

# LIFE CYCLE ASSESSMENT OF THE FIRST WEEE SORTING CENTRE IN THE REGION OF ATTICA, GREECE

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## Abstract

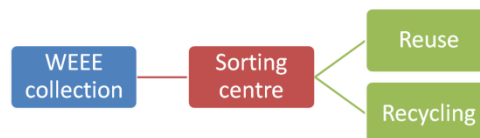
The reuse of Waste Electrical and Electronic Equipment (WEEE) currently draws, worldwide, much attention from an economic, environmental, and social viewpoint. The REWEEE project aims to reduce WEEE through the implementation of prevention (reuse) and preparation for reuse actions and the development and demonstration of efficient sorting and preparation for reuse processes for a variety of WEEE, leading to an increased acceptance of used WEEE by the consumer. One of the key goals of the REWEEE project is to monitor and highlight the link among the environmental, economic and social benefits associated with WEEE reuse and preparation for reuse. The aim of this manuscript is the presentation of the key parameters that need to be taken into account in order to assess via means of LCA the environmental impact of the operation of two sorting centres for WEEE reuse in Greece.

Keywords: WEEE, reuse, sorting centres, social life cycle assessment, Greece

## Introduction

Waste Electrical and Electronic Equipment (WEEE) or e-waste is one of the fastest growing waste streams worldwide. More than 40 million tonnes of e-waste are created globally each year. The management and disposal of these kind of waste is complex and sometimes related to illegal e-waste trade towards developing countries [1].

Moreover, in the European context for WEEE management, the amended EU Waste Framework Directive introduced definitions for 'reuse' and 'preparing for reuse'. 'Reuse' means any operation by which products or components *that are not waste* are used again for the *same* purpose for which they are conceived. 'Preparing for reuse' means checking, cleaning or repairing recovery operations, by which products or components of products *that have become waste* are prepared so that they can be reused without any other pre-processing.



**Figure 1.** Focus of the LIFE+ ReWeee project.

However, despite the enhanced legislative framework, the actual quantities of WEEE collected and reported reused and prepared for reuse in 2012 in the EU correspond to 2% of the total WEEE collected. The UK, Germany and France lead the way [1]. Reused WEEE, and prepared for reuse WEEE in Greece is reported to be 0% for 2012 [1]. In order to enhance the public perception towards the reuse of electric appliances and the prevention of WEEE generation, an initiative has been undertaken by a group of partners, which is implemented via the LIFE+ ReWeee project [2]. The project aims to prevent the generation of WEEE. In order to achieve this objective, two WEEE sorting centers will operate for the first time in Greece, in the wider region of Attika in southern Greece, and central Macedonia on northern

Greece, respectively. The core activity of those centers is the collection, the storage and the sorting of WEEE depending on their condition and then their preparation for reuse or treatment (see Figure 1).

The aim of this manuscript is the presentation of the key parameters that need to be taken into account in order to assess the environmental impact resulting from the operation of the two sorting centers for WEEE reuse in Greece via means of LCA.

### **Scope of the study**

The scope of the study will be the operation of the two sorting centers in Greece, one in Attica and one in the greater Thessaloniki region. The objective of the sorting centers will be the sorting of those appliances that are more likely to be reused. The environmental benefits of the extension of the lifespan of an appliance are the following:

- The WEEE stream is reduced
- Raw materials (metals, glass, crude oil for the plastics) are saved
- Energy is saved during the life cycle of the EEE.

On the other hand, when EEE are reused, the following drawbacks are observed:

- Raw materials and energy are required for the preparation for reuse and repair of EEE and the operation of the sorting center
- Based on the fact that the energy rating of EEE is improving, extension of the lifespan of older appliances yields to higher electricity consumption

Therefore, in order to assess the overall environmental balance among the aforementioned benefits and drawbacks, the life cycle assessment methodology should be utilised.

### **Life cycle inventory**

- Transportation means for the appliances that enter the sorting center (fuel type and fuel consumption per km) and for those leaving the sorting center)
- Total distance (km) traveled for the EEE that enter and leaving the sorting center
- Total weight (kg) of EEE entering and leaving the sorting center.
- Data on material types and energy required for each EEE entering the sorting centers (kg of material per EEE item)
- Data on the mean life span of each EEE entering the sorting center (years).
- Inventory of the quantities of EEE entering and leaving the sorting center, in order to assess the amount of each EEE that is prepared for reuse (pieces).
- Annual electricity consumption for the operation of the sorting center (KWh)
- Annual consumption of any other form of energy required for the operation of the sorting center ( $\pi.\chi$ . liters of heating oil,  $m^3$  of natural gas)
- Full inventory of the sorting center infrastructure (e.g. conveyor belts, benches, collection boxes)
- Full inventory for the material parts required in order to repair the EEE and prepare them for reuse (kg of each material)

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