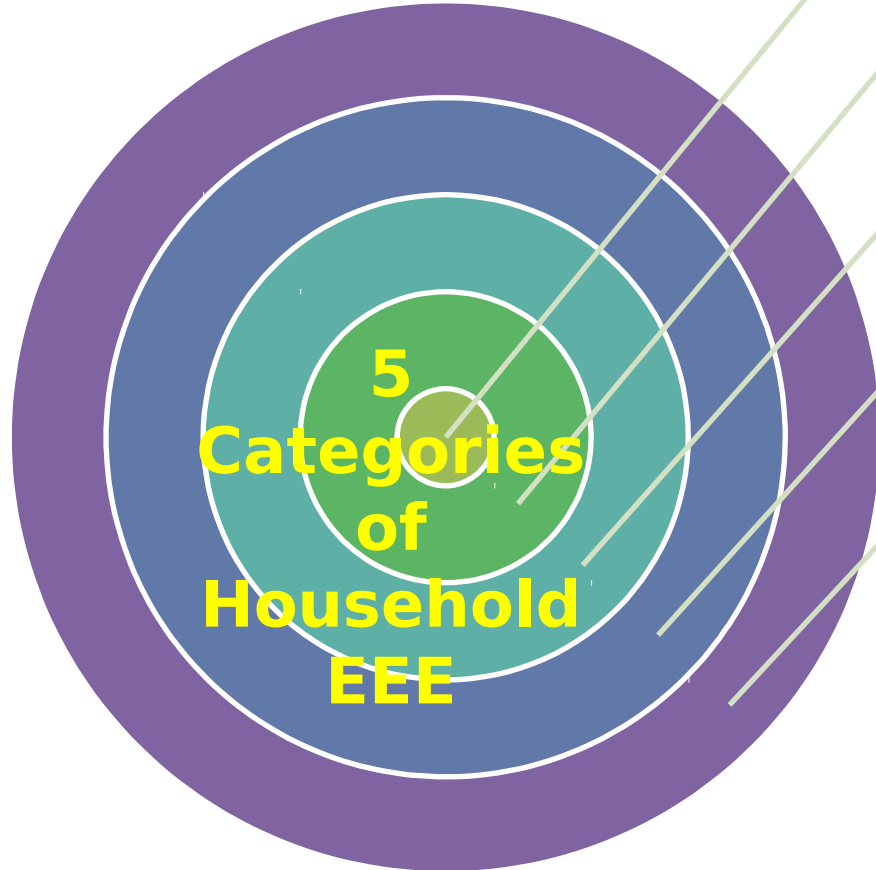
TV, Telephony, entertainment

Large appliances

Small appliances

Cooling/Heating appliances

Household Tools

Methodology

Freezer

Electric Oven

Electric Kitchen

Washing machine and dryer

Dishwasher

Dryer

Table dishwasher

Refrigerator

Microwave

Washing Machine

Large Appliances

Air oven

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Households characteristics of the participating sample

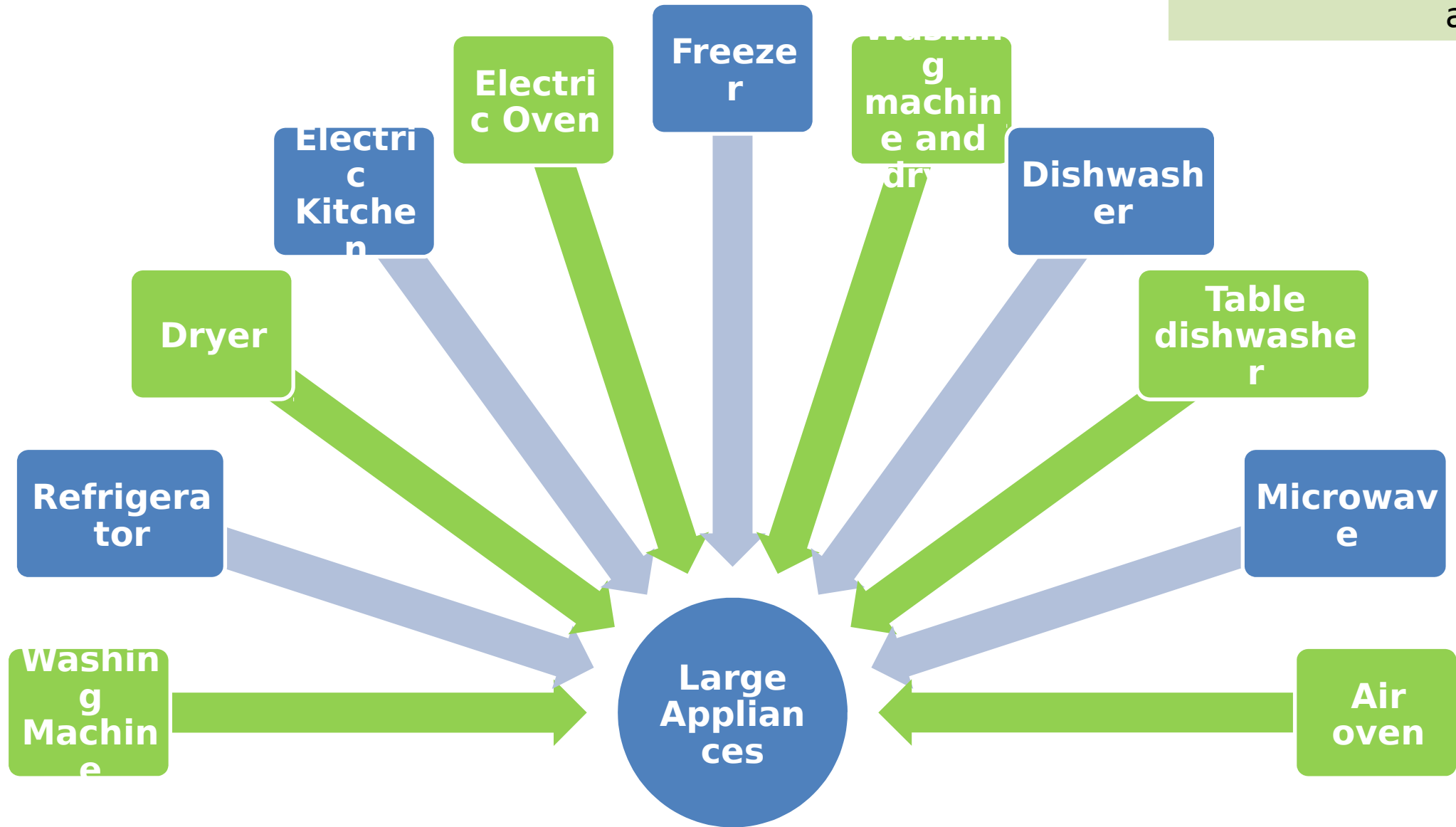| Characteristic	Category	Ratio (%) of the participating sample*
Household type	One person	25.1
	Roommates (students of higher education)	7.2
	Couple	29.3
	Family (with underage members)	24.0
	Family (all adults)	14.4
Age of the interviewees	18-24	2.4
	25-34	39.5
	35-44	28.1
	45-54	12.0
	55-64	9.0
	65-85	7.8

*According to the Hellenic Statistical Authority (2014), the percent share of one person households is 25.7%, of two person households (including couples, roommates, and single parent families) is 29.5%, and of more than 3 persons is 44.8%).

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Results

Refrigerator
- **98.6% are used daily**

Washing Machine
- **Almost 50% are used 2-3 times a week**
- **20.3% daily use**

Electric Kitchen
- **72.6% are used daily**

Freezer
- **46.9% daily use**
- **15.6% 2-3 times a week**

Dishwasher
- **35.3% are used daily**
- **35.3% are used -3 times a week**

✓ **Large Household appliances are mainly used on daily base**
✓ **The frequency of 2-3 times a week prevails to the rest EEE**

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Results

98.6% Daily use	**Almost 50% 2-3 times a week**	**72.6% Daily use**	**46.9% Daily use**	**35.3% 2-3 times a week**

- ✓ **Large Household appliances are mainly used on daily base**
- ✓ The rest EEE **2-3 times a week**

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Results

Refrigerator
- **All functional**

Washing Machine
- **98.4% is functional**

Electric Kitchen
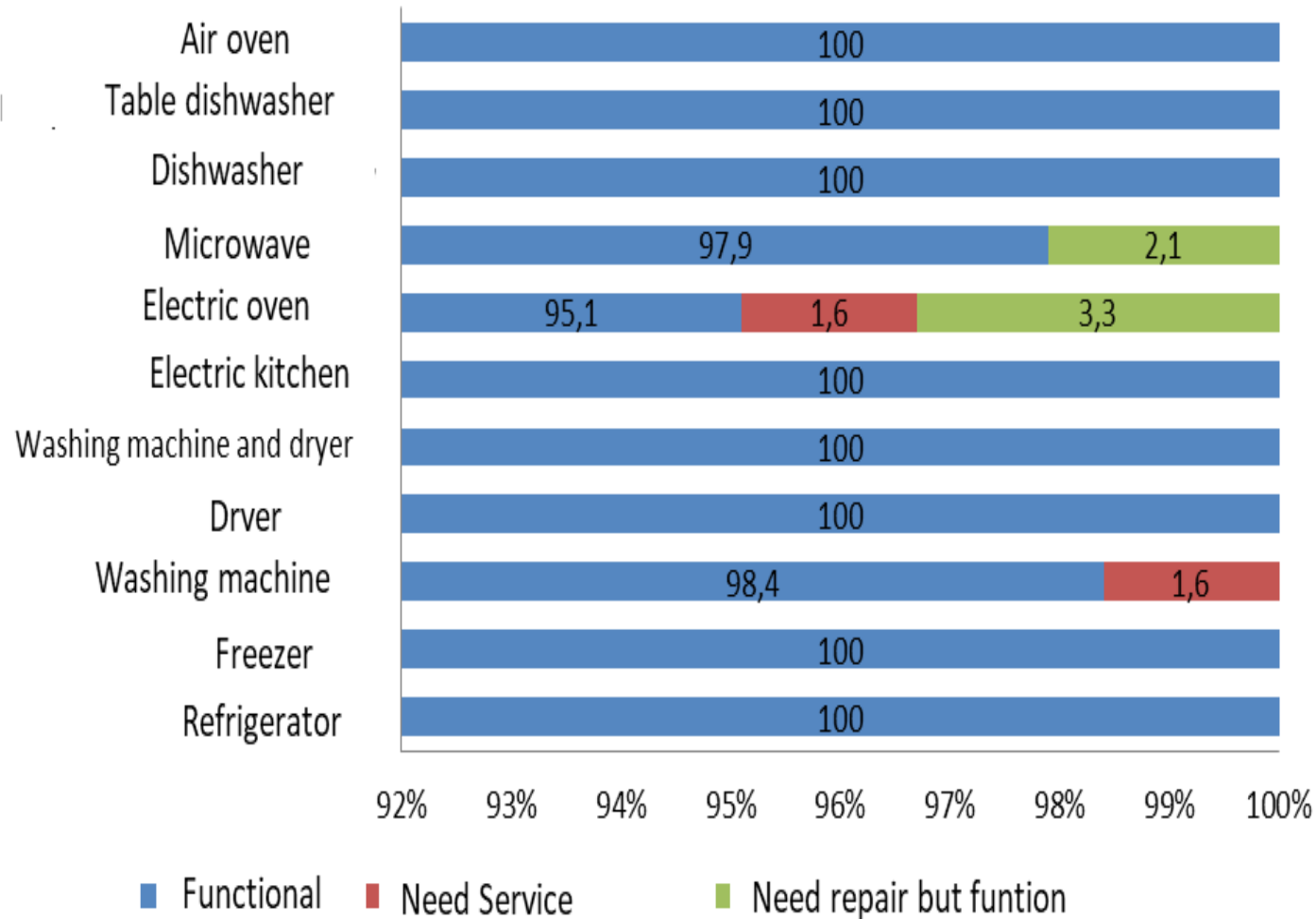- **All functional**

Freezer
- **All functional**

Dishwasher
- **All functional**

✓ In all analysed questionnaires, large EEE were functional

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Results

Status of Households appliances

- ✓ **Over 94%** Household appliances are functional
- ✓ Electric oven is the device with the most needs for repair

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Results

Refrigerator
- **98.4% was purchased brand new**

Washing Machine
- **93.8% was bought new**

Electric Kitchen
- **94.2% was purchased new**
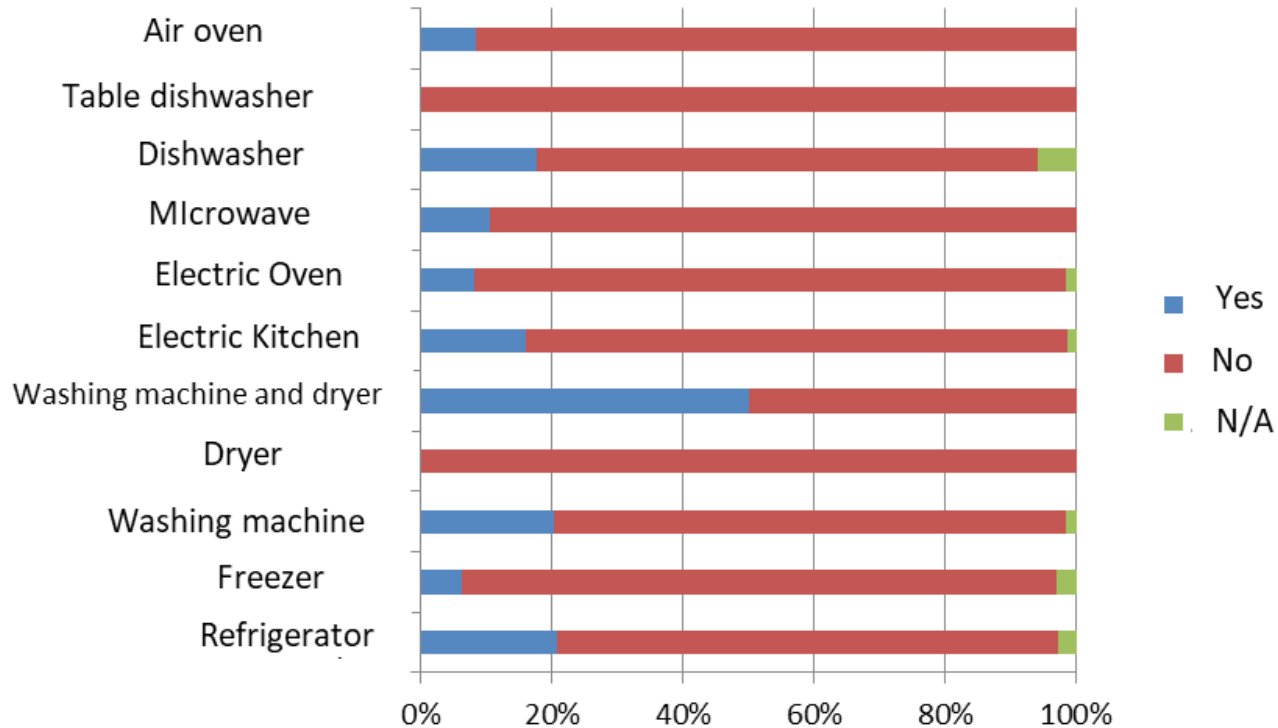
Freezer
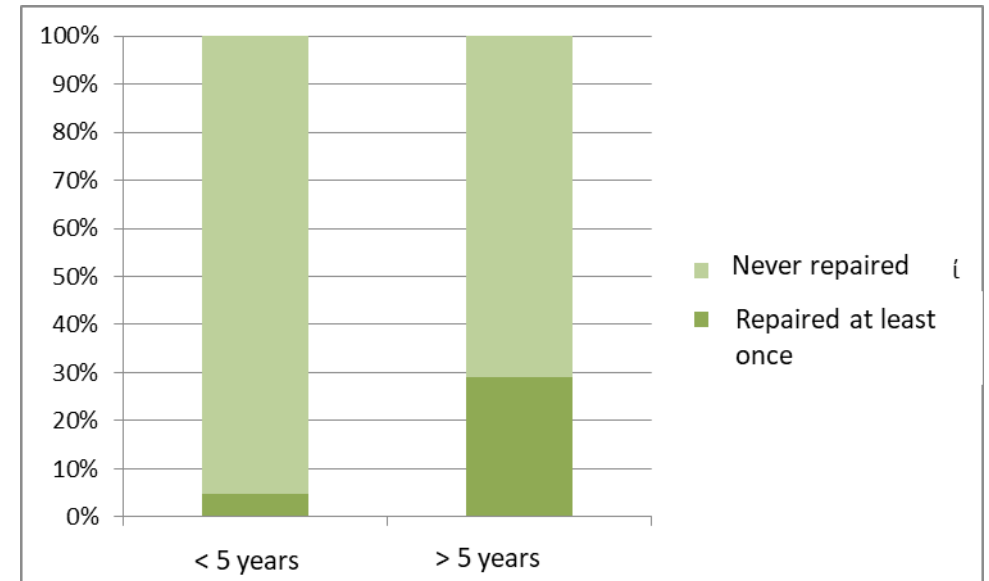- **All are bought new**

Dishwasher
- **88.2% was purchased new**

✓ **94% of the devices was purchased brand new**

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Results

The proportion of devices which were Repaired at least once
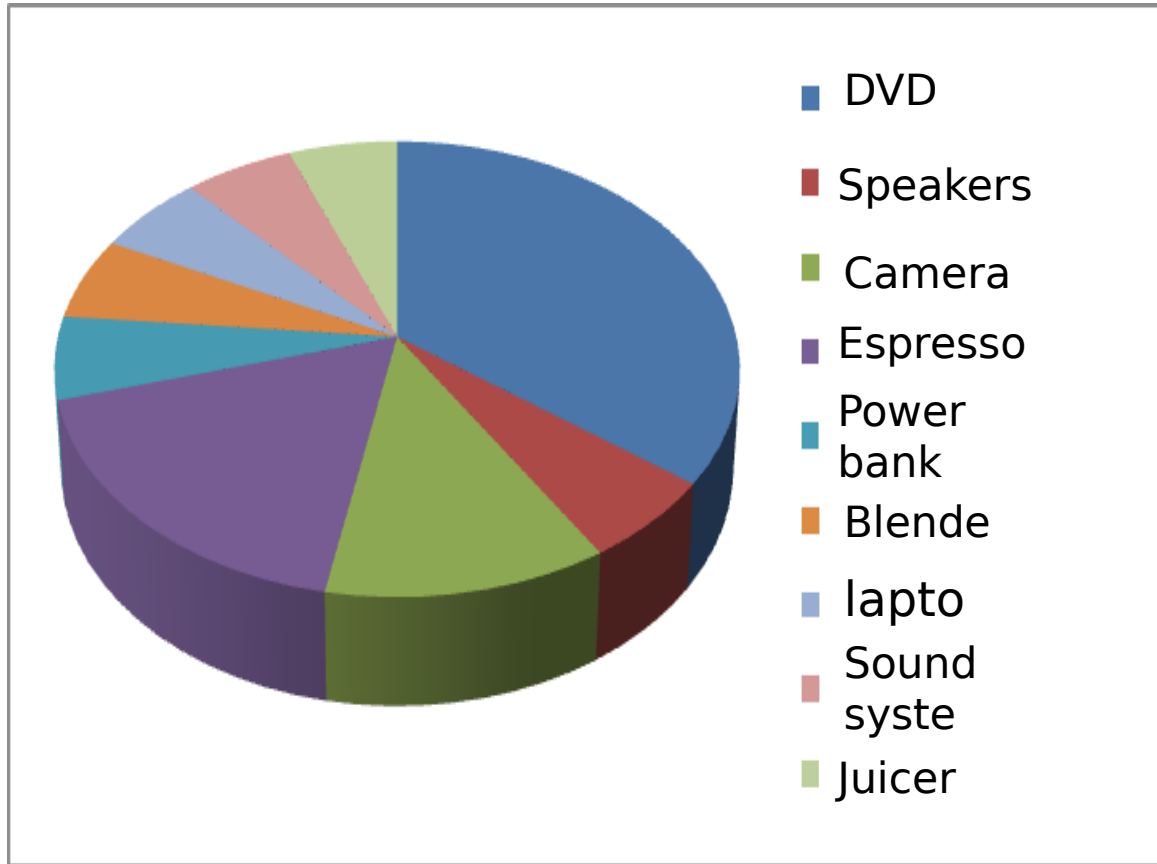

The proportion of repairing devices in correlation with the lifespan

✓ The analysis shows that all appliances needed a repair
✓ **There is a positive correlation between the age of the device and the need for repair**

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Results

Legend:
- DVD
- Speakers
- Camera
- Espresso
- Power bank
- Blende
- lapto
- Sound syste
- Juicer

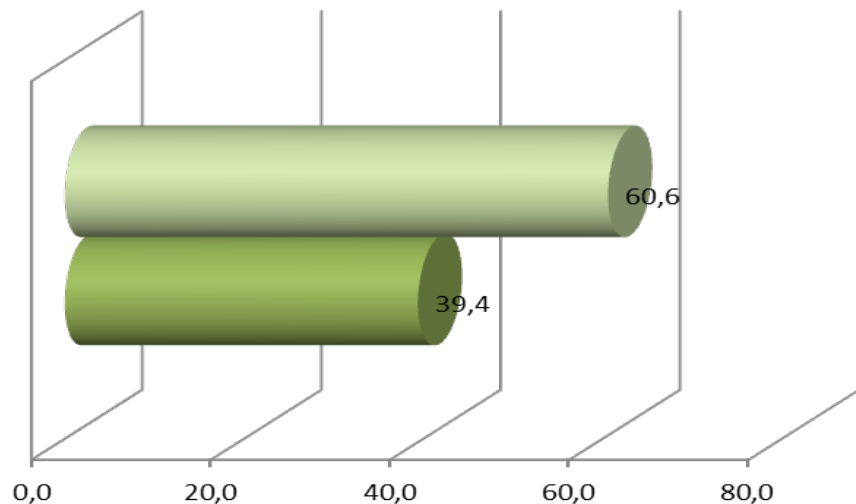**Proportion of appliances which function but are not in use**

➢ Mainly household gadgets and electronic devices of obsolete technology
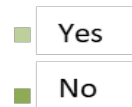
Reasons to keep them:
➢ Sentimental
➢ No access to a recycling bin / center
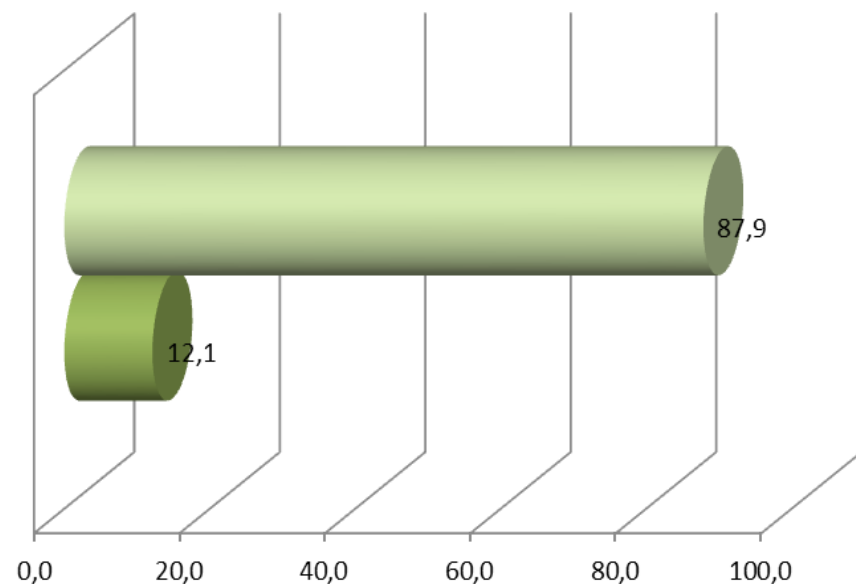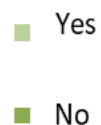➢ For future donation to people in need
➢ For future use

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The proportion of people who would repair a 'broken' device

✓ The research indicates that over a 60% of the respondents would repair a broken/malfunctioning device leading to the expansion of the lifespan

The proportion of people who would recycle a 'broken'

✓ Approximately 90% would recycle a broken device if repairing is not feasible

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