



PAVEtheWAYSTE

Demonstrating resource efficiency through innovative, integrated waste recycling schemes for remote areas

Layman's Report

Prepared under

Action D.7: Layman's Report

LIFE14 ENV/GR/000722 |

1. THE LIFE PAVETHEWAYSTE PROJECT

The LIFE PAVetheWAYSTE project aim was to facilitate the implementation of the Waste Framework Directive in remote areas, by enabling local and regional authorities improve their municipal waste recycling performance and thus **pave the way** to high resource efficiency. This was achieved through the development and application of an economically viable solid waste management plan, based on the demonstration of an **innovative system** for the **fine separation of municipal solid waste (MSW) at source**. This innovative system is able to sort and treat different types of recyclable waste in a way to directly recover end-products of high quality and purity. In the course of the project, several companies activated in the recycling industry were engaged in order to ensure that the end-products will satisfy market specifications and that the recovered materials are exploited. The project was implemented by following the stages depicted in the graph below.



The project implementation areas comprised of two Greek areas, namely the **Municipality of Naxos and Small Cyclades Islands** and the **Municipality of Ancient Olympia**. In addition, a major contribution to the demonstration character of the project was provided by a Spanish project partner (Valladolid, Castilla y León area) with the provision of feedback and research and development-based knowledge for the successful replication and transfer of the developed Integrated Solid Waste Management System (ISWM) and its findings, not only in other. Suffice it to say, that many Municipalities in both countries expressed a strong interest in replicating the project by introducing the innovative recycling system, that is implemented in the project's target areas, to their waste management schemes.

The project was initiated in **September 2015** and was concluded in **December 2021**. The **Municipality of Naxos and Small Cyclades Islands** in South Aegean (Greece) is the coordinator of the project, while the project partners are the **Municipality of Ancient Olympia** in Western Greece, the **National Technical University of Athens** (Greece) and the **Fundación CARTIF** (Spain).

The project was co-financed by the **LIFE Program for the Environment and Climate Change (2014-2020)**.

The main objectives of the project were to:

Establish an EU integrated and replicable innovative system for source separation and treatment of recyclable materials in Greece

Treat recyclable materials at source avoiding waste collection, transportation and treatment in central recovery facilities

Recover the maximum possible resources and high purity materials, while contributing to the diversion of waste reaching landfill

Inform and educate citizens on how to separate different types of recyclable materials through the installation of innovative prototype recycling systems, operated by specially trained staff

Evaluate the quality and marketability of the final products in relation to the specifications of local/regional market and specific industry standards

Facilitate recycling of the material and improve the quality of materials recovered through better waste separation and processing methods

Make waste recycling an economically attractive option in remote areas where transport costs are predominant

Eradicate landfilling and more importantly illegal waste management practices such as uncontrolled waste dumping

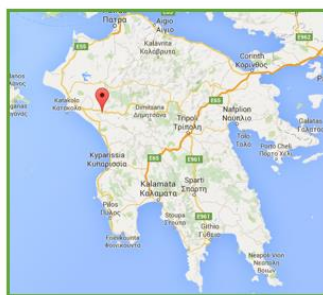
Provide an integrated approach to implementing the objectives of the policy and legislation of the Union in the field of resource efficiency through sustainable waste management approach in remote areas

The LIFE PAVetheWAYSTE project:

Target Areas



Municipality of Naxos and Small Cyclades Islands
(Iraklia, Schinousa, Donousa, Koufonisia)



Municipality of Ancient Olympia
(Local Communities of Ancient Olympia, Platanos, Pelopio)

Replication



Castilla-León

Project Partners

1. Coordinator:
Municipality of Naxos and Small Cyclades

Partners:

2. CARTIF Technological Institute
3. National Technical University of Athens (NTUA)
4. Municipality of Ancient Olympia

Project Duration

01/09/2015 - 31/12/2021

Budget

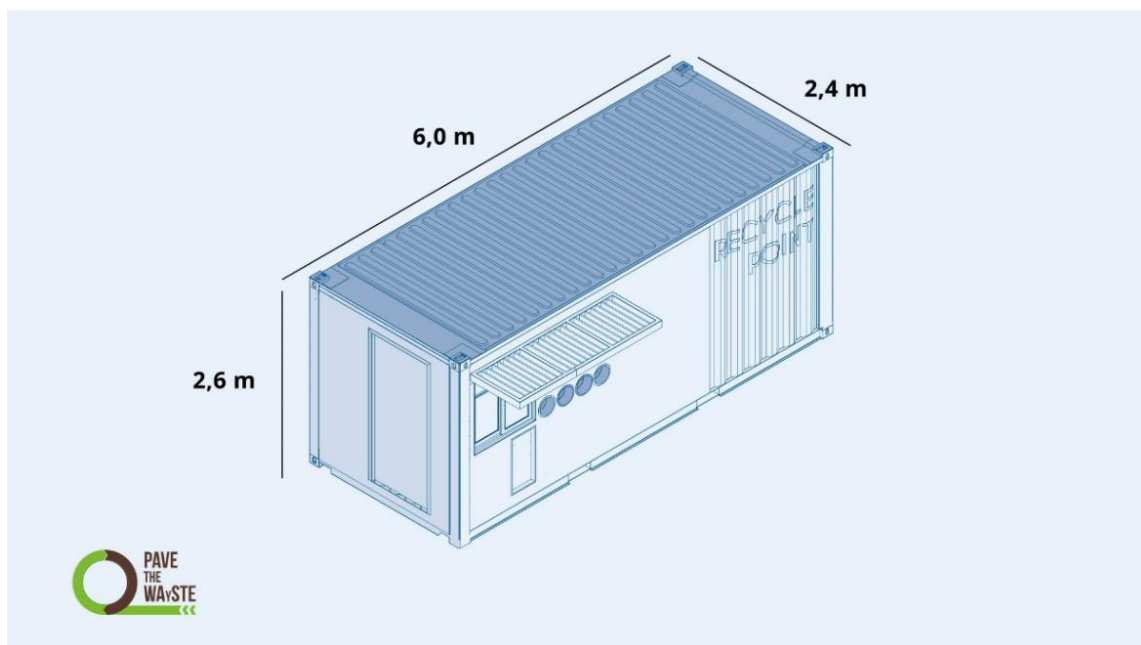
Total: 1,758,267 €

% EU Contribution: 1,054,960 €
(60% of eligible costs)

2. THE GREEN KIOSK

The **Green Kiosk** constitutes an innovative recycling initiative designed by the Unit of Environmental Science and Technology (School of Chemical Engineering - National Technical University of Athens), under the European **LIFE** Program **PAVEtheWAYSTE**.

Modelled on the basis of Circular Economy, the Green Kiosk comprises a small Recycling Sorting Center suitably adapted into a modified container which receives pre-sorted materials from residents and businesses, records and rewards active participation.

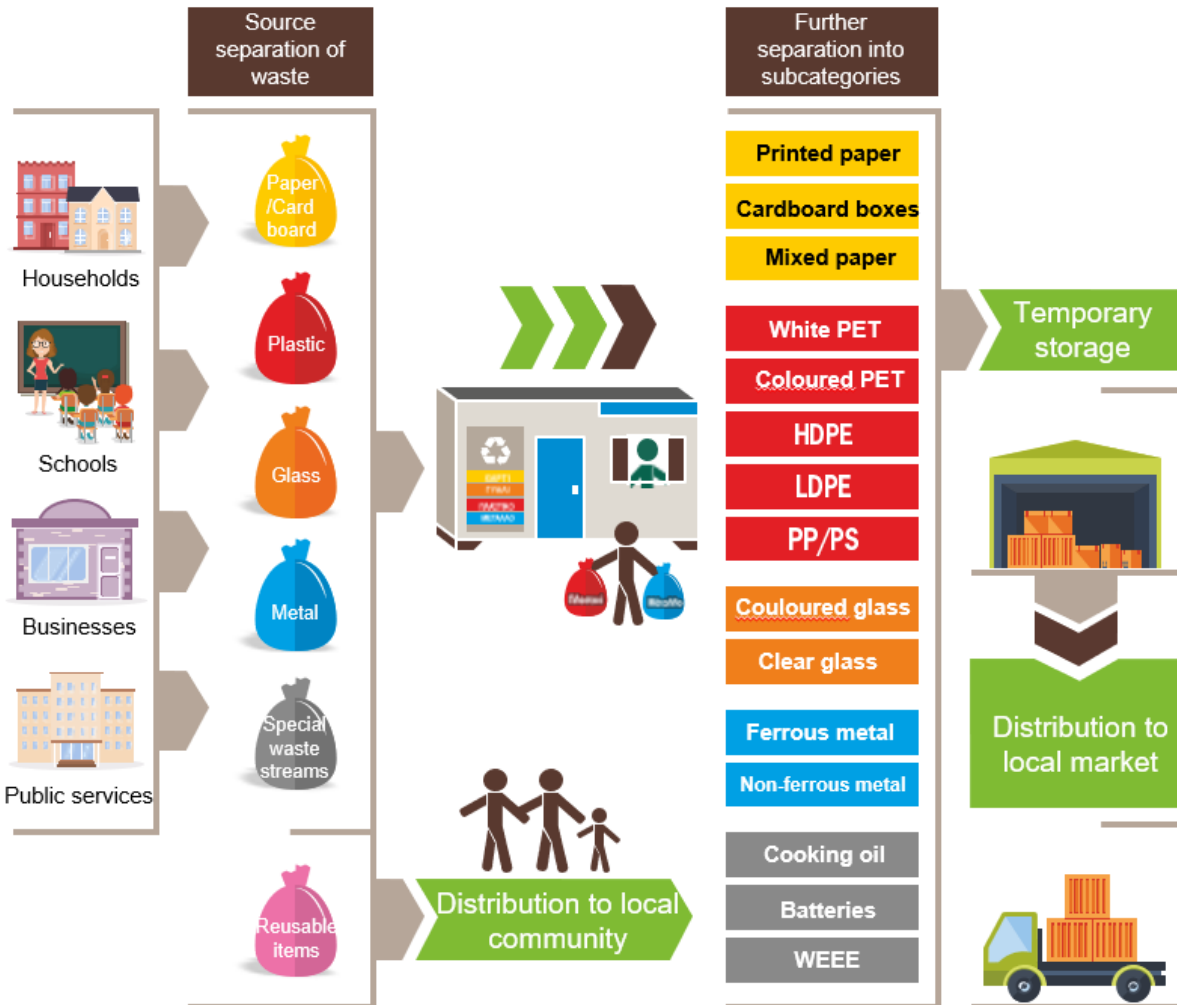


The Green Kiosk operates as a complementary system for an integrated solid waste management plan on a local level, supported by the active involvement of citizens, local authorities and relevant stakeholders. Its aim is to raise awareness and educate citizens of all ages on the importance of recycling by sorting at source, to familiarize them with this practice so that through continuous and fervent participation, it ultimately contributes to increasing recycling levels, more efficient use of resources and overall sustainable development of the municipalities that implement it.

The prototype recycling system the “Green Kiosk”:

- Receives **5 streams of pre-sorted materials** (paper, plastic, glass, metal, special waste)
- **Records** and **rewards** active participation
- **Informs** and **educates** residents, if required

- Separates the sorted materials in up to **12 subcategories**
- **Compresses** (reducing initial volume by 70-90%), **bales** and temporarily **stores** the recyclable material
- Ensures the immediate **recovery** of the treated materials as products of **high quality and value**, ready to re-enter the market, while being economically sustainable, without any complicated licensing procedures accompanying its implementation and operation



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The Green Kiosk is a flexible, standalone unit with prefabricated spaces for collecting, processing and storing recyclable materials. One of its advantages is its convenient transportation, as a prefabricated structure, and its placement wherever deemed fit. Both its appearance and size are designed to maintain a discreet and harmonious relationship with the surrounding

¹ PET: Polyethylene terephthalate, PP: Polypropylene, PS: Polystyrene, HDPE: High density polyethylene, LDPE: Low density polyethylene, WEEE: Waste from Electrical and Electronic Equipment

environment. Another advantage, contributing to the reduction of its environmental impact, is the fact that it was created by reusing and modifying an existing container to meet the requirements of the prototype unit developed under the LIFE PAVetheWAYSTE project.



INTERIOR DESIGN

Its **interior** is divided into two separate spaces:

1. **The reception and treatment area** (~8,7 m²), which is where the operator receives, separates, compresses and bales the materials
2. **The storage area** (~4,1 m²), where the operator stores the baled materials or materials that are not treated (i.e., special waste streams) until they are transferred to the final recipient (e.g., recycling industries, market).

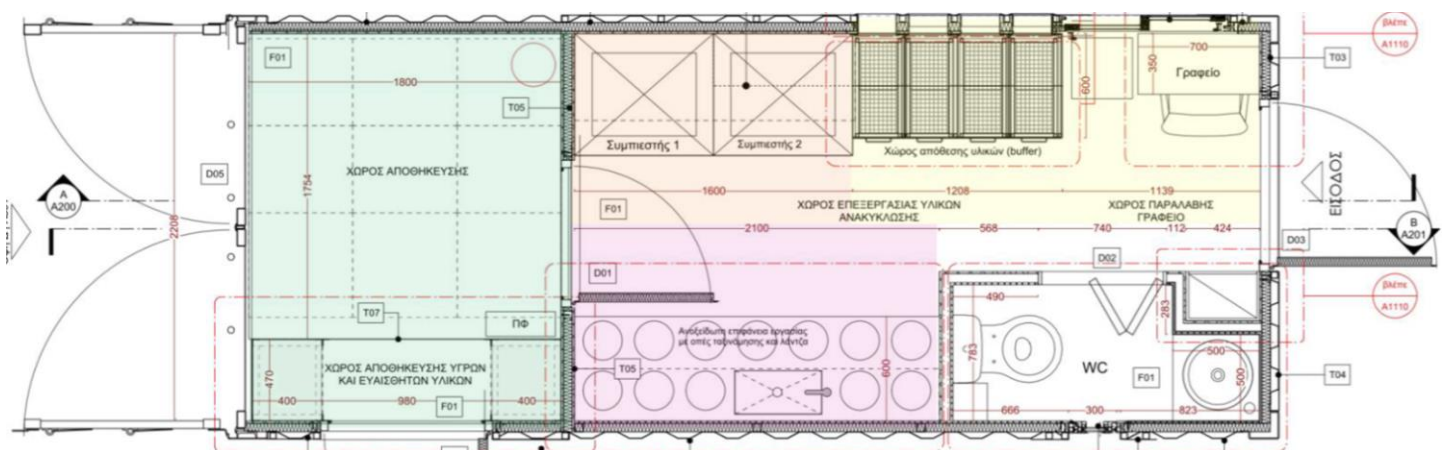
In the layout plan below, the Green Kiosk's spaces are depicted according to the different function performed in each space, in colour code as follows:

Yellow: Reception area for presorted materials

Purple: Separation area of materials into sub-categories

Orange: Material processing area (compressing and baling)

Green: Storage area for baled materials



Actual photographs of the interior of the Green Kiosk are presented below:



Separation areas into sub categories



Reception area with recording equipment



Compression and baling of materials



Storage area

STEPS FOLLOWED FOR PARTICIPATION AND OPERATION

STEP 1 Source separation

Recyclable materials are carefully selected and separated at home/business, according to their type (paper/cardboard, plastic, glass, metal) and placed into separate colour coded reusable bags, that are given out by the local authority.

STEP 2 Delivering the separated recyclable materials to the Green Kiosk

After the recyclable materials are separated and placed into each bag according to the colour corresponding to each material type (yellow-paper, red-plastic, orange-glass, blue-metal), they are then transferred and dropped off at the closest Green Kiosk by the residents.

STEP 3 Using the personalized card for collecting points

At the Green Kiosk, the residents together with their bags, hand over their personalized card, which is given to each household/business for collecting points after each visit, according to the weight and quality of the materials received by the Green Kiosk's operator.

STEP 4 Points credit

The operator checks the materials, weighs them and calculates the points to be credited on each participant's card. The weight and quality are uploaded onto a specially developed electronic platform by using a tablet, and the points are printed out in the form of a receipt which is handed over to the residents. According to each municipality and local community's needs and preferences, these reward points may be redeemed for whatever purpose is deemed fit (e.g., venue ticket discounts, gift vouchers, events).

STEP 5**Further separation of the recyclable materials**

The operator transfers the pre-sorted materials to a first separation buffer area with four slots for each main category of materials (paper, plastic, glass, metal) and returns the reusable bags to the participants. At this point the operator may provide tips or answer questions, if needed. The operator then further separates the materials into sub-categories by placing them in the second separation station containing up to 12 slots.

STEP 6**Treatment and market distribution**

The operator compresses the materials that can be compressed, bales and stores the materials within the unit, until they are collected and transferred to the market as secondary products of high quality and value, thus closing the loop of the recyclable materials.

3. COMMUNICATION AND TRAINING ACTIVITIES

The communication strategy followed during the project was aimed at informing citizens and stakeholders about the importance of recycling and the purpose of the project, as well as training system operators and competent authorities on using the prototype recycling systems. The project's communication and educational plan included events, school visits, launching of the systems' demonstration, participation in conferences, publications, meetings with interested municipalities, regional authorities and individuals in order to investigate the reproduction of the project in other regions.

- ✓ Communication actions for getting to know the project and the Green Kiosks
- ✓ School visits
- ✓ Press and scientific publications
- ✓ Training of staff and competent bodies
- ✓ Application and demonstration of the systems' demonstration
- ✓ Participation in conferences
- ✓ Meetings with stakeholders to promote the project



Demonstrating resource efficient through innovative, integrated waste recycling schemes for remote areas (163)

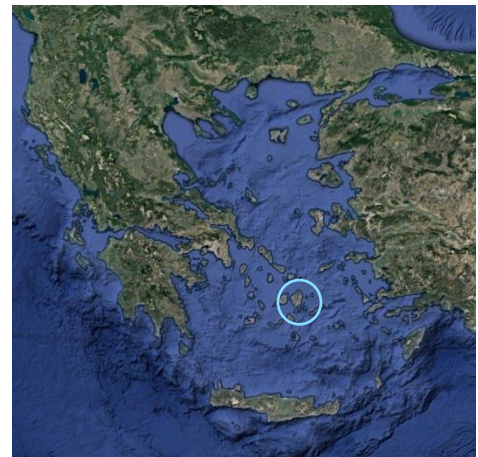
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4. PROJECT LOCATIONS

At the present time, there are **9 Green Kiosks** in total situated and operating in the municipalities of Ancient Olympia and Naxos and Small Cyclades. More specifically, at the municipality of **Naxos and Small Cyclades**, there are four prototype recycling systems operating since 2018 in Iraklia, Schinousa, Koufonisi and Donousa islands.



Iraklia island



Donousa island



Schinousa island



Koufonisi island

At the municipality of **Ancient Olympia**, there are five Green Kiosks located in three local communities. More specifically, there are three prototype recycling systems in the local community of Ancient Olympia, one in the local community of Platanos and one in the local community of Pelopion.



Local community of Ancient Olympia – Old town hall



Local community of Ancient Olympia – High school



Local community of Ancient Olympia – Fire department



Local community of Platanos



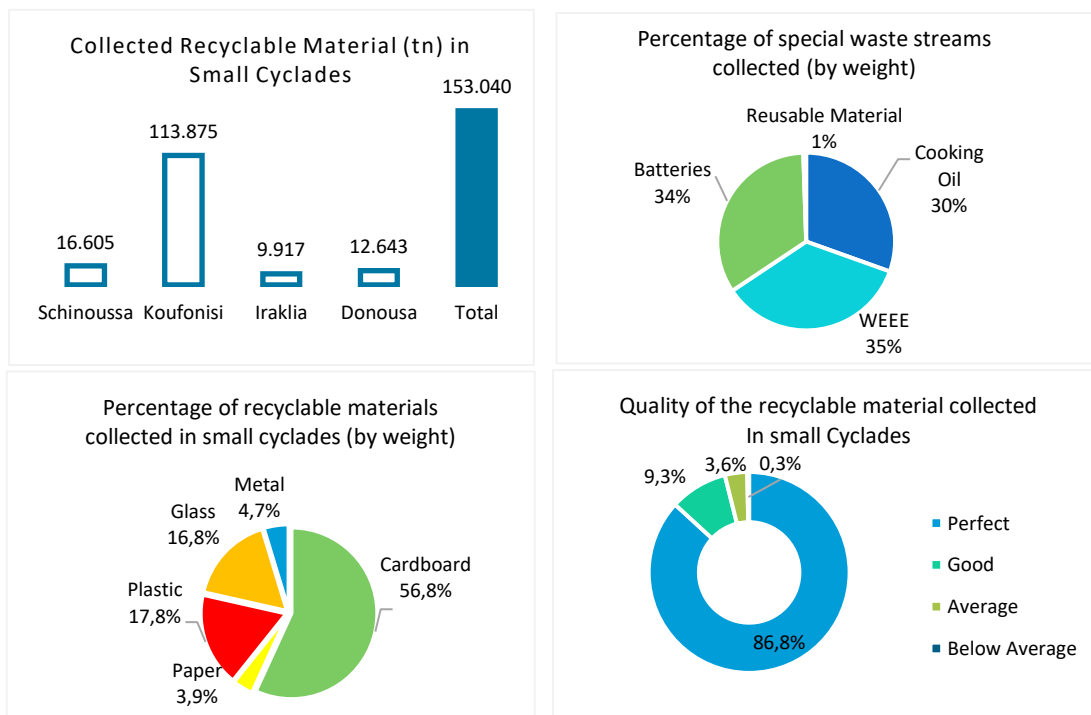
Local community of Pelopion

5. PROJECT RESULTS

From the beginning of their operation in August 2018 until September 2021, the 4 prototype systems in **Small Cyclades** (one in each island namely Koufonisi, Donousa, Schinoussa and Iraklia), collected and treated more than **153 tons of recyclable material**, while achieving a **recovery rate** that reached **97%** and a **purity level** that exceeded **95%**. These results bear salient significance as no other recycling process takes place at these islands.

Project results for Naxos and Small Cyclades (08/2018-09/2021):

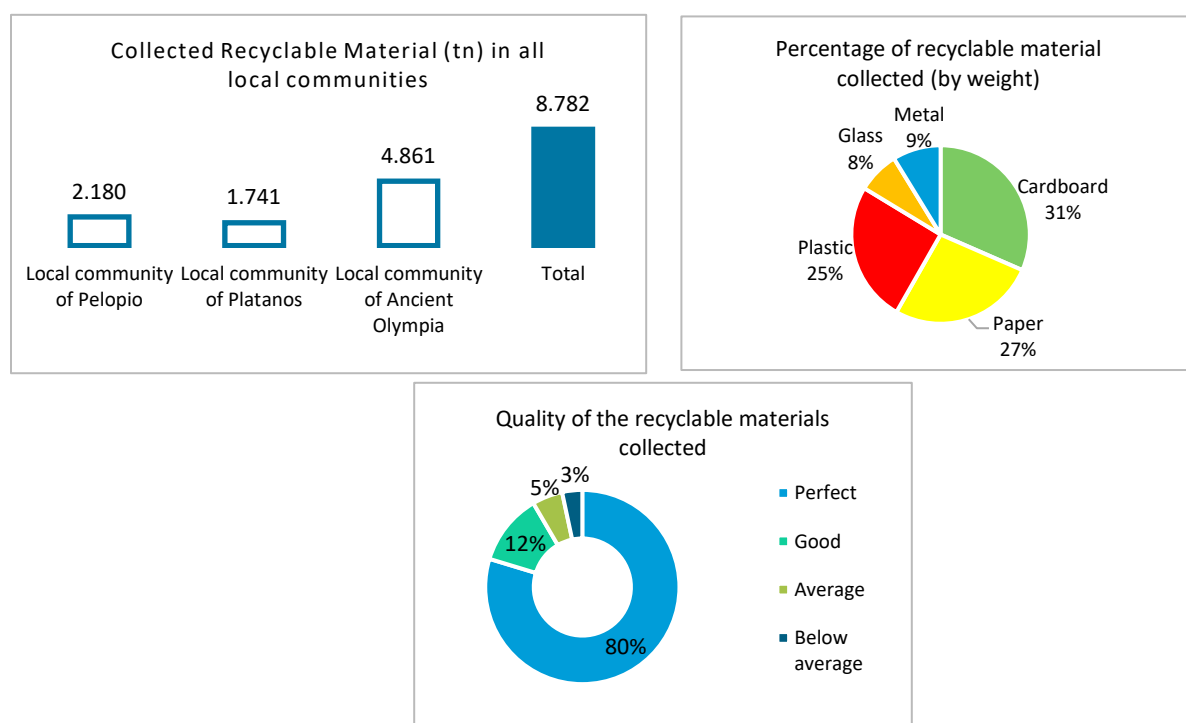
- ✓ More than **153 tons of recyclable materials** were collected
- ✓ A **purity level** higher than **95%** was achieved
- ✓ More than **570kg of special waste streams** were collected
- ✓ More than **97% of all collected materials were recovered** (i.e., the proportion of recyclable materials that are used to produce new products)
- ✓ More than **200 households and businesses** were informed about the operation of the Green Kiosks
- ✓ Up to **90% compression** was achieved
- ✓ More than **3350 cubic meters** of materials (waste) were **diverted from landfill**
- ✓ More than **70 tons of carbon dioxide (CO₂) emissions** were avoided annually



From the beginning of their operation in December 2019 until September 2021, the 5 prototype systems in the municipality of Ancient Olympia collected and treated more than **8 tons of recyclable material**, while achieving a **recovery rate** that reached **95%** and a **purity level** that exceeded **90%**.

Project results for the municipality of Ancient Olympia (12/2019-09/2021):

- ✓ More than **8 tons of recyclable materials** were collected
- ✓ A **purity level** higher than **90%** was achieved
- ✓ More than **95% of all collected materials were recovered** (i.e. the proportion of recyclable materials that are headed towards producing new products)
- ✓ Up to **90% compression** rate was achieved
- ✓ More than **13.5 tons of carbon dioxide (CO₂) emissions** were avoided



The Green Kiosk, not only does it divert a substantial fraction of recyclable material which would have otherwise been landfilled, but it also strives towards closing the loop by directly producing valuable secondary raw material ready to re-enter the market as new products. The prospect of replicating the project and the prototype recycling system has been addressed multiple times over the course of the project, with many municipalities and individuals expressing their interest in implementing the system in order to enhance their waste management schemes. The largest replication of the project will take place in Cyprus with over 20 systems being implemented in five districts.

CONTACT DETAILS



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