A circular economy approach for lifecycles of products and services

D6.2: On site demonstration of CEBM for tablets

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Summary

Deliverable 6.2 "On site demonstration of CEBM for tablets" is a deliverable of Work package 6 "Demonstrators", delivered from the Task 6.3. "Demonstration of CEBM with tablets" and focused on:

1) The demonstration of co-creation with tablets
2) The demonstration of collaborative recycling and reuse via the use of intelligent bins
3) The demonstration of sustainable consumption via the eco-account app developed in Task 3.2

For achieving the first objective, a survey on attitudes to reuse and recycling practices has been carried out in order to determine consumer's preferences and needs. As a result, a more sustainable incentive has been demanded by the consumer. In order to accomplish this request, a new environmental incentive has been proposed for the demonstration in Getxo, the donation of eco-credits for tree planting. Once the new incentive has been approved, a modification and update of the ICT platform, CIRC4Life App and eco-shopping module have been made to allow end-users to select and execute this new option.

For performing the demonstration of collaborative recycling and reuse, firstly several meetings with City Council of Getxo have been held in order to arrange their participation and collaboration. After that and taking into account the stakeholders identified in task 2.5, contacts and discussions with potential agents offering incentives to end-users have taken place. Thus, a discount of 5% in new purchases has been offered by the local shop "Expert Mancia" while the tree planting will be paid for Recyclia and Indumetal and performed by a local nursery, Viveros Fadura. In addition to this, the advertising of the demonstration activities to the citizens has been identified as a critical point; therefore, a local company, highly experienced in collaborating with the City Council of Getxo, has been hired to carry out the communication and awareness campaign. Once solved these actions and received the two intelligent bins at Indumetal's facilities, co-creation actions with the bins have been carried out, assessing the CIRC4Life App developed in Task 3.2, the end-user interactions and the information materials to be placed in the bins. As a result of this co-creation, the final labelling of the bins, a new version of CIRC4Life App and part of the communication materials have been defined.

As soon as the intelligent bins and CIRC4Life App have been ready to be launched to the citizens, the communication and awareness campaign have been developed in order to give details and explanations to the citizens about the demonstration activities and to stimulate their participation. Google and Facebook advertisings, leafleting, roll ups or articles in local newspaper are some of the actions performed within this campaign. After agreeing the public locations for placing the bins with the City Council, the demonstration has started in February 2021, with the first bin located in Romo Cultural Centre. Fadura Sport Centre and Villamonte Cultural Centre have been the second and the third location respectively, being in each place around two and a half month. The disposed wastes have been gathered periodically by Indumetal and analysed using CIRC4Life Traceability Module, with the aim of verifying that the disposed waste is an electronic equipment, checking the status of the waste and finally defining the End of Life (EoL) state, which will definitely allocate the related eco-credits to the end-user.

In addition to the demonstration with the citizens of Getxo, the demonstration of collaborative recycling and reuse has also included the selection of three primary schools for the training of recycling/reusing Waste Electrical and Electronic Equipment (WEEE). For that, the intelligent bin has been installed temporarily in the three schools and an awareness session focused on the circular economy and the sustainable consumption has been conducted.

Finally, for demonstrating the sustainable consumption with tablets, CIRC4Life App has been developed in order to enable end-users to check the obtained eco-credits related to their recycling activities and to track their daily impacts/footprints, encouraging thus to use environmental products and hence improving their awareness of sustainability.

Table of Contents

Table of Figures

List of Tables

Acronyms and abbreviations

Abbreviation	Description
CEBM	Circular Economy Business Model
EEE	Electrical and Electronic Equipment
EoL	End of Life
HOV	High Occupancy Vehicle
ICT	Information and Communication Technology
KPIs	Key Performance Indicators
LL	Living Lab
LL	Living Lab
WEEE	Waste Electrical and Electronic Equipment
WP	Work Packages
e-waste	Electronic waste

1 Introduction

The electrical engineering industry is one of the most competitive European manufacturing industries, the fast-moving technological progress in information and communication technologies has led to a strong growth in their numerous sub-sectors. It is also important to take into account that this sector is strongly affected by European policies and regulations, which have resulted in the technological progress and investment in new more efficient technology.

However, the waste resulting from these products is very costly and have high environmental impact. In particular, Waste Electrical and Electronic Equipment (WEEE) can be characterised by its growing amount (WEEE is the fastest growing waste stream: around 10 million tons of WEEE is generated each year in the EU19, representing 20% of worldwide production), its low efficient collection channel (only 35% of WEEE generated in the EU is collected while more than 50% of the WEEE generated in Europe follows unofficial collection routes), its toxicity (WEEE is only 5% of European municipal waste but it represents around 70% of overall toxic waste), its resources of high value (WEEE contains rare earths that cannot be collected in the EU ground anymore), its currently low recycling rate (only 19% of the 10 million tons of WEEE generated in the EU is recycled) and its economic potential (according to the European Commission, the full implementation of the EU legislation on waste would save €72 billion a year, increasing by €42 billion the annual revenue of waste management and recycling sector, and create over 400,000 jobs by 2020).

The demonstration of the new Circular Economy Business Models (CEBMs) developed in Work Packages (WPs) 1-3, including Co-creation of Products and Services model, Collaborative Recycling/Reuse model and Sustainable Consumption model for tablets has intended to introduce a new concept which could be implemented in the market: the reused or re-manufactured electronic tablets. This report describes the testing and the validations of these CEBMs with the tablets.

For achieving the aim of the task, a planning of activities has been done before the reception of the intelligent bins. This planning (see Figure 1), elaborated together with LAUREA and detailed in Deliverable 7.2 “Report of implementing living labs and ACSI-events and recommendations in the future circular economy efforts”, has been focused on arranging the Living Lab (LL) activities (WP7) and connecting them at the same time to the demonstration (WP6) of the three business models in Getxo. The demonstration scenarios have been confirmed, and their implementation has been developed, including the key players, resources, and schedule of the demonstrations.

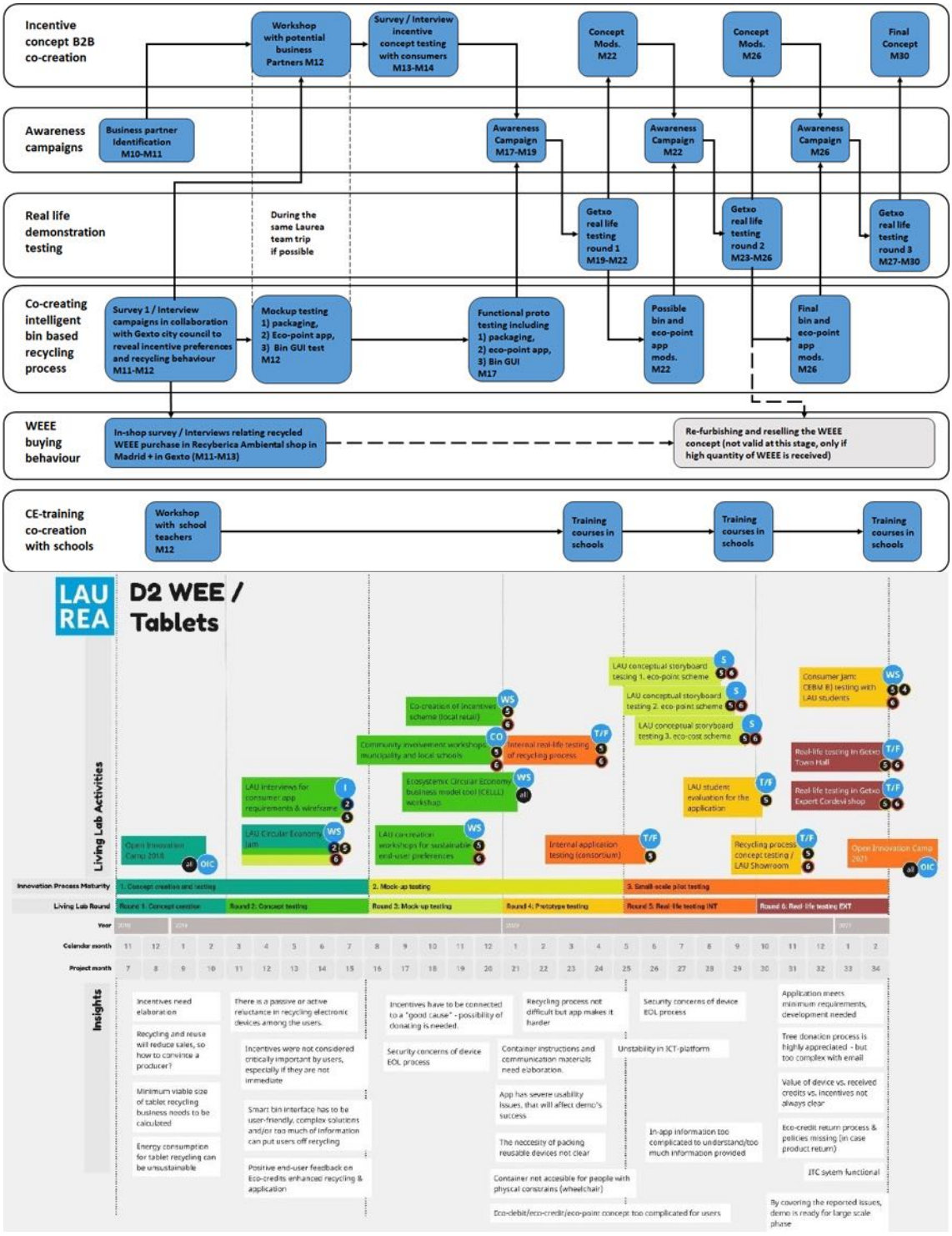


Figure 1. Planning of activities related to the demonstration with tablets detailed in Deliverable 7.2

Following this planning, the different activities described below have been carried out.

2 Demonstration of Co-creation for the development of a collaborative collection system and business models

Throughout this subtask, the involvement of end-users and consumers in the development and co-creation of concepts to be implemented in demo activities is pursued.

Co-creation of Products and Services is one of the three CEBMs being developed by the project to integrate stakeholder feedback in the development of a new product or service. It aims to bring end-users closer to the design and manufacturing phases by identifying consumer preferences and needs.

In the demonstration with tablets, no design and/or manufacturing phases are present, but preferences of consumers have been gathered and considered to develop concepts, incentives and communication campaigns carried out in demo activities.

2.1 Survey results

As mentioned before, consumers play a pivotal role in transitioning to a circular economy. However, according to EU sources and studies, consumer participation on the Circular Economy has received little attention until now. Thus, in order to move towards a Circular Economy, the consumption/demand side needs to be well understood and studied. That is why in CIRC4Life project, consumers are part of the co-creation process of the new business models and demonstrations. Several surveys have been conducted and results were included in Deliverable 3.4 “Report on Consumer Satisfaction Surveys”.

Between July and October 2019, three consumer surveys were conducted covering different topics, including one about “Reuse and Recycling attitudes” looking for the opinion of consumers in relation to Electrical and Electronic Equipment (EEE) topics covered by the demonstration with tablets in Getxo.

The aim of the survey conducted with questions concerning the demonstration in Getxo was to know the feeling of consumers about the concepts to be implemented as well as to integrate consumer feedback in the development of the actions and final implementation.

One of the aspects covered by surveys was the incentives. In these surveys, surprisingly, economic incentives were not the main driver to motivate consumers to bring their EEE back for collection and recycling. 88% stated that they would be motivated to recycle if they could positively contribute to the environment, such as planting a tree.

It has to be considered that survey respondents came from a higher socio-economic background and this may be a less important factor for them. However, this is a paradox as respondents answered in other questions that price was one of the most important elements when purchasing food products and second-hand EEE.

2.2 Tree planting donation as incentive

According to the feedback received from end-users in surveys, as shown in section 2.1, and to LL activities carried out in previous stages of the project and detailed Deliverable 7.2 “Report of implementing living labs and ACSI-events and recommendations in the future circular economy efforts”, it was noted that no other incentives different from economics were offered to citizens in the demonstration with tablets. In these surveys and activities, some users pointed out that they could be more encouraged by receiving

social/environmental incentives which could contribute to social/environmental actions in contrast to economic incentives and purchase new products.

As a result of this feedback, a new incentive was proposed for the demonstration in Getxo. Donation for tree planting was added as a new incentive for end-users who dispose the e-waste into the intelligent bins placed in public locations of the municipality. Once implemented, users can donate their eco-credits received for trees to be planted in a green area of the municipality. For every 20 eco-credits, 1 tree is planted. This new incentive is developed in cooperation with Getxo City Council and a local nursery of the municipality, and the cost is assumed by Recyclia and Indumetal. In addition, the communication materials have been adapted including this new incentive as it is detailed in Figure 2.

Figure 2. Communication material in which donation for tree planting appears

With the implementation of this new incentive for end-users, the lack of other incentives different from economics was solved. This is also one example of how co-creation and consumer preferences have been considered for Demo 2 activities.

2.3 Implementation of the incentive in the App and in the rewarding module

Once the integration of the new incentive was approved, a modification and update of the Information and Communication Technology (ICT) platform, CIRC4Life App and eco-shopping module was necessary to allow users to choose this new option to redeem the eco-credits obtained with the same procedure as the economic incentives previously included.

In this manner, ICT partners made the modifications and now users can see donation for tree planting when

accessing the section dedicated to incentives inside CIRC4Life App as shown in Figure 3 below:

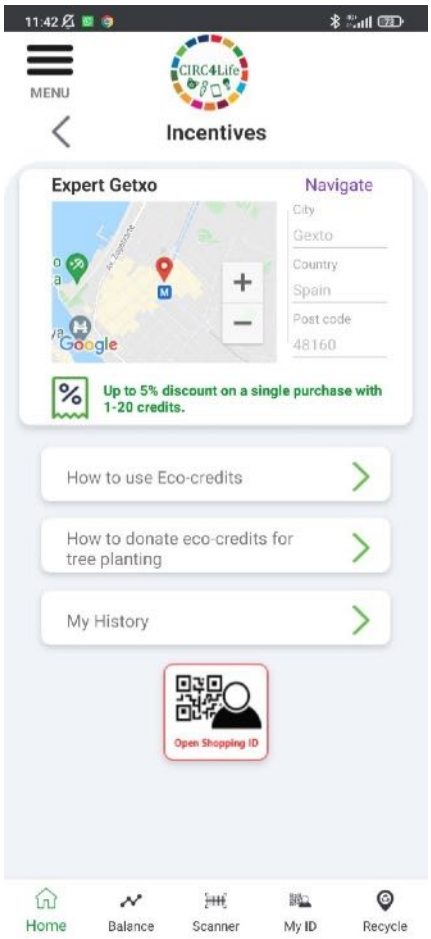


Figure 3. Screenshot of CIRC4Life App with donation for tree planting included into incentives section

A new procedure on how to donate eco-credits for this incentive was performed and included in CIRC4Life App and the update of the eco-shopping module was carried out as a result, to allow managers to redeem eco-credits of the end-users when choosing donation for tree planting as incentive.

3 Demonstration of Collaborative Recycling and Reuse with tablets

The aim of this subtask is to promote the recycling and reuse of EoL tablets among the end-users. Nevertheless, the definition and construction of the demonstration scenario is based on some key elements developed across the project in other WPs, which are detailed in Figure 4.

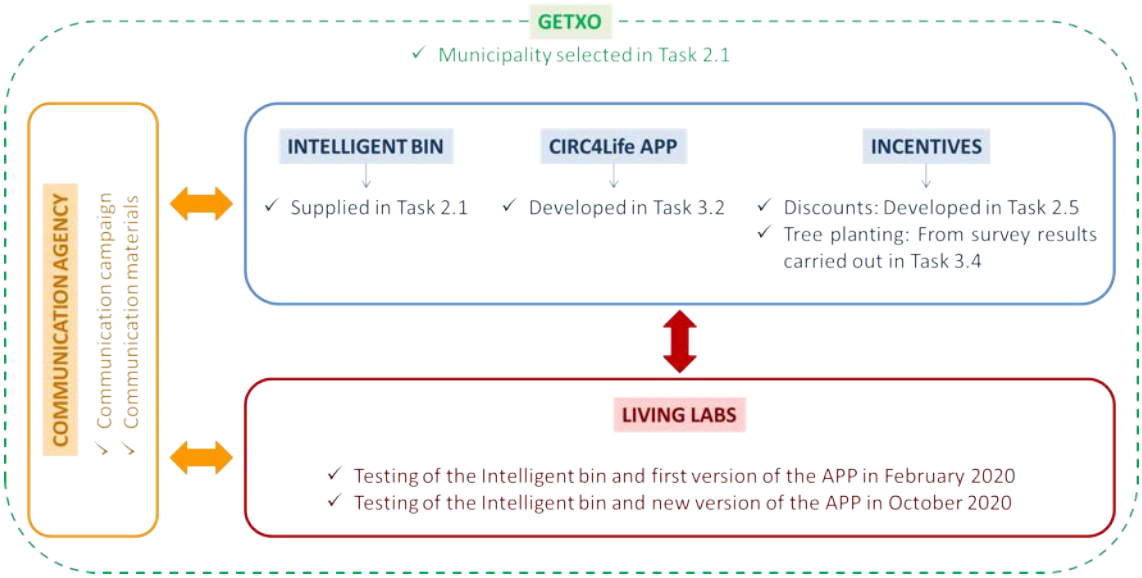


Figure 4. Key elements used for the construction of demonstration

Based on these key elements, the demonstration of collaborative recycling and reuse business model has been built, consisting of the steps detailed in Figure 5.

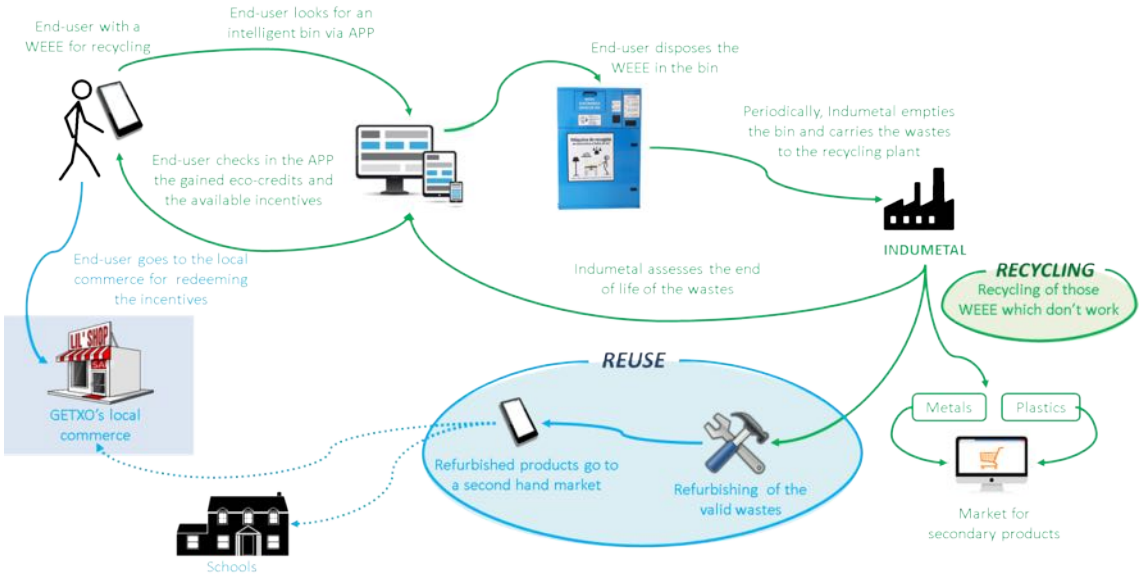


Figure 5. Main steps of the demonstration

3.1 Meetings with City Council

After the selection of Getxo in Task 2.6, as the most suitable area for the implementation of the demo, several meetings with the City Council (see Figure 6) have been arranged in order:

- To confirm their participation in the demonstration.
- To define a list of possible collection points where containers can be placed: subway entrances, public cultural centres, sports centres, distributors of a certain size.
- To contact with the person in charge of the potential collection points.
- To contact with the responsible of the Environmental Classroom of Getxo, which carries out the Environment Agenda for Getxo schools, in order to carry out the co-creation and the training in circular economy with the schools.
- To identify business partners such as: list of companies of interest in Getxo, including distributors and repairers, contact person of the trade association and contact person of GetxoEmpresa and Getxokirolak (the local sport agency of Getxo).
- To define the best location for the training and co-creation day with business partners and other agents.
- To collaborate in the dissemination of the awareness-raising campaigns.

Figure 6. First meeting with City Council of Getxo on 4th December 2018

Derived from these conversations, the actions detailed in Table 1 have been carried out:

Table 1. Actions derived from the collaboration with City Council of Getxo

Actions	Results
Meetings with the Environmental Classroom of Getxo	- Project presentation - Contact with local schools and organization of a co-creation day with them, already detailed in D2.6 - Participation in the workshop "Sustainability and Circular Economy", 18/03/2021
Locations for the bin	- Romo Cultural Centre - Fadura Sport Centre - Villamonte Cultural Centre
Collaboration in the communication campaign	- Authorization for labelling the local containers for batteries - Publication of articles in the local magazine of the City Council, called GetxoBerri - Publication of news in Social Media

3.2 Incentives

Incentives are instated for the purpose of encouraging citizens to engage in specific actions or activities. The most used incentive is money; however, incentives do not necessarily need to be fiscal or economical. For example, the high occupancy vehicle (HOV) lane exists on the highway to encourage carpooling, and therefore reduce greenhouse gas emissions. Social and environmental incentives are also aimed to those users who are more interested in contributing to social/environmental actions that in receiving money or discounts.

Following stakeholders identified in task 2.5 (deliverable 2.5), contacts and discussions with potential agents offering incentives to end-users took place. First, a preliminary discussion with Getxo City Council was conducted in order to know how the municipality could contribute to the potential incentives to be offered during the demonstration. City Council was open to collaborate in facilitating the promotion and dissemination of these incentives as well as offering public places to this end, such as public green spaces in which tree planting could be carried out. No other incentives were proposed in that point due to the local tax restrictions.

Meanwhile, other stakeholders were contacted with the aim of searching synergies and collaboration to provide incentives related to the disposal of e-waste (specially tablets) in the intelligent bins to be placed in Getxo by end-users. Some of the stakeholders contacted were:

- Expert Mancia: national retailer with a local shop in Getxo.
- Tien21: national retailer with a local shop in Getxo.
- Eroski: big national distributor with several shopping centres and shops around the country.
- Repsol: multinational with massive implementation and huge number of gas stations around the country.
- Getxolan: Economic Promotion and Employment Service.
- Getxoempresa association: local association of SME in Getxo.
- Viveros Fadura: local nursery for tree planting.
- Jardinería IZEIA: local nursery for tree planting.

As a result of these contacts, a discount of 5% in new purchases was offered by Expert Mancia (see Figure 7) to those users who dispose correctly the e-waste in the intelligent bins placed in public places. The incentives offered by the shop follow the formula developed in Deliverable 2.4 in which a conversion rate of 1 eco-credit - 1€ is applied.

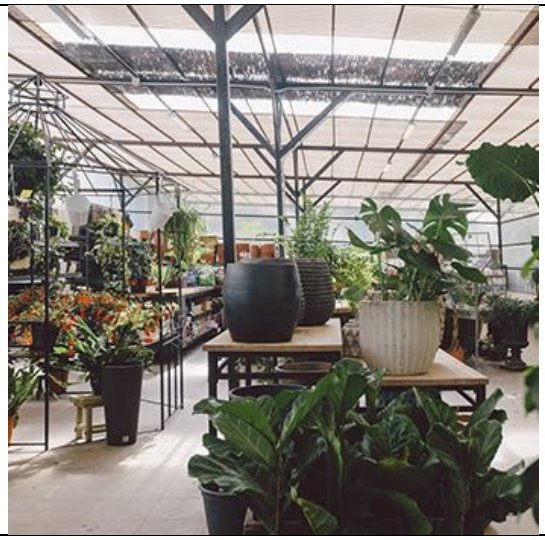
Figure 7. Installation of eco-shopping machine developed within CIRC4Life project in Expert Mancia shop

Other options were discarded due to some restrictions coming from the stakeholders, lack of time to develop the initiatives and be adapted to our system and the feasibility of the measures, among others. In an exploitation phase, some of these stakeholders could be reached again to retake the contacts.

Moreover, donation of eco-credits for tree planting was added as stated in section 2.2, intended to those users who do not want to purchase new products but to contribute to a better environment in their local area. In this case, users can donate 20 eco-credits in exchange to a tree planted in their behalf. The cost of the planting is assumed by Recyclia and Indumetal and after several contacts, a local nursery located in Getxo was selected. All the details about the company are summarized in Table 2.

Table 2. Details about the company selected for the tree planting in Getxo

VIVEROS FADURA
VIVEROS FADURA -1984- **VIVEROS FADURA** is a family company found in 1984. With an exhibition of 8000 m^2, they offer the following services: ✓ Garden and terrace design ✓ Artificial grass installation ✓ Automatic watering ✓ Plant rental ✓ Garden maintenance Web: https://viverosfadura.com/



With these two incentives (discount in new purchases and donation for tree planting) a wide offer of incentives was established with the aim to encourage end-users to dispose the e-waste in intelligent bins, promoting a collaborative recycling and reuse of tablets and other IT devices.

3.3 Communication agency

With the aim of communicating the details of the demonstration activities to the citizens and stimulating their participation, a local company, highly experienced in collaborating with the City Council of Getxo, has been contacted. After several meetings for discussing the scope and the actions to be performed within the communication and awareness campaign, the company has been hired. All the details about the company are summarized in Table 3.

Table 3. Details about the hired communication agency

COMMUNICATION AGENCY
ARANA COMUNICACIÓN is a communication and graphic design studio led by Iñaki Arana. Graphic designer, Bachelor of Communication Sciences, Master in Online Marketing and passionate about improvisation clown, he applies all his creativity and the experience of more than 25 years as a consultant in corporate communication, creative of online and off-line advertising campaigns and designer of all kinds of graphic and web media. Web: http://www.aranacomunicacion.com/

Once agreed the hiring of the company, a first offer has been defined in November 2019, which has been attached in the Appendices. However, considering the COVID-19 pandemic and the real dates for the demonstration, an updated offer (January 2021) has been prepared and attached also in the Appendices. The definitive list of activities to be implemented is detailed in Table 4.

Table 4. Definitive list of actions in the communication campaign

ACTION
Google Ads campaign Contracting Google Ads Ads design and campaign execution
Leaflet printing 30,000 units, DIN A4 folded as 4+4 in a 130 gr paper
Leafleting 30,000 units From 0 to 10,000 units: 20.00 €/thousand More than 10,000 units: 18.00 €/thousand
Roll up Design and printing of 3 roll ups
Labelling of the intelligent bins Design and printing
Facebook campaign Contracting Facebook Ads Ads design and campaign execution
Article for Getxo Berri newspaper Design and layout of 4pages
Materials for shops Printing and distribution
Public battery waste container Labelling of 19 containers
Design and management of the campaign

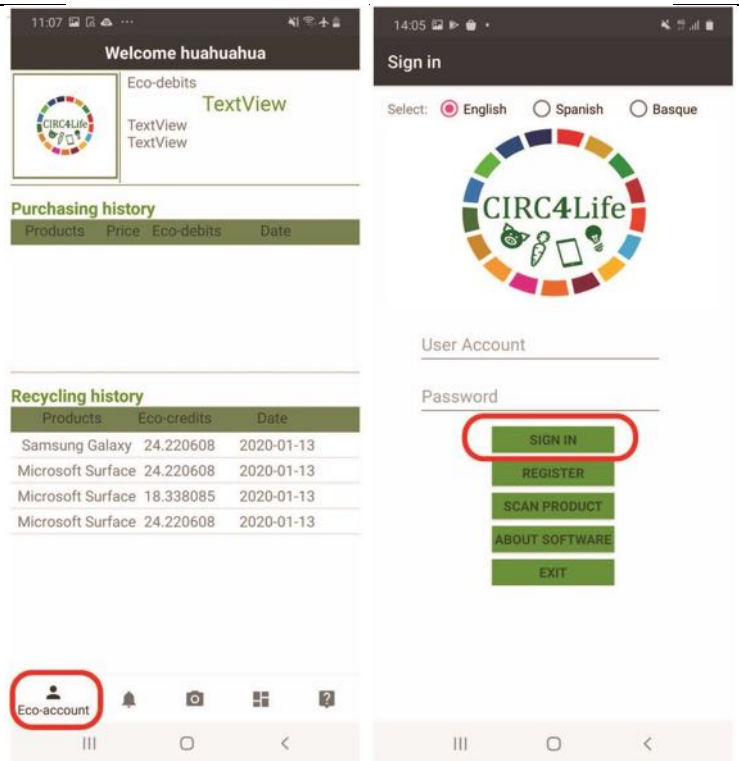
All the details about the implementation of theses action have been gathered in section 3.5.

3.4 Co-Creation of the intelligent bin and the information materials

3.4.1 First LL activity with Indumetal's personnel in February 2020

Once purchased the two intelligent bins and received at Indumetal's facilities, they have been tested in order to assess the CIRC4Life App developed in Task 3.2 and the user interactions with the intelligent bin. In addition, a first version of the information materials (detailed in Table 5) to be placed with the bins has been also assessed. For that, a LL activity has been arranged by LAUREA, with the participation of NTU and Indumetal's personnel. All the procedures followed during the LL activity, the participants and the results are detailed in Deliverable 7.2, however a short summary of the LL activity is included in this deliverable, in order to show the evolution of the materials thanks to this tool.

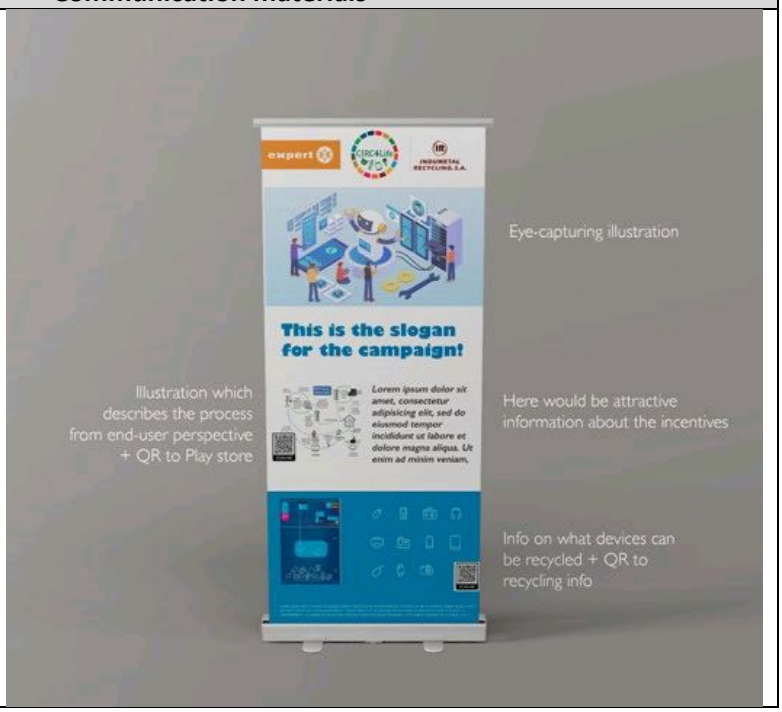
Table 5. Starting materials used during LL at Indumetal's facilities

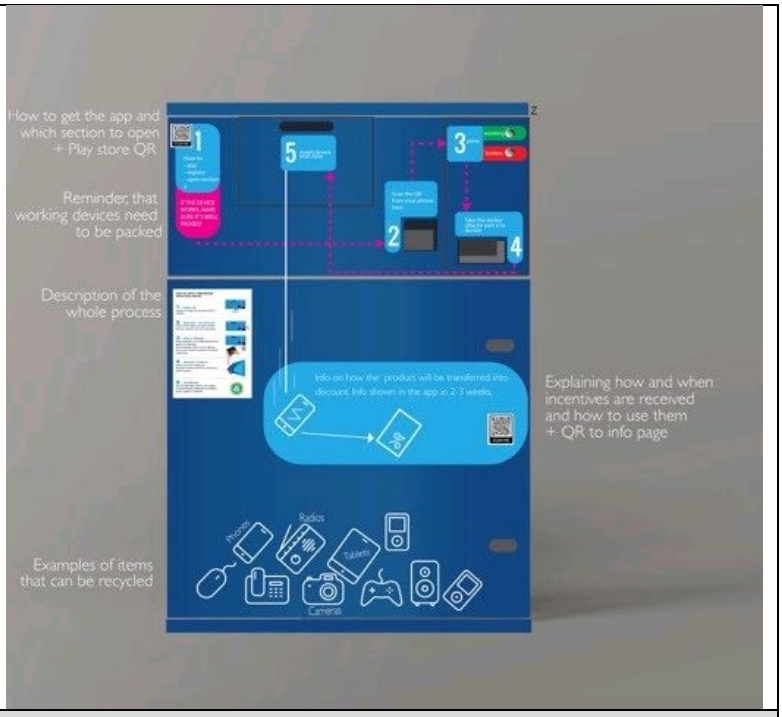
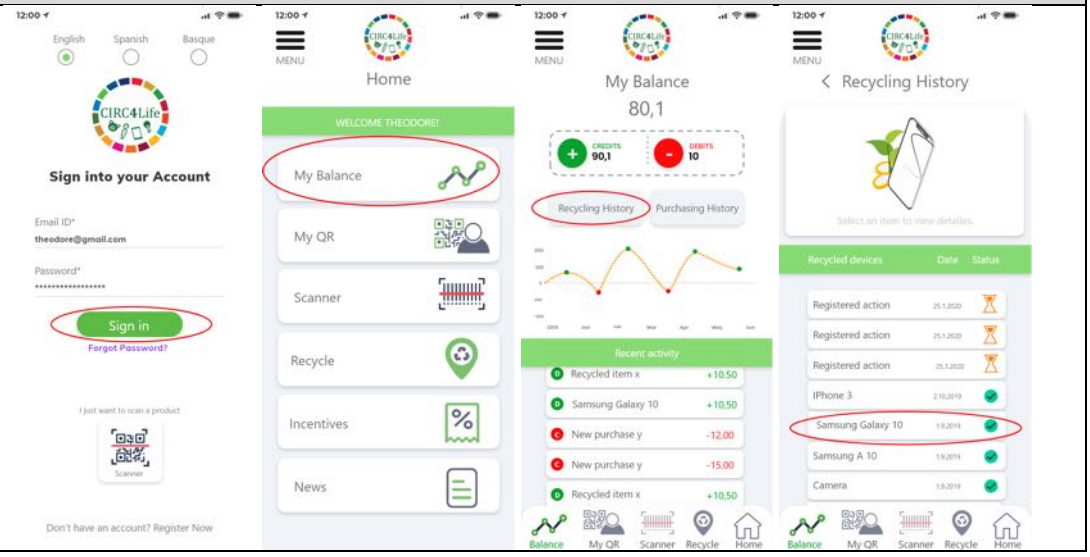
Starting materials	
1st version of roll up with project information and instructions for the bin	
1st version of CIRC4life APP	

Manual labelling of the intelligent bin for the LL	

The LL activity has concluded that several modifications should be done in the communication materials and that further App development is critical. According to this, the recommendations detailed in Table 6 have been suggested.

Table 6. Recommendations proposed after LL

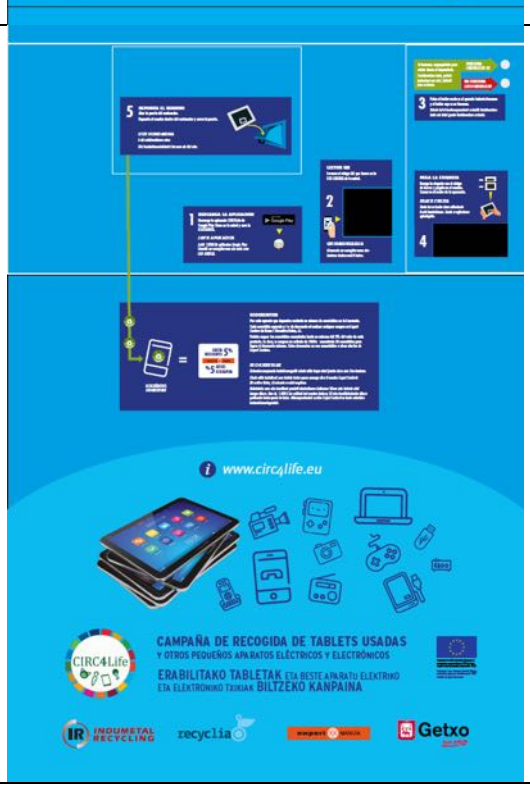
Communication materials	
Structure and contents for roll up	

Labelling proposal for the intelligent bin	
APP	

3.4.2 Labelling of one of the intelligent bins and roll ups

Based on the proposed labelling by LAUREA after the LL activity, the communication agency started with the final design of the bin and of the roll ups, proposing different sketches. The evolution of the labelling from the first draft to the final one is detailed in Table 7.

Table 7. Designs for the intelligent bin labelling

First version of the labelling	
Second version including texts in Basque	

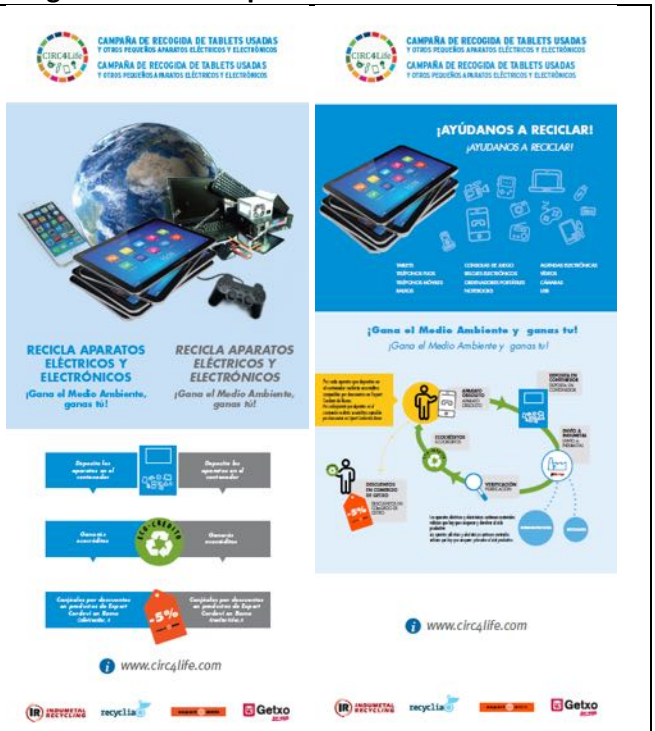
Third version including tree planting as incentive	

The third version has been selected, and one of the intelligent bins has been labelled in order to be tested with real users (see Figure 8).

Figure 8. Intelligent bin labelled in September 2020

Regarding the roll ups and following the proposals from the LL activity, the evolution of the design is detailed in Table 8.

Table 8. Designs for the roll ups

First version of the roll ups	
Second version including the tree planting as incentive	

The second version has been selected and printed in order to be tested with real users (see Figure 9).

Figure 9. Roll up printed in September 2020

3.4.3 Real Tests with end-users in October 2020

Following the LL methodology developed in WP7, the LL real life testing process has been carried out with a group of end-users (focus groups) with the purpose to assess user acceptability, usability and experience, and **to improve the solutions before large-scale release**. These Demo 2 Real Life testing was implemented during October-December 2020 in the municipality of Getxo (Spain) and included three stages:

1) Stage 1: Recycling process
2) Stage 2: Receiving eco-credits and making decisions about incentives
3) Stage 3: Using eco-credits for purchasing new products

All the information and details about this Demo 2 Real Life testing are gathered in Deliverable 7.2, however the main conclusions and their effect on the large-scale demonstration activities have been analysed in this deliverable. A summary of them is detailed in Table 9.

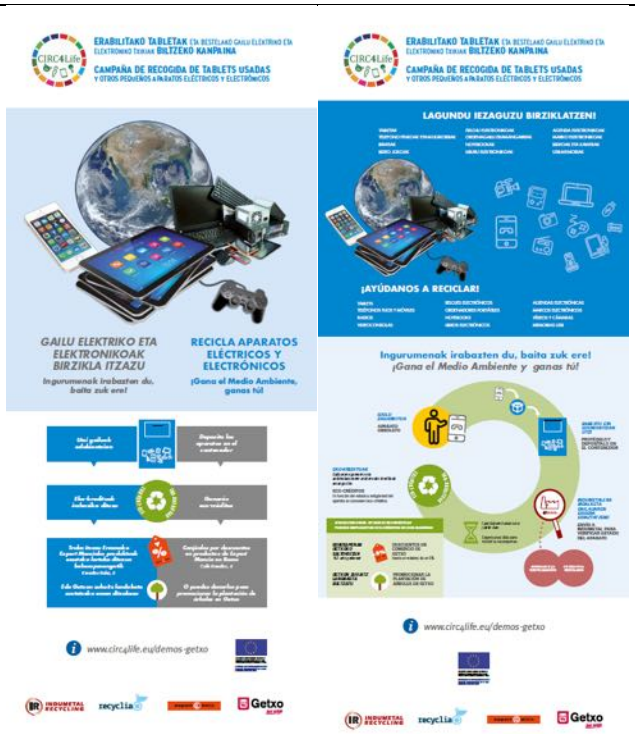
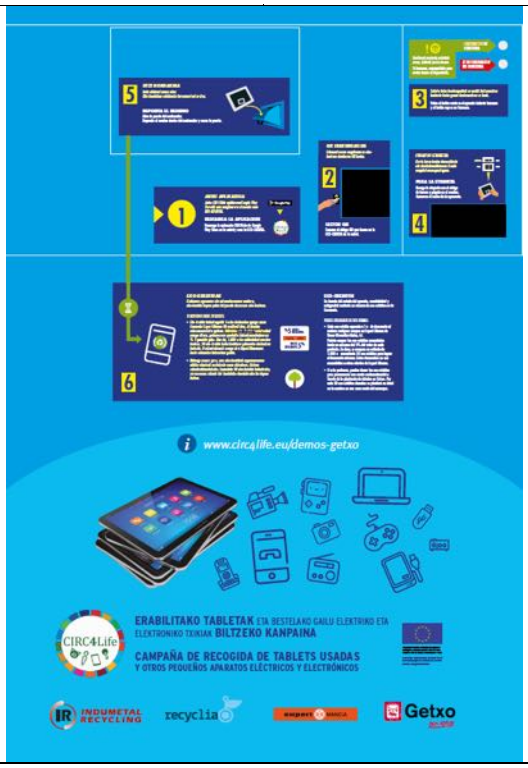
Table 9. Summary of the main conclusions from Real Test and the outcomes

Assessed section	Main conclusions of Real Test	Outcome
Communication to users prior and during the recycling process	✓ Materials with information content as simple as possible ✓ Information in a logical order ✓ Text size legible ✓ Need for packaging better explained	New versions of roll ups and bin labelling
Technical development in the app	✓ Operational inconsistencies and errors in the App	New version of the App
Incentives	✓ Need of simplifying the tree donation process	Development of eco-credit return

	✓ Lack of eco-credits return policy ✓ Lack of notification when the end-user receives the eco-credits	procedure

Taking into account the outcomes detailed in this summary, the related modifications have been arranged and new versions of roll ups, bin labelling and App have been released, as it is detailed in Table 10.

Table 10. Final versions of communication materials and CIRC4Life APP

Final versions of roll ups	
Final version of bin labelling	

CIRC4Life APP version 8.3.2	

3.4.4 Final labelling of the intelligent bin

Based on the conclusions and recommendations obtained in the Real Tests, the labelling of the second intelligent bin has been carried out, being the final result showed in Figure 10.

Figure 10. Intelligent bin labelled in January 2021

3.5 Communication and awareness campaign

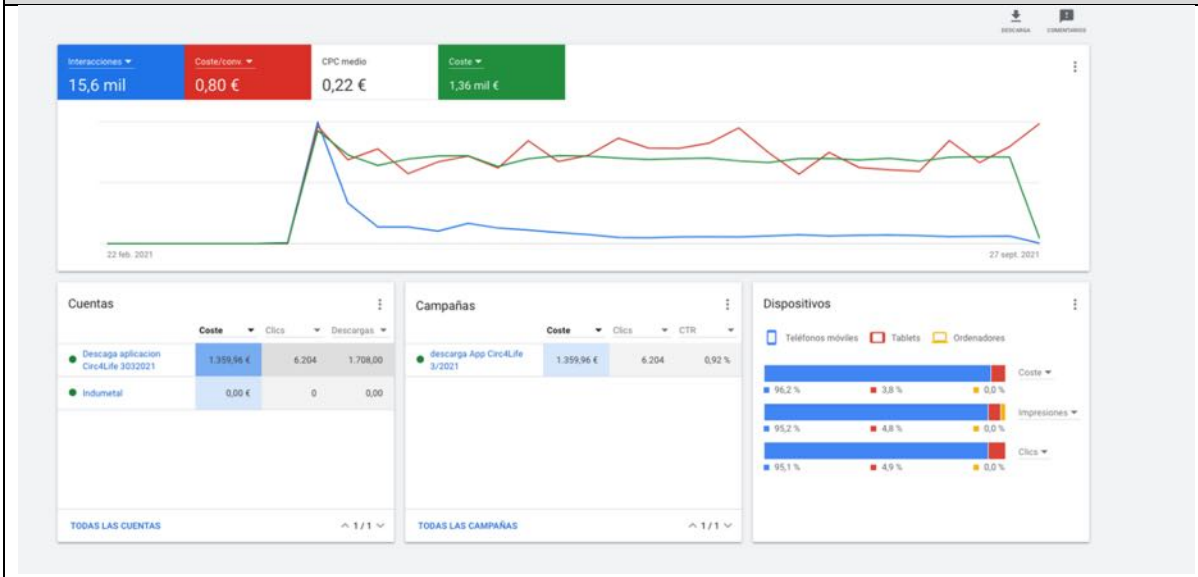
As mentioned before, a local communication agency has been hired in order to support the demonstration in Getxo. This communication campaign plays a key role within the demonstration, giving details and explanations to the citizens about the activities and stimulating their participation. Bearing in mind the definitive list of actions to be carried out, a review of their performance has been done in this section, gathering the content of the actions, the status, dates, photos, and end-user data if necessary.

3.5.1 Google and Facebook Ads

Both campaigns have been launched in March 2021 and are still active in September 2021. The latest evolution data of them is detailed in Table 11.

Table 11. Evolution data, updated 28/09/2021

GOOGLE ADS



- 1708 CIRC4Life App downloads have been registered

FACEBOOK ADS

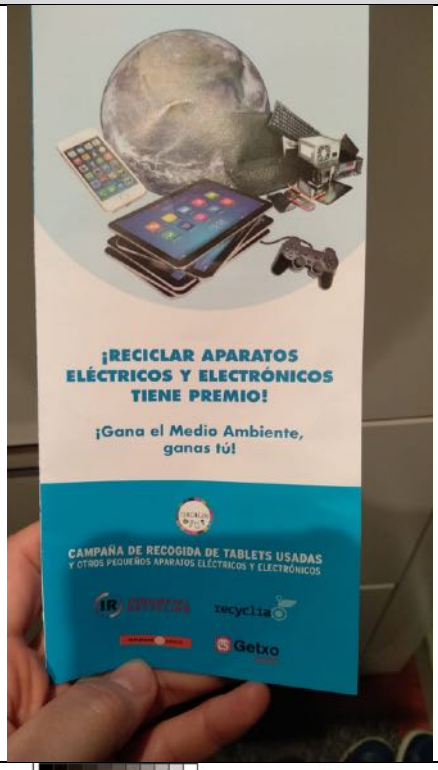
- 87.993 people have watched the advertising
- 3,122 people have clicked to the CIRC4Life webpage

3.5.2 Leafleting

The main objective of this action is to give details to the citizens about the recycling process with the intelligent bin, the incentives, the location of the bin and the kind of devices that can be disposed, being all the information in two languages, Spanish and Basque. To perform it, two different leafleting phases have

been released during the demonstration in Getxo. Table 12 shows the design of the leaflet as well as the launch dates and the delivered number of units.

Table 12. Details about the leafleting in Getxo

<table>
<tr><th>Leaflet</th><th>Launch date</th><th>Number of units</th></tr>
<tr><td rowspan="2"> 
</td><td>April 2021</td><td>30,000</td></tr>
<tr><td>July 2021</td><td>30,000</td></tr>
<tr><td colspan="3"> 
</td></tr>
</table>

3.5.3 Roll ups and labelling of intelligent bin

As it has been detailed previously, the intelligent bin was labelled, and the roll ups printed according to the results obtained from the LL. In the case of the intelligent bin, two different labelling were performed, while regarding the roll up, three printing were ordered. All details are summarized in Table 13.

Table 13. Phases for the intelligent bin labelling and roll up printing

Date	Photo
September 2020	
January 2021	

July 2021	

3.5.4 Articles for Getxo Berri newspaper

During the first meetings with the City Council of Getxo, all their dissemination media were put at project's disposal with the aim of reaching to the maximum audience. On this matter, City Council offered the so-called "Getxoberri", a weekly publication of general information with all kinds of news related to the Getxo municipality. This media has been used during the demonstration in Getxo, in order to give detailed information about the intelligent bin, where it is located, how it works or where the end-user can redeem the eco-credits. The published articles in this local media are showed in Table 14.

Table 14. Articles published in the local newspaper

Date	Photo
February 2021	

	 
June 2021	 

3.5.5 Public battery waste container

In addition to the local media offered by the city council, the public battery waste containers were also used for advertising the demonstration in Getxo. Table 15 shows one of these containers placed in the street.

Table 15. Information included in public battery waste container

Date	Photo
February 2021	

3.6 Installation of the intelligent bin

Getxo is a big municipality, located just 20 minutes from Bilbao and divided into five different neighbourhoods. Attending to the extension and characteristics of Getxo (see Figure 11), and of course considering the specifications required by the intelligent bin, several meetings with the City Council were arranged in order to select the best place for its location and trying to reach a large number of people.

Figure 11. Map of Getxo

The selected places for the installation of the intelligent bin are described below.

3.6.1 Romo Cultural Centre

Romo Cultural Centre is a public space of the City Council, located in the neighbourhood of Romo and showed in Figure 12. This centre provides information and cultural advice services; library service, various study rooms (individual and group), Euskaltegi (Basque school for adults) and Gazteleku (young people centre). It also includes the programming of cultural activities such as concerts by local groups, children's and small-format theatre, exhibitions, audio-visual projections, talks and conferences, various courses, and street shows.

Figure 12. Romo Cultural Centre

After several meetings with the responsible of the centre and the City Council, Romo Cultural Centre was selected as the first location for the bin and the place for launching the demonstration in Getxo. For that, an event was organised where, besides Indumetal and Recyclia, the City Council, the owner of Expert Mancia shop and local media also participated. All the details are gathered in Table 16.

Table 16. Installation of the intelligent bin in Romo Cultural Centre

Banner placed in the entrance of the building to indicate the location of the bin	
Intelligent bin and roll ups	

Press conference on 15th February 2021 with the City Council, Expert Mancia and INDUMETAL	 *From left to right: Joseba Arregui (environmental city councillor), Leire Mancia (owner of the shop) and Esteban Marijuan-Requeta (general manager of INDUMETAL)*

The intelligent bin has been placed in Romo Cultural Centre from **15th February 2021** to **31st May 2021.**

3.6.2 Fadura Sport Centre

After Romo Cultural Centre, and with the aim of rotating the bin by the different neighbourhoods of Getxo, it was decided to move it to Fadura Sport Centre (see Figure 13). In addition to this, a lot of people visit Fadura's facilities during the summer, increasing thus the possibility of participation.

Fadura Sport Centre was born in 1971 as a space oriented to the sport practice and the generation of well-being in the municipality of Getxo. Located in the neighbourhood of Algorta, the Fadura sports park has 360,000 square meters of sports facilities divided into four large spaces: (1) Track and field area, (2) Building with fronton, (3) Building with the swimming pools and (4) Football area.

Figure 13. Fadura Sport Centre

All the details about the installation of the bin are gathered in Table 17.

Table 17. Installation of the intelligent bin in Fadura Sport Centre

Move from Romo Cultural Centre	
Move to Fadura Sport Centre	
Intelligent bin and roll ups	

The intelligent bin has been placed in Fadura Sport Centre from **1st June 2021** to **30th September 2021.**

3.6.3 Villamonte Cultural Centre

Finally, once the activities with the schools (described in section 3.11) had finalised and the second intelligent bin was available, it was decided to look for another public space in Getxo for its location. With the aim of giving service to the citizens of Algorta, Villamonte Cultural Centre was selected as the third place.

Villamonte Cultural Centre is a public space of the City Council, located in the neighbourhood of Algorta and showed in Figure 14. This centre includes an exhibition room, library and five meeting rooms for workshops and courses, being all of them offered to local associations.

Figure 14. Villamonte Cultural Centre

All the details about the installation of the bin are gathered in Table 18.

Table 18. Installation of the intelligent bin in Villamonte Cultural Centre

Intelligent bin and roll ups	

The intelligent bin has been placed in Villamonte Cultural Centre from **1st July 2021** to **1st September 2021.**

3.6.4 Locations of the bins in the CIRC4life App

The place where the bins have been installed can be checked within the CIRC4Life App, specifically, in "Recycle" section and then, selecting the exact location. Figure 15 shows screenshots of these locations in the App.

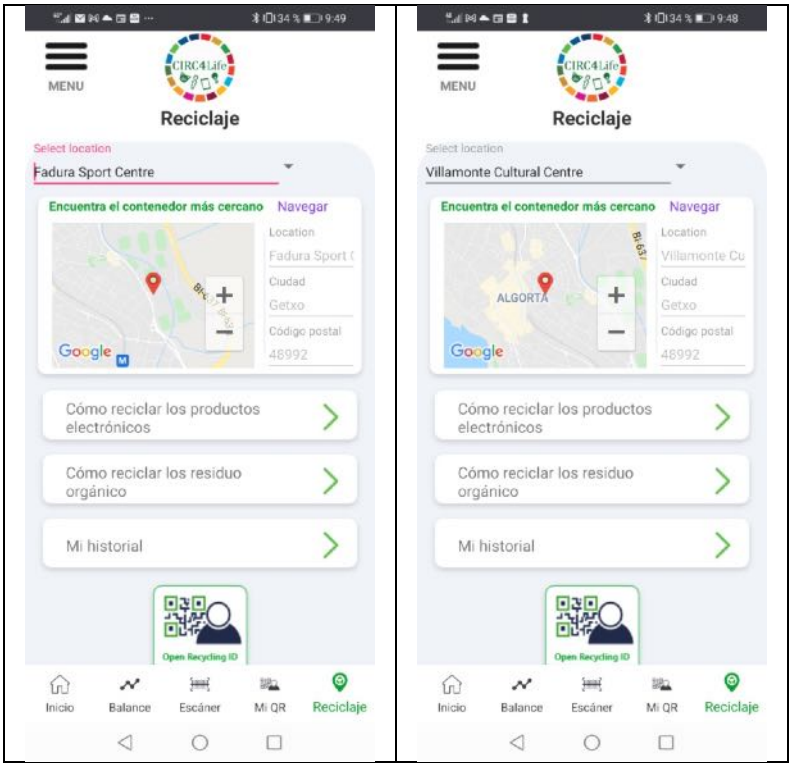


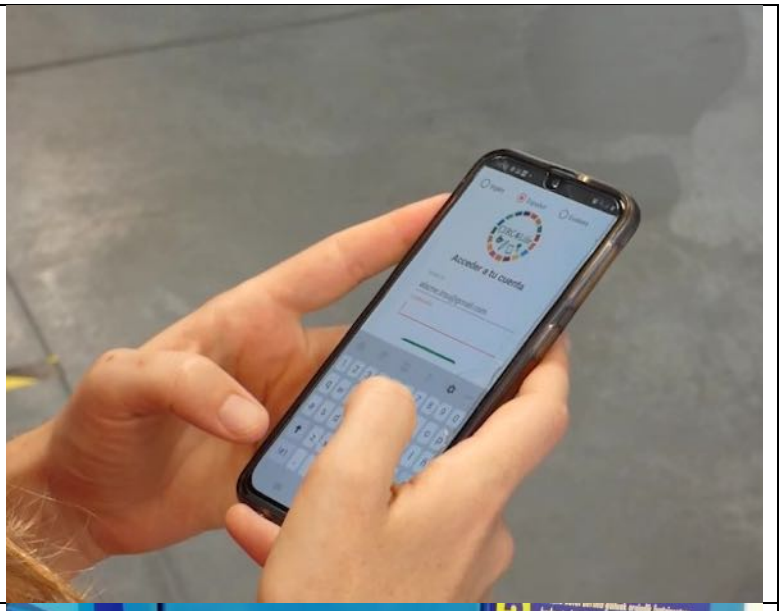
Figure 15. Locations of the bins in CIRC4Life APP

3.7 Disposal of e-waste in the intelligent bin

Once the intelligent bins have been placed in the different locations, the end-user has had the opportunity of using them for disposing his/her electronic wastes. For that, the end-user has followed the procedure detailed in Table 19.

Table 19. Actions carried out during the disposal of the wastes

#	Action	Photo
1	Review the communication materials	

2	Open CIRC4Life APP and log in with the username and password	
3	Scan the recycling QR code included in “My ID” section	

4	Select “Working” button (green) or “Not working” button (red)	
5	Pick up the sticker with the barcodes printed by the bin and keep the above sticker as a receipt	

6	Attach the bottom sticker in the waste	
7	Open the door and dispose the waste	

8	Close the door	

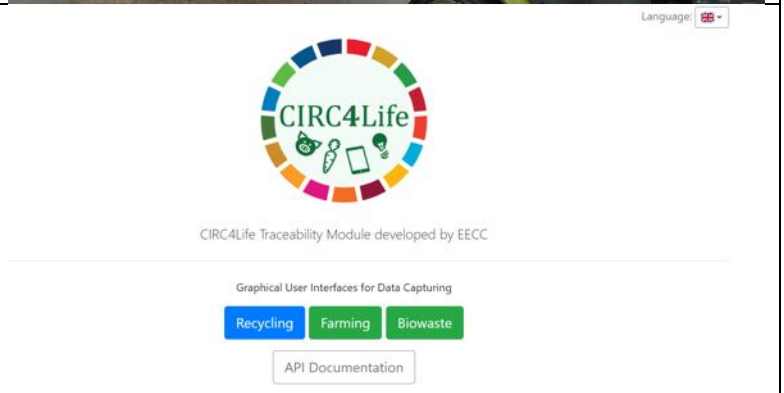
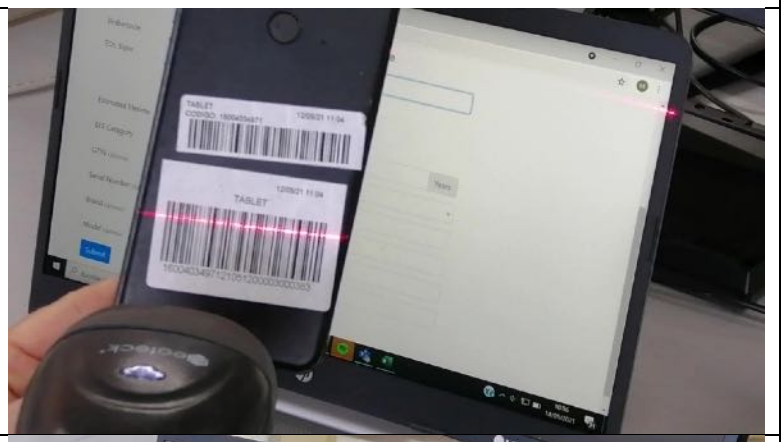
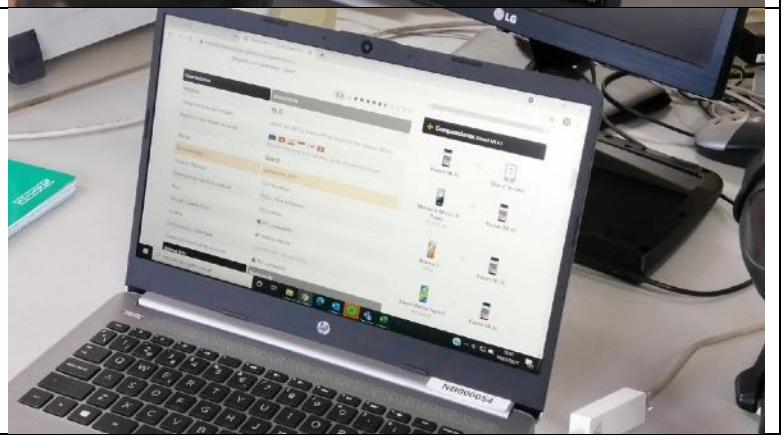
3.8 Analysis of the collected wastes at Indumetal's facilities

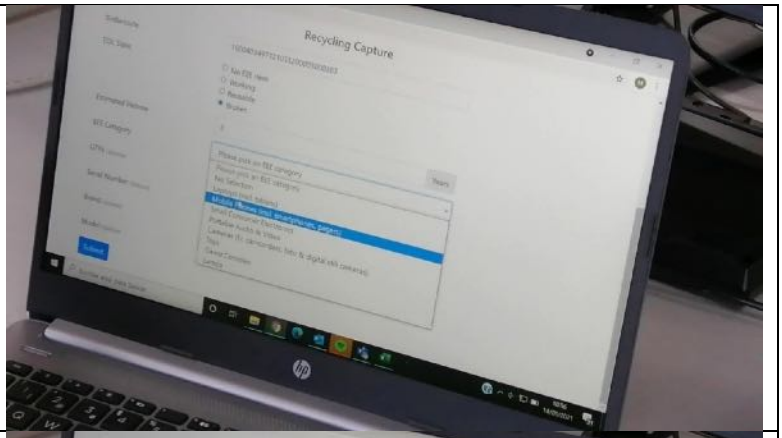
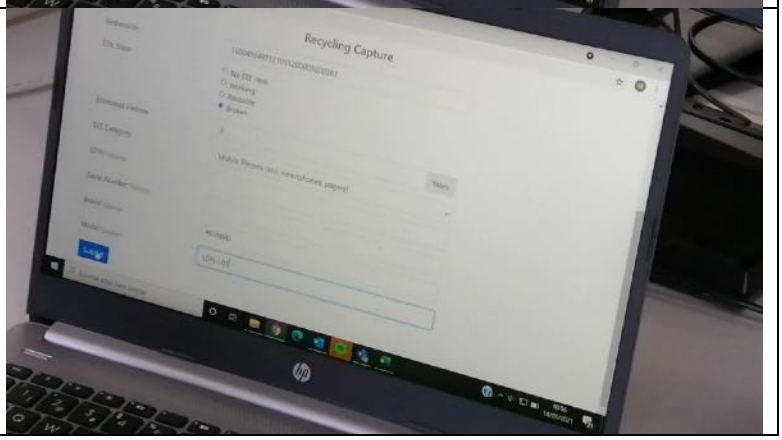
As described in Figure 5, another critical step in the demonstration is the gathering of the wastes disposed in the bin and their analysis at Indumetal's facilities. The aim of this step is firstly, to verify that the disposed waste is electronic equipment and secondly to check the status of the waste in order to conclude the EoL state and thus allocate the related eco-credits to the end-user.

For that, periodically Indumetal has emptied the intelligent bins and transported the waste to the recycling plant. There, the wastes have been analysed one by one following the procedure described in Table 20.

Table 20. Actions carried out during the analysis of the wastes

#	Action	Photo
1	Collection of the wastes	

2	Arrival to Indumetal	
3	Use of CIRC4Life Traceability Module	
4	Scanning of waste	
5	Searching information about the waste	

6	Fulfilling the waste information in the recyclability module	
7	Submitting the information	

During the analysis and regarding the status of WEEE, the following criteria have been considered:

- **Broken**: any device with irreparable damage or that cannot be turned on.
- **Working**: any device that can be turned on or still works, despite the appearance, the model, or the lifetime. After this, among the working devices, the most recent models and with a good appearance have been separated and sent to the preparation for reuse centre that RECYBERICA (company of Indumetal's Group) owns in Madrid. There, the devices have been assessed following a specific protocol in order to verify a possible remanufacturing. This protocol, named "ITR de validación tablet" has been described in Deliverable 2.1.

With the submitted information, the CIRC4Life system calculates the number of eco-credits that the end-user receives through the formula developed in Task 2.4 and described in Deliverable 2.4. Then, the obtained eco-credits appear in the CIRC4Life App within "My Balance" section. The amount of waste collected from the different locations and analysed at Indumetal's facilities is detailed in Table 21.

Table 21. Summary of collected waste analysis

Location	Collection date	Number of WEEE	Amount of WEEE (kg)	Status of WEEE
Romo Cultural Centre	13/04/2021	25	12	Broken: 22 Working: 2 No EEE item: 1
	31/05/2021	18	5	Broken: 17 Working: 1
Fadura Sport Centre	22/07/2021	34	6.5	Broken: 32 Working: 2
	27/09/2021	250	220	Broken: 233 Working: 15 No EEE item: 2
Villamonte Cultural Centre	8/09/2021	17	5.5	Broken: 15 Working: 1 No EEE item: 1

These data have been examined resulting the distribution of the collected wastes by EEE category in the different locations is described in Figure 16, Figure 17 and Figure 18.

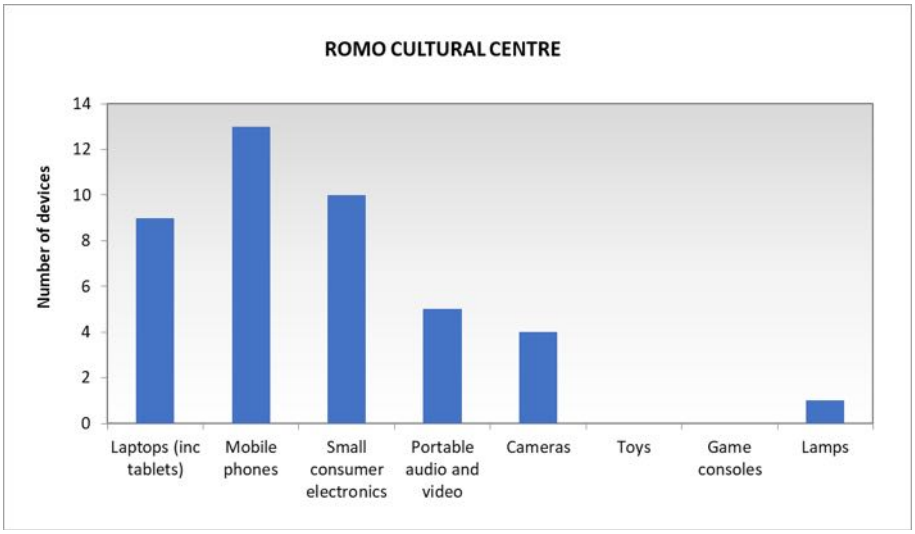


Figure 16. Distribution of number of collected wastes by EEE category in Romo Cultural Centre

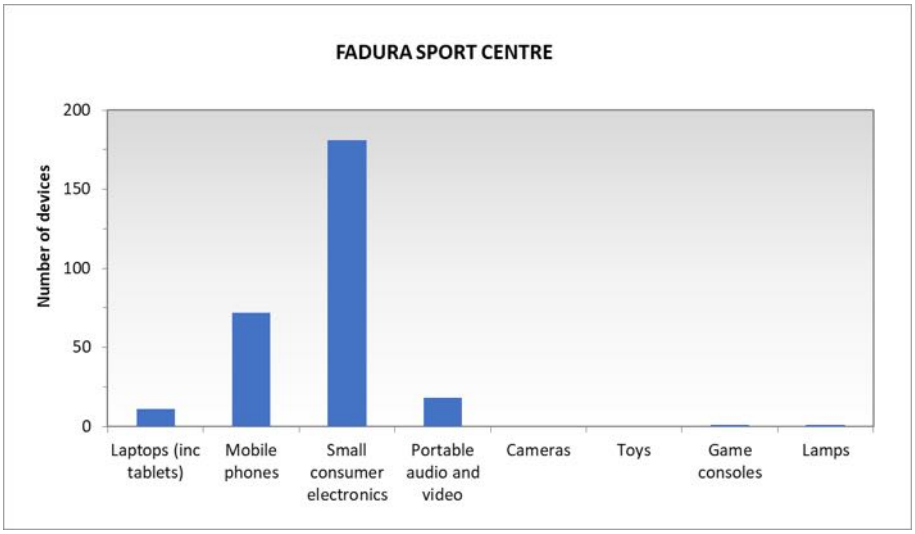


Figure 17. Distribution of number of collected wastes by EEE category in Fadura Sport Centre

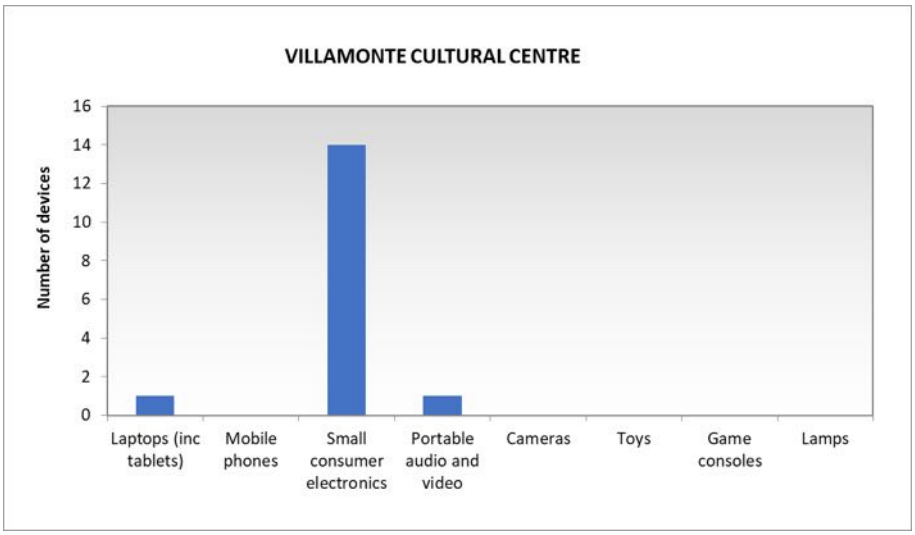


Figure 18. Distribution of number of collected wastes by EEE category in Villamonte Cultural Centre

Finally, in addition to the distribution of waste number, a comparison among the different locations has been done contrasting the percentages by weight for each EEE category. The result is highlighted in Figure 19.

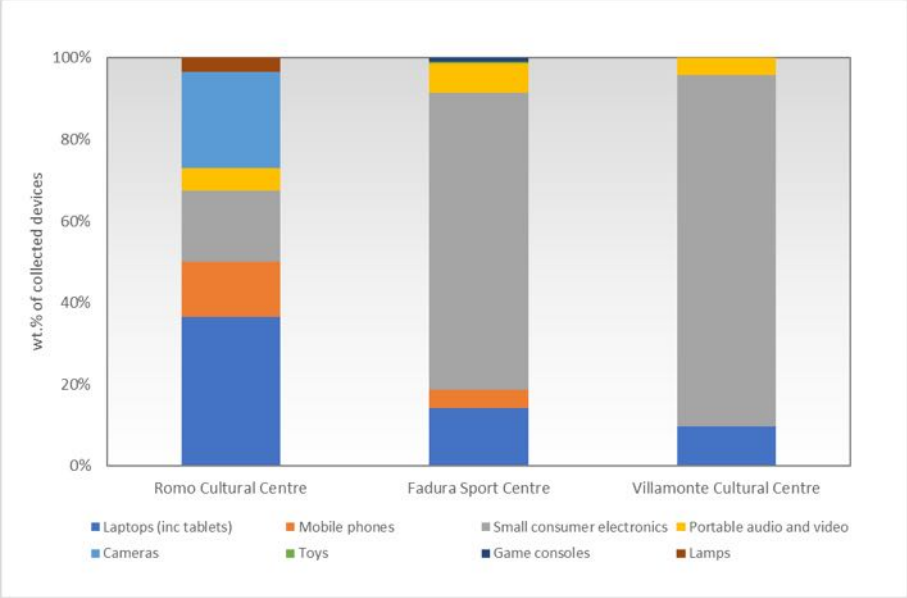


Figure 19. Percentages by weight for each EEE category and for each location

3.9 Recycling and Reuse of collected WEEE

3.9.1 Recycling process

All the WEEE assessed during the analysis as “Broken” have been sent to the standard recycling process that Indumetal carries out. This recycling process consist in a first depollution step where all the hazardous components are removed by means of a specific procedure. After that, the wastes are introduced in the industrial mechanical plant whereby successive process of grinding and size reduction and physical separation and concentration steps, the different materials are obtained. The main fractions recovered during the process are copper concentrates, aluminium concentrates, ferrous concentrates, printed circuit boards, and plastic fractions. Figure 20 illustrates the recycling process applied to the tablets and the WEEE in general and Table 22 summarizes the recovery ratio of the fractions obtained after the recycling process. Since Indumetal doesn’t treat tablets independently, these percentages are related to the treatment of a Mix WEEE batch where all the electronic waste collected in the intelligent bins has been mixed with other small domestic appliances.

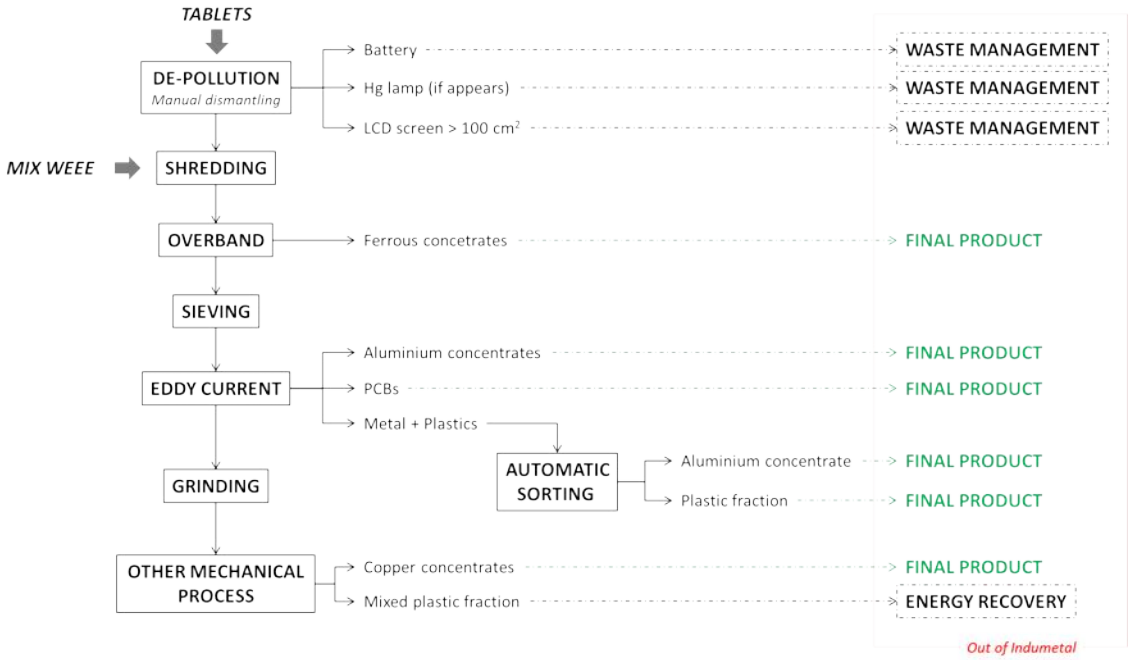


Figure 20. Recycling process for the tablets and WEEE

Table 22. Recovery ratio of the fractions obtained from Mix WEEE (including tablets) during the recycling process

Recovered fractions	Ratio (%)
Ferrous concentrates	40,59
Aluminium concentrates	0,53
Copper concentrates	13,74
Plastic fraction (INDUPLAST)	23,00
Printed circuit boards	4,52
Mixed plastic fraction	9,00
Fines	7,50
Hazardous components	1,12
TOTAL	**100,00**

3.9.2 Refurbishing process

As it has been detailed previously, all the WEEE assessed during the analysis as “Working” have been subjected to a second review to separate those with a potential refurbishing. From all the working devices (from end-users and from schools), only eight have been selected for sending to Recyberica to assess a potential refurbishing. Some photos about the process are shown in Table 23.

Table 23. Photos about the refurbishing process carried out in Recyberica

Below, the performed analysis and final result for each device are summarised.

#1. IPAD A1395 (see Figure 21)

1) The external conditions of the device are assessed.
2) The manufacturing year and model are assessed, A1395 year 2011. The device is old for remanufacturing since Apple locks its updates in the old devices.
3) The device is connected to the power supply in order to check the battery load.
4) The device has a pattern lock
5) The device is connected to Itunes to be formatted. It is formatted but it continues requesting a Pin. It is linked to an Apple account.
6) It is not possible the reuse.

Figure 21. Refurbishing process for IPAD A1395

#2. TABLET SAMSUNG GT-P3110 (see Figure 22)

1) The external conditions of the device are assessed.
2) The manufacturing year and model are assessed, GT-P3110. The device is old for refurbishing. When it is connected to Internet, an advice appears saying that the device does not accept the browser.
3) The device is connected to the power supply in order to check the battery load.
4) With a 100% load, the tests defined in the protocol “ITR de validación tablet” are carried out.
5) All data are deleted using the Blancco App.
6) The device is registered in the system.
7) The device is cleaned and packaged

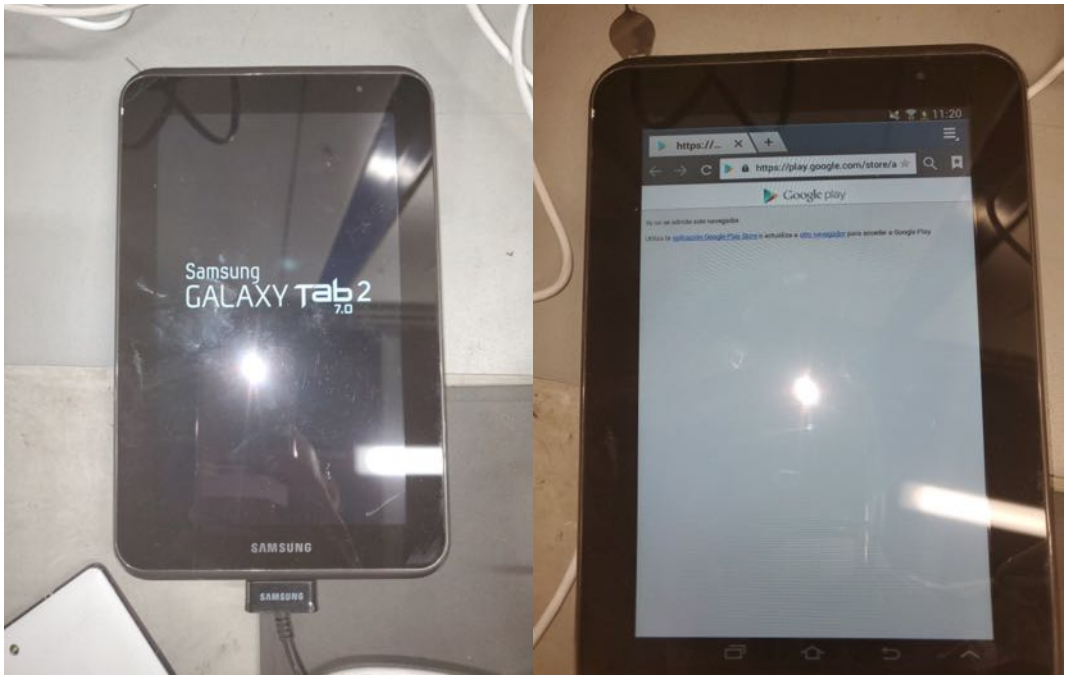


Figure 22. Refurbishing process for TABLET SAMSUNG GT-P3110

#3. TABLET HEAVEN 10.1 (see Figure 23)

1) The external conditions of the device are assessed.
2) The manufacturing year and model are assessed, Heaven 10.1 year 2016.
3) The device is connected to the power supply in order to check the battery load.
4) When the device is turned on, it is connected to the Wi-Fi but it displays the message “An Internet connection is not available”.
5) The device is not able to conclude the start up.
6) It is not possible the reuse.

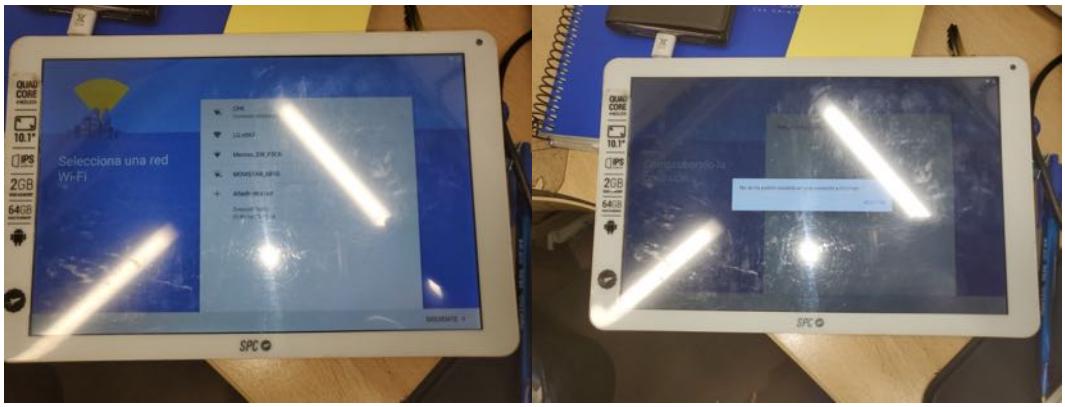


Figure 23. Refurbishing process for TABLET HEAVEN 10.1

#4. MOBILE LG-P970 (see Figure 24)

1) The external conditions of the device are assessed.
2) The manufacturing year and model are assessed, Lg-P970 May 2011.
3) The device is connected to the power supply in order to check the battery load.
4) With a 100% load, the tests defined in the protocol “ITR de validación tablet” are carried out.
5) All data are deleted using the Blancco App.
6) The device is registered in the system.
7) The device is cleaned and package.

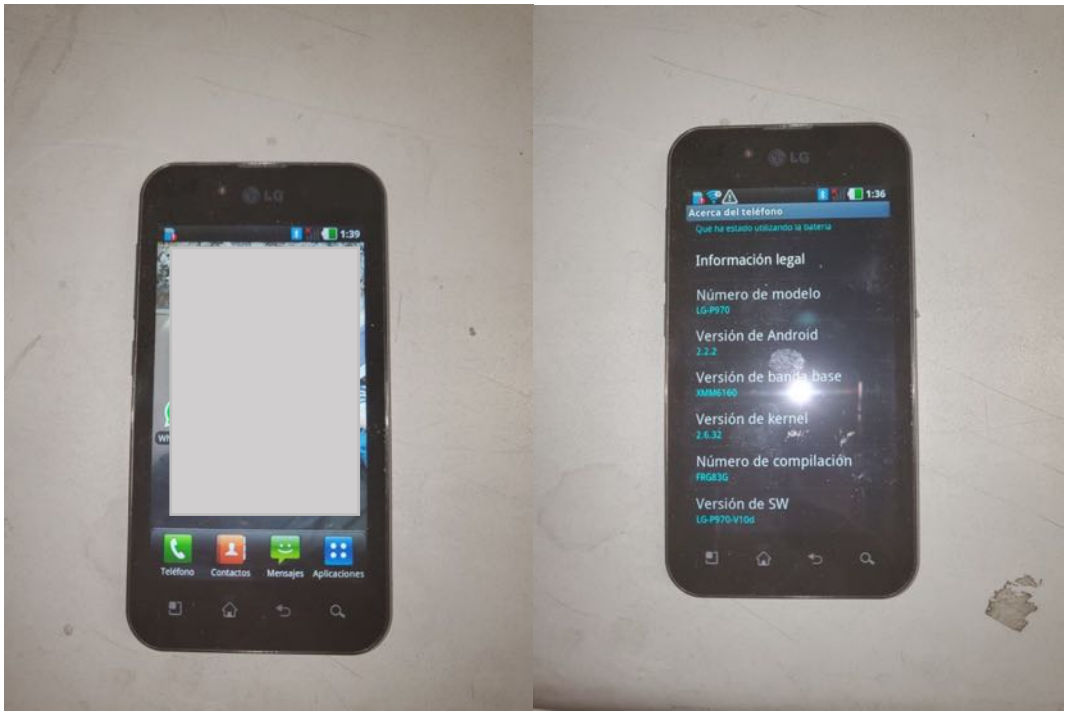


Figure 24. Refurbishing process for MOBILE LG-P970

#5. MOBILE Redmi3 (see Figure 25)

1) The external conditions of the device are assessed.
2) The manufacturing year and model are assessed, Redmi 3 2016.
3) The device is connected to the power supply in order to check the battery load.
4) The device has a pattern lock. It is possible neither to remove the pattern nor to restore the factory settings nor to format.
5) It is not possible the reuse.

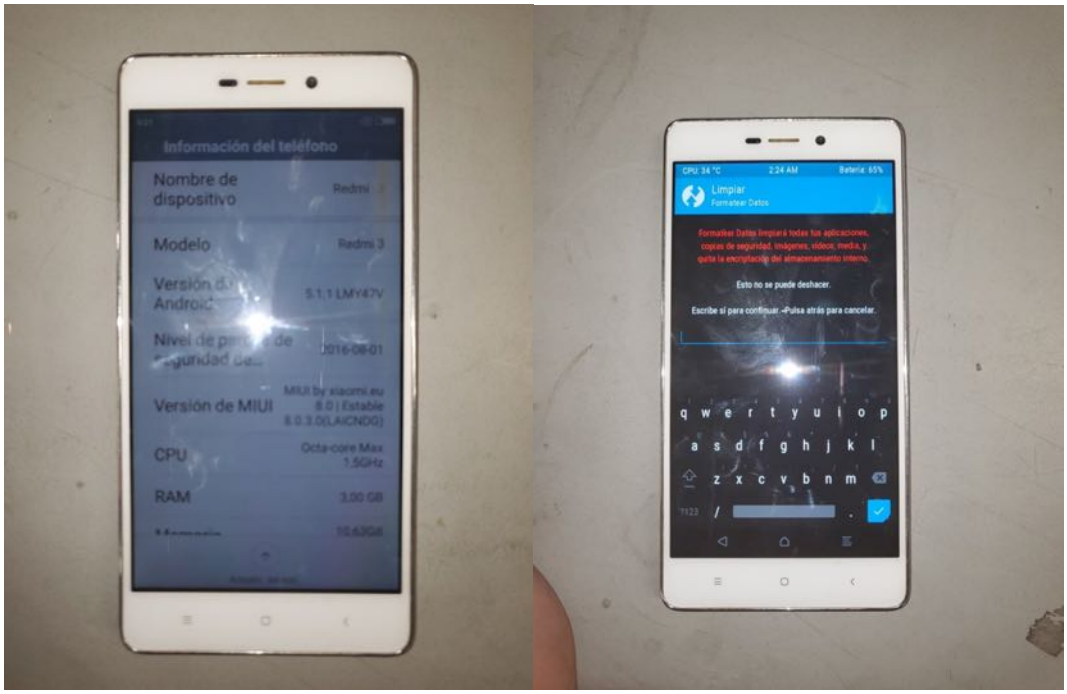


Figure 25. Refurbishing process for MOBILE Redmi3

#6. MOBILE WIKO PULP (see Figure 26)

1) The external conditions of the device are assessed.
2) The manufacturing year and model are assessed, Wiko PULP.
3) The device is connected to the power supply in order to check the battery load.
4) The device has a pattern lock. It is not possible neither to remove the pattern nor to restore the factory settings nor to format.
5) The device has an associated account.
6) It is not possible the reuse.

Figure 26. Refurbishing process for MOBILE Wiko PULP

#7. MOBILE HUAWEI PRA-LX1 (see Figure 27)

1) The external conditions of the device are assessed. There is a break in the back housing next to the camera, however it doesn't affect the functioning of the camera.

2) The manufacturing year and model are assessed, Huawei PRA-LX 2017.
3) The device is connected to the power supply in order to check the battery load.
4) With a 100% load, the tests defined in the protocol "ITR de validación tablet" are carried out.
5) All data are deleted using the Blancco App.
6) The device is registered in the system.
7) The device is cleaned and package.

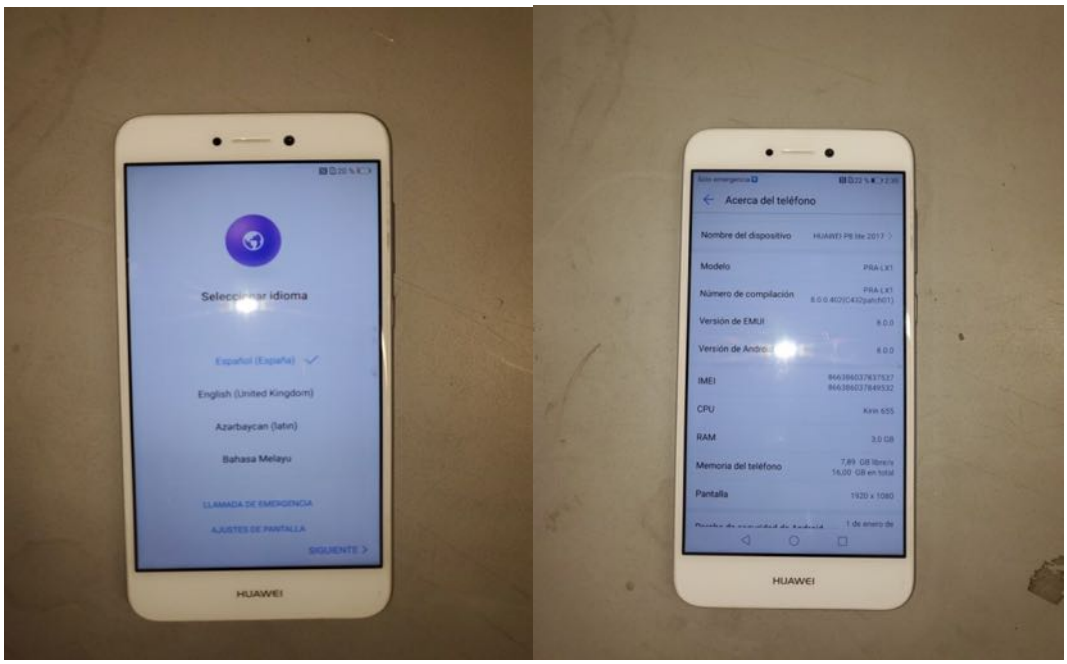


Figure 27. Refurbishing process for MOBILE HUAWEI PRA-LX1

#8. MOBILE HUAWEI CAM-L21 (see Figure 28)

1) The external conditions of the device are assessed.
2) The manufacturing year and model are assessed, Huawei CAM-L21, year 2016.
3) The device is connected to the power supply in order to check the battery load.
4) The device has a pattern lock. It is possible neither to remove the pattern nor to restore the factory settings nor to format.
5) It is not possible the reuse.

Figure 28. Refurbishing process for MOBILE HUAWEI CAM-L21

3.10 Exchange of the eco-credits

Once the wastes have been checked and the recycling traceability module fulfilled, end-users receive the eco-credits in their eco-account and then, they can redeem them by the incentives described in section 3.2, using the shopping QR code they have also in their eco-account. The different redeem options as well as the procedure to be followed are described in the following sections.

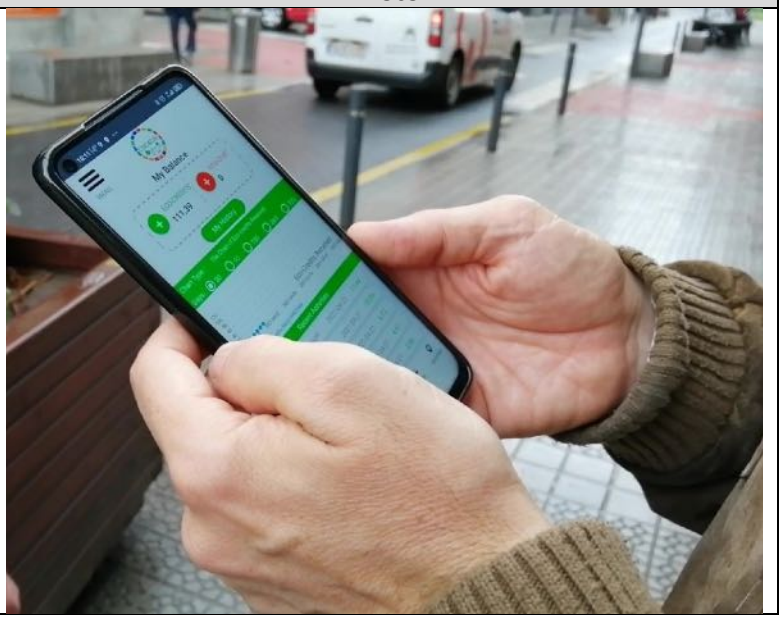
3.10.1 Exchange by discounts in Expert Mancia shop

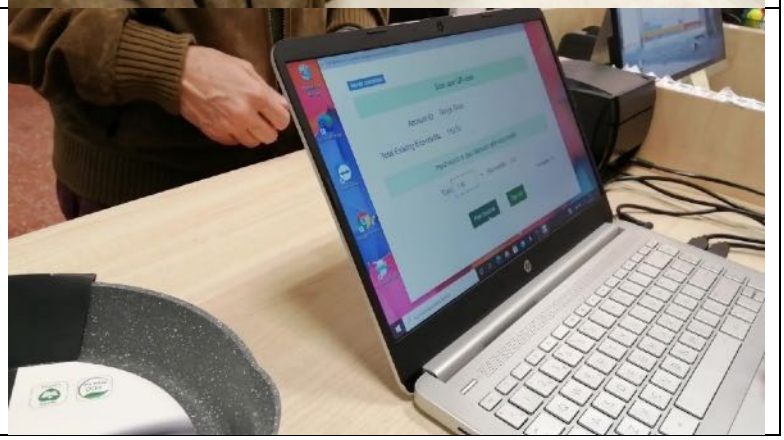
As it has been detailed previously, after several meetings with different potential incentivizers, Expert Mancia shop (see Figure 29) agreed on participating in the project. Being each obtained eco-credit equal to 1€, the end-user can redeem the eco-credits up to 5% discount on a single purchase in the shop, using the CIRC4Life App and the eco-shopping module (developed in Task 3.2 and described in Deliverable 3.1).

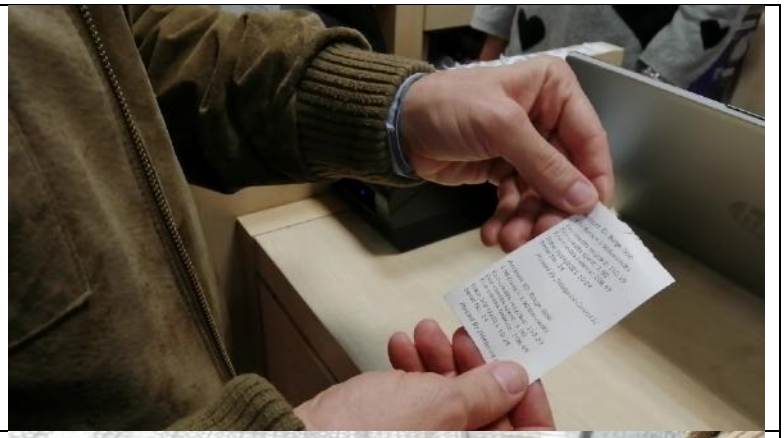
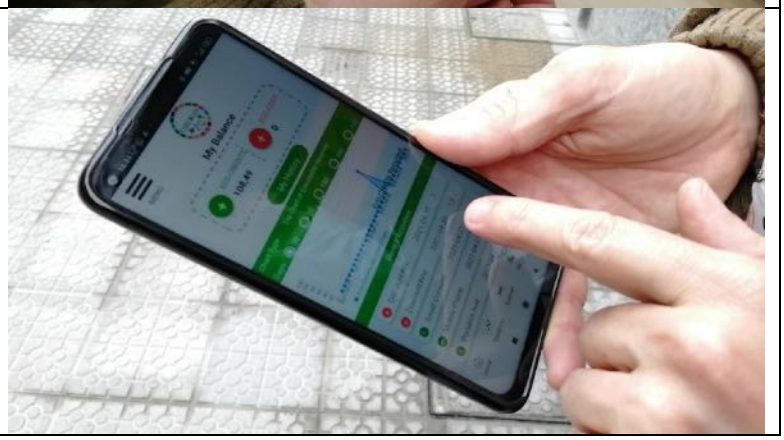
Figure 29. Expert Mancia shop in Romo (Getxo)

The procedure that end-user has to follow for redeeming the eco-credits by discounts in the shop is detailed in Table 24.

Table 24. Procedure for obtaining the discount in the shop

#	Action	Photo
1	End-user checking "My balance" section in CIRC4Life App to see the amount of available eco-credits	

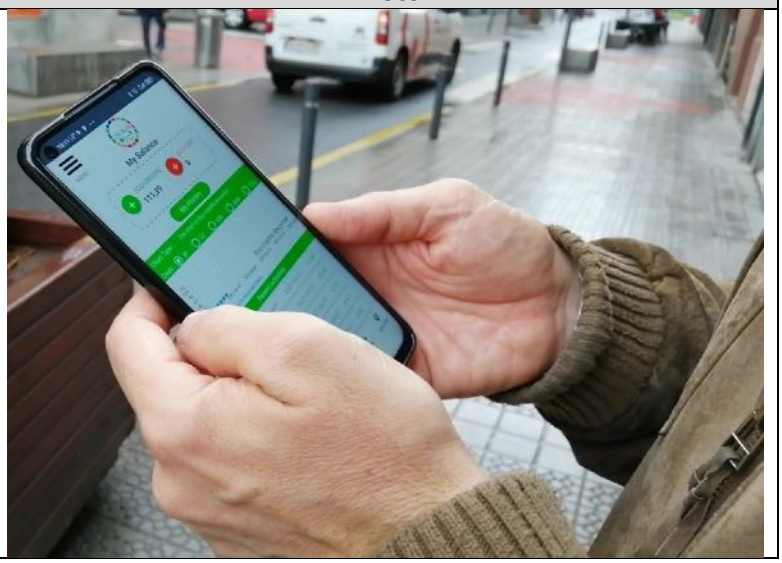
2	End-user chooses a product to be bought	
3	End-user selects the shopping QR code includes in “My ID” section	
4	End-user scans the shopping QR code in the shopping module for being identified	
5	Shop assistant introduces the number of eco-credits to be discounted from the eco-account	

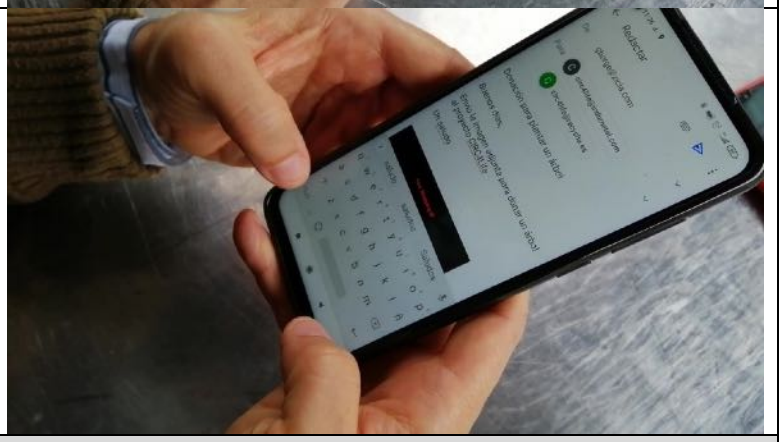
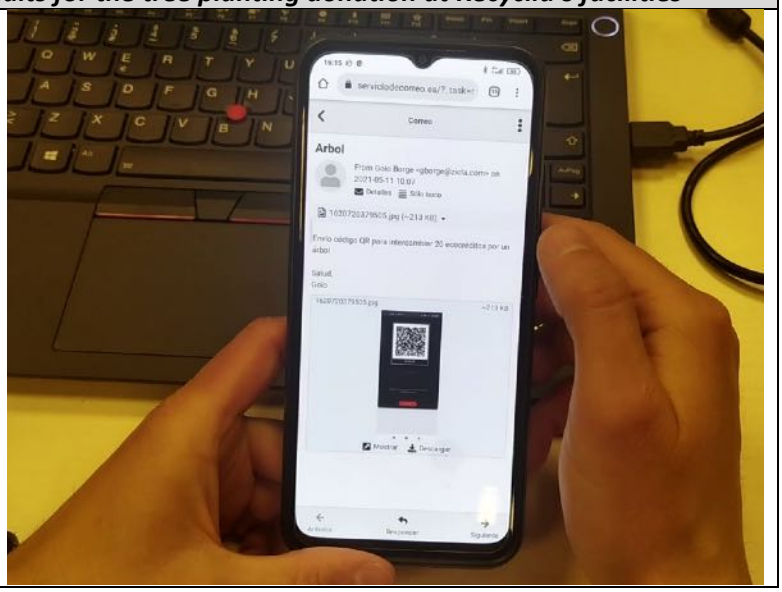
6	End-user gets the receipt which details the number of eco-credits spent and the eco-credits left in the eco-account	
7	End-user checks “My Balance” section to verify that the eco-credits-have been spent	

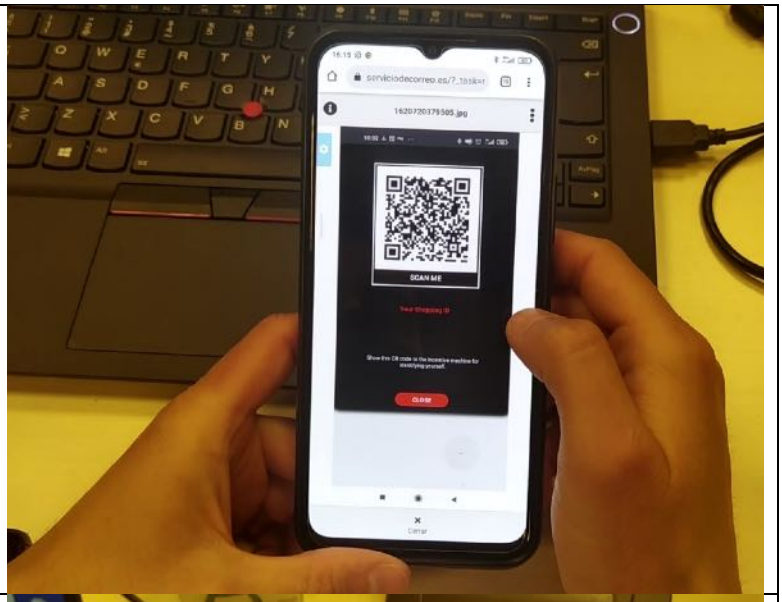
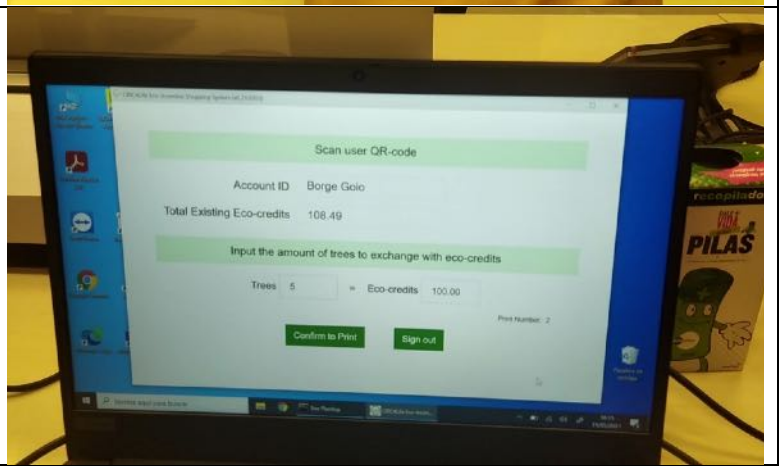
3.10.2 Eco-credit donation for tree planting in Getxo

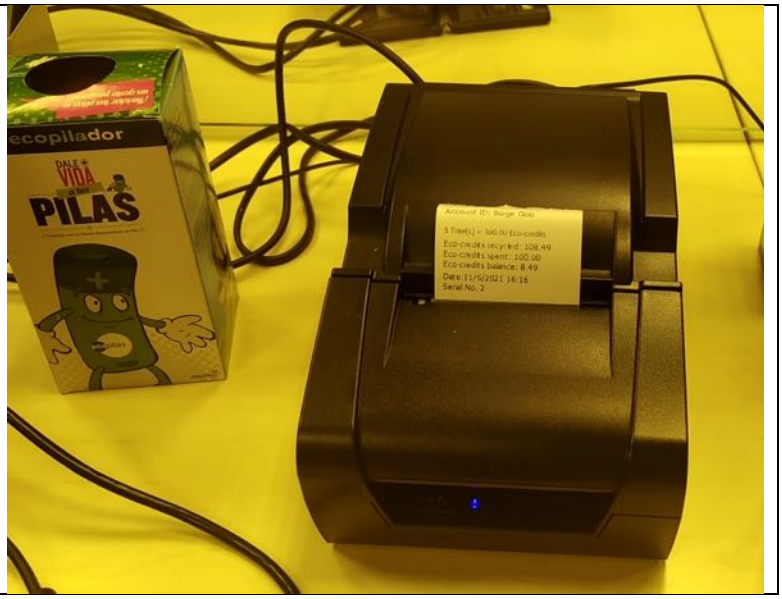
As detailed in section 2.2, this incentive arises from the co-creation process with end-users, being suggested by the participants in the survey. Once implemented, end-users can donate the obtained eco-credits for trees to be planted in a green area of Getxo. For every 20 eco-credits, 1 tree is planted. The procedure that the end-user has to follow is detailed in Table 25.

Table 25. Procedure for tree planting donation

#	Action	Photo
1	End-user checking “My balance” section in CIRC4Life App to see the amount of available eco-credits	

2	End-user takes a screenshot of the shopping QR code included in "My ID" section	
3	End-user sends an e-mail to circ4life@indumetal.com and circ4life@recyclia.es including: - The purpose (donation for tree planting) - The shopping QR code screenshot - The number of trees to be donated	
Exchange of the eco-credits for the tree planting donation at Recyclia's facilities		
4	Review of the received email	

5	Open the screenshot with the shopping QR code	
6	Scan the shopping QR code	
7	Exchange the number of eco-credits in the shopping module	

8	Getting the receipt which details the number of eco-credits spent and the eco-credits left in the user´s eco-account	

3.11 Installation of the intelligent bin and training in the schools

In addition to the demonstration with the citizens of Getxo, the demonstration of collaborative recycling and reuse also includes the selection of three primary schools for the training of recycling/reusing WEEE. For that, the intelligent bin has been installed temporarily in the three schools and an awareness session focused on the circular economy and the sustainable consumption has been conducted.

Part of these activities were included in Task 2.6. “End-user awareness for reuse/recycling”, however due to duration of Task 2.6, it was not possible to perform all the activities and therefore, they have been accomplished within Task 6.3. “Demonstration of CEBM with tablets” and summarised in this deliverable.

Within Task 2.6, a first contact was made with several schools of Getxo (see Table 26). Although initially several schools confirmed their intention of participating in the project, finally and due to some delays in the project execution, only two of them agreed to be part of the demonstration.

Table 26. Contact with schools made within Task 2.6

School	Characteristics	Participation in CIRC4Life Project
CEIP ROMO HLHI	https://sites.google.com/a/romoeskola.com/romoeskola/ Primary Education Close to a High School External neighbourhood of great population	**YES**

School	Characteristics	Participation in CIRC4Life Project
IKASTOLA SAN NIKOLAS 	https://www.sanikolas.eus/es Primary and Secondary Education Centre of the city	**NO**
SANTÍSIMA TRINIDAD 	https://www.trinitariasalgorta.net/ Primary and Secondary Education School of great tradition in the city centre	**NO**
COLEGIO ZABALA 	https://sites.google.com/a/zabalaeskola.es/zabalaeskola/ Primary and Secondary Education Centre of the city	**NO**
IES JULIO CARO BAROJA 	http://www.juliocarobaroja.hezkuntza.net/web/guest Secondary Education and High-School	**YES**
ESCUELA IBAIONDO 	http://www.ibaiondo.net/index Vocational School in a suburbia	**NO**
COLEGIO AZKORRI 	http://www.azkorri.com/es/ar/1/inicio.html Primary, Secondary and High-School A great number of students in a rural area of the municipality	**NO**

Finally, and thanks to the successful experienced in CEIP Romo and IES Julio Caro Baroja, a third school named CEIP Larrañazubi, confirmed its participation in the demonstration. Details about the selected schools and the activities carried out with them are summarized in the following sections.

3.11.1 *C.E.I.P. Romo H.L.H.I.*

CEIP Romo, also known as Romo Eskola, is a primary school of Getxo located in the Romo neighbourhood. With almost 600 students and 55 teachers, this school is actually involved in several environmental activities and the awareness-raising of their students, and following these criteria, they decided to participate in CIRC4Life project. Figure 30 shows an overview of the facilities and Table 27 details the timeline of activities carried out in CEIP Romo.

Figure 30. Facilities of CEIP Romo

Table 27. Calendar of actions carried out with CEIP Romo

Action	Date
First contact with the school	26/10/2020
Teams meeting	02/12/2020
Installation of the intelligent bin	09/12/2020
Session with students	10/12/2020
Removal of the intelligent bin	17/03/2021

Once the intelligent bin was installed, a session on sustainable consumption awareness and circular economy was performed with the students. The functioning of the intelligent bin, the eco-credits and incentive system were also explained, and a brief tablet dismantling workshop was also carried out. All the materials employed during the school sessions are attached in the Appendices. Additionally, some photos of the session are showed in Table 28.

Table 28. Indumetal's personnel with the students during the session in CEIP Romo

3.11.2 IES Julio Caro Baroja BHI

IES Julio Caro Baroja, also known as Getxo I, is a secondary school of Getxo located in the Algorta neighbourhood and inaugurated in 1966. During this school year, both teachers and students have been focused mainly on the “Stop Plastics” activity, and in accordance with this activity they decided to participate in CIRC4Life project. Figure 31 shows an overview of the facilities and Table 29 details the timeline with the activities carried out in IES Julio Caro Baroja.

Figure 31. Facilities of IES Julio Caro Baroja

Table 29. Calendar of actions carried out with IES Julio Caro Baroja

Action	Date
First contact with the school	26/02/2021
Meeting in the school	05/03/2021
Installation of the intelligent bin	17/03/2021
Sessions with students	22/03/2021 24/03/2021
Removal of the intelligent bin	13/05/2021

Once the intelligent bin was installed, a session on sustainable consumption awareness and circular economy was performed with the students. The functioning of the intelligent bin, the eco-credits and incentive system were also explained, and a brief tablet dismantling workshop was also carried out. All the materials employed during the school sessions are attached in the Appendices. In addition, some photos of the sessions are showed in Table 30.

Table 30. Indumetal's personnel with the students during the sessions in IES Julio Caro Baroja

3.11.3 C.E.I.P. Larrañazubi

CEIP Larrañazubi is a primary school of Getxo located in Algorta neighbourhood. Among their environmental activities, the school manages a vegetable garden, and following with these activities they decided to participate in CIRC4Life project. Figure 32 shows an overview of the facilities and Table 31 details the timeline with the activities carried out in CEIP Larrañazubi.

Figure 32. Facilities of CEIP Larrañazubi

Table 31. Calendar of actions carried out with CEIP Larrañazubi

Action	Date
First contact with the school	15/04/2021
Meeting in the school	23/04/2021
Installation of the intelligent bin	13/05/2021
Sessions with students and teachers	17/05/2021
Removal of the intelligent bin	30/06/2021

Once the intelligent bin was installed, a session on sustainable consumption awareness and circular economy was performed with the students and also with teachers. The functioning of the intelligent bin, the eco-credits and incentive system were also explained, and a brief tablet dismantling workshop was also carried out. All the materials employed during the school sessions are attached in the Appendices. Furthermore, some photos of the sessions are showed in Table 32.

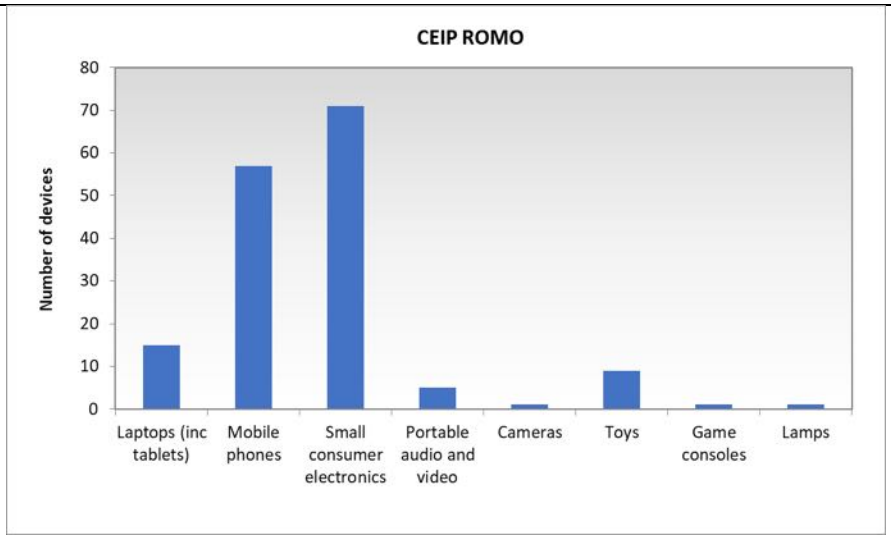
Table 32. Indumetal's personnel with the students and teachers during the sessions in CEIP Larrañazubi

3.11.4 Results of the demonstration of collaborative recycling and reuse in the schools

As it has been detailed previously, the demonstration of collaborative recycling and reuse also includes the collection of WEEE in the schools through the intelligent bin. For that, the three schools selected a responsible for CIRC4Life activities, who was in charge of downloading the CIRC4Life App and disposing the wastes in the bin. Table 33, Table 34 and Table 35 describes the results for each school.

Table 33. Summary of the collected wastes in CEIP Romo

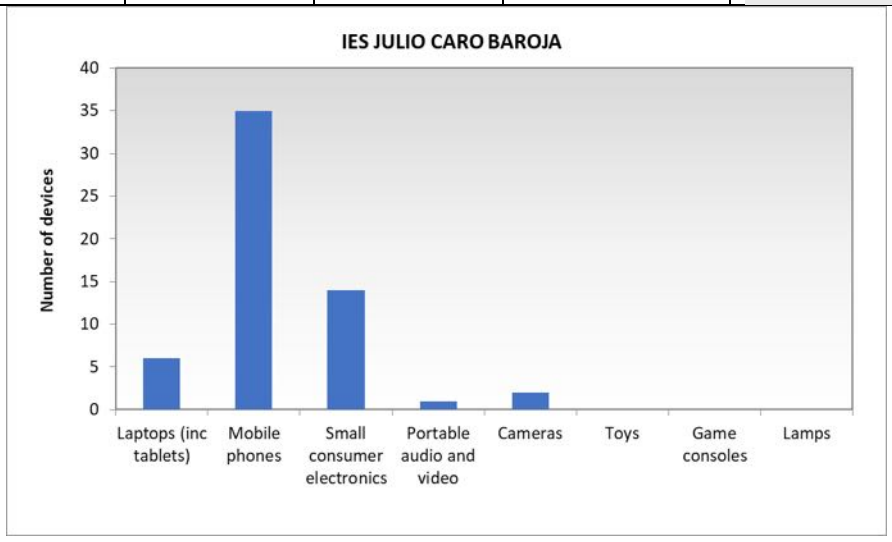
Period of demonstration	Number of WEEE	Amount of WEEE (kg)	Status of WEEE	Obtained eco-credits
From 09/12/2020 to 17/03/2021	160	47	Broken: 153 Working: 7 No EEE item: 1	



Distribution of collected waste by EEE categories

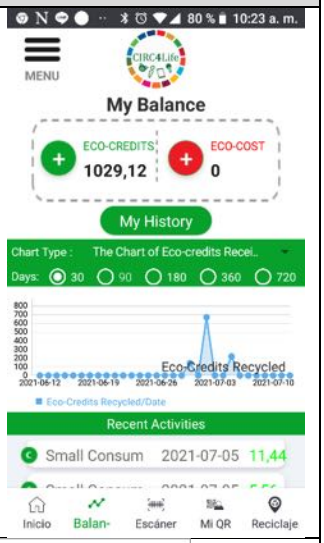
Table 34. Summary of the collected wastes in IES Julio Caro Baroja

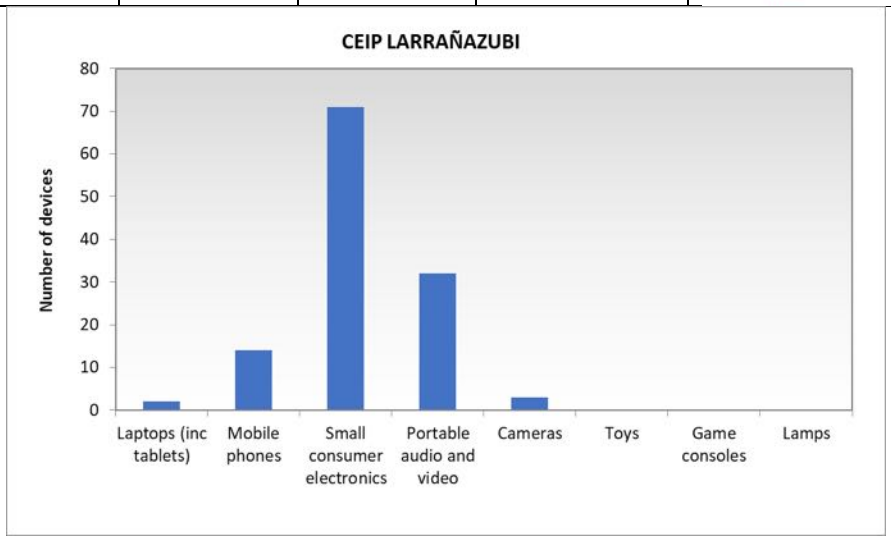
Period of demonstration	Number of WEEE	Amount of WEEE (kg)	Status of WEEE	Obtained eco-credits
From 17/03/2021 to 13/05/2021	58	14	Broken: 51 Working: 7 No EEE item: 2	



Distribution of collected waste by EEE categories

Table 35. Summary of the collected wastes in CEIP Larrañazubi

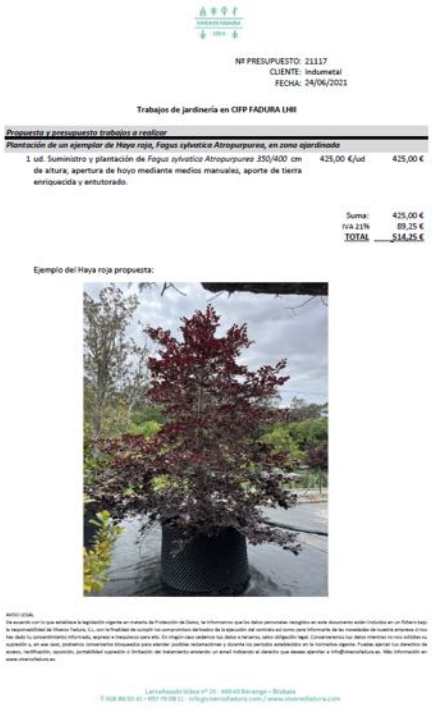
Period of demonstration	Number of WEEE	Amount of WEEE (kg)	Status of WEEE	Obtained eco-credits
From 13/05/2021 to 30/06/2021	122	75	Broken: 93 Working: 29 No EEE item: 1	



Distribution of collected waste by EEE categories

Concerning the exchange of the obtained eco-credits, the three schools opted for tree planting incentive and therefore, it was decided to carry out a tree planting ad-hoc for each school, taking into account the total amount of eco-credits and transforming them directly into euros. In collaboration with Viveros Fadura, a detailed planting plan was designed, considering the amount of euros and the green spaces of each school. The proposals made by Viveros Fadura are presented in Table 36.

Table 36. Tree planting proposals for the schools

School	Budget for tree planting (€)	Proposal made by Viveros Fadura
CEIP Romo	1,700	 Nº PRESUPUESTO: 21116 CLIENTE: Indumetal FECHA: 24/06/2021 Trabajos de jardinería en Colegio Público Romo *Propuesta y presupuesto trabajos a realizar* *Vegetación del vallado en la zona de entrada; bien a la derecha, en vallado contra carretera; bien a la izquierda, en la zona sombría contra los edificios así como en el vallado contra los edificios hasta la calle Luis López Ovés* 18 ud. Suministro y plantación de plantas trepadoras variadas 18,00 €/ud 324,00 € 3 ud. Suministro y plantación de *Morus alba Pendula* 90,00 €/ud 270,00 € 25 ud. Suministro y plantación de Arbustos variados para formación de masas de color y floración 24,00 €/ud 600,00 € *Zona Huerta* 2 ud. Suministro y plantación de árboles frutales a definir 69,60 €/ud 139,20 € 8 ud. Suministro y aporte de sustrato universal para apoyo de la plantación suministrado en sacos de 80L 9,00 €/ud 72,00 € Suma: 1.405,20 € IVA 21% 295,09 € TOTAL 1.700,29 €
IES Julio Caro Baroja	500	 Nº PRESUPUESTO: 21117 CLIENTE: Indumetal FECHA: 24/06/2021 Trabajos de jardinería en CIFP FADURA LHII *Propuesta y presupuesto trabajos a realizar* *Plantación de un ejemplar de Haya roja, Fagus sylvatica Atropurpurea, en zona ajardinada* 1 ud. Suministro y plantación de *Fagus sylvatica Atropurpurea* 350/400 cm de altura; apertura de hoyo mediante medios manuales; aporte de tierra enriquecida y entutorado. 425,00 €/ud 425,00 € Suma: 425,00 € IVA 21% 89,25 € TOTAL 514,25 € Ejemplo del Haya roja propuesta:
CEIP Larrañazubi	1,029	Pending To be done in September

Considering seasonal requirements and that the schools are closed in summer without any garden maintenance, the tree planting is postponed to October.

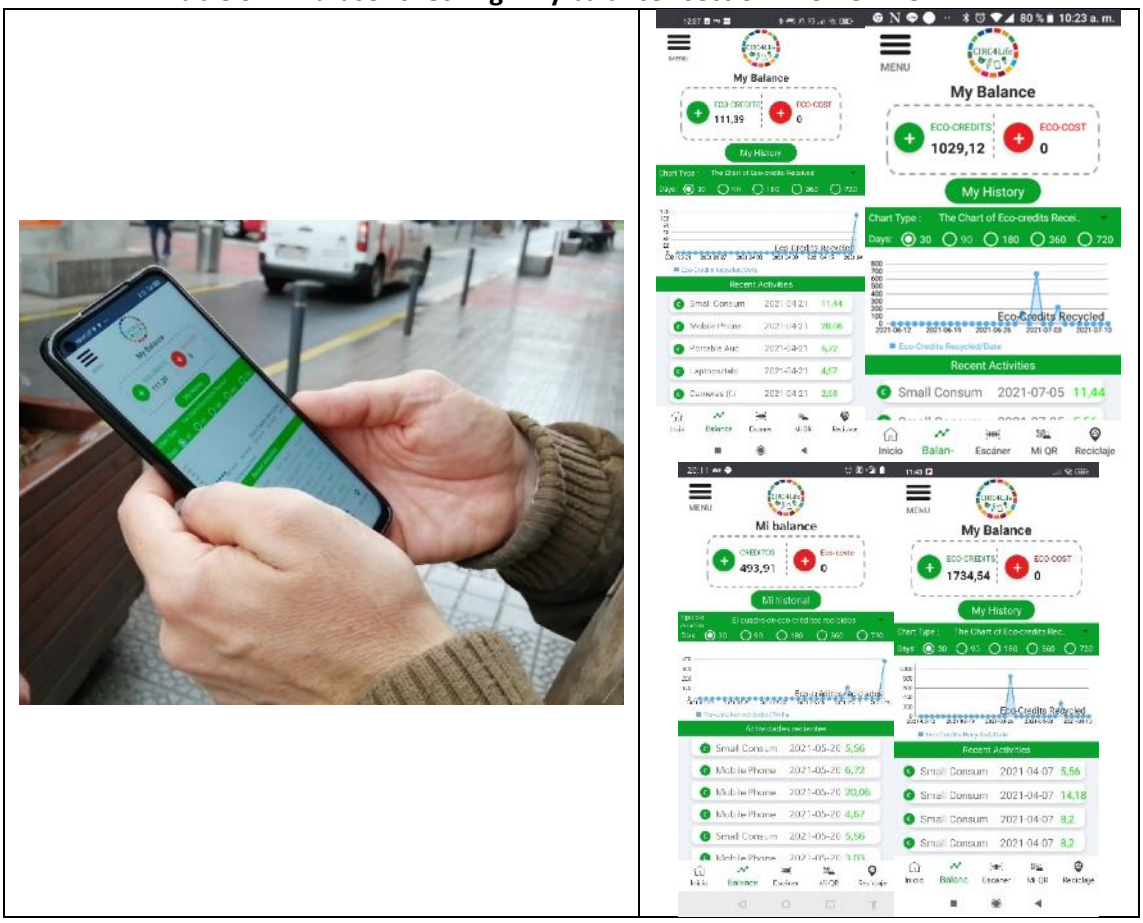
4 Demonstration of Sustainable Consumption with tablets

The aim of this subtask is to enable end-users to set up their individual eco-cost accounts, based on CIRC4Life App developed within the project, which shows the eco-points related to their recycling activities and hence the end-users' impacts on the environment with regards to their recycling/reusing activities.

4.1 Obtaining of eco-credits in end-user's eco-account

The first approach for demonstrating the sustainable consumption with tablets has been the obtaining of eco-credits and their checking by the end-user, via the CIRC4Life App. For that the end-user, after disposing his waste and being this analysed at Indumetal's facilities, can check the obtained eco-credits in "My balance" section, as it is shown in Table 37.

Table 37. End-user checking "My balance" section in CIRC4Life APP



4.2 Tracking of daily impacts/footprints

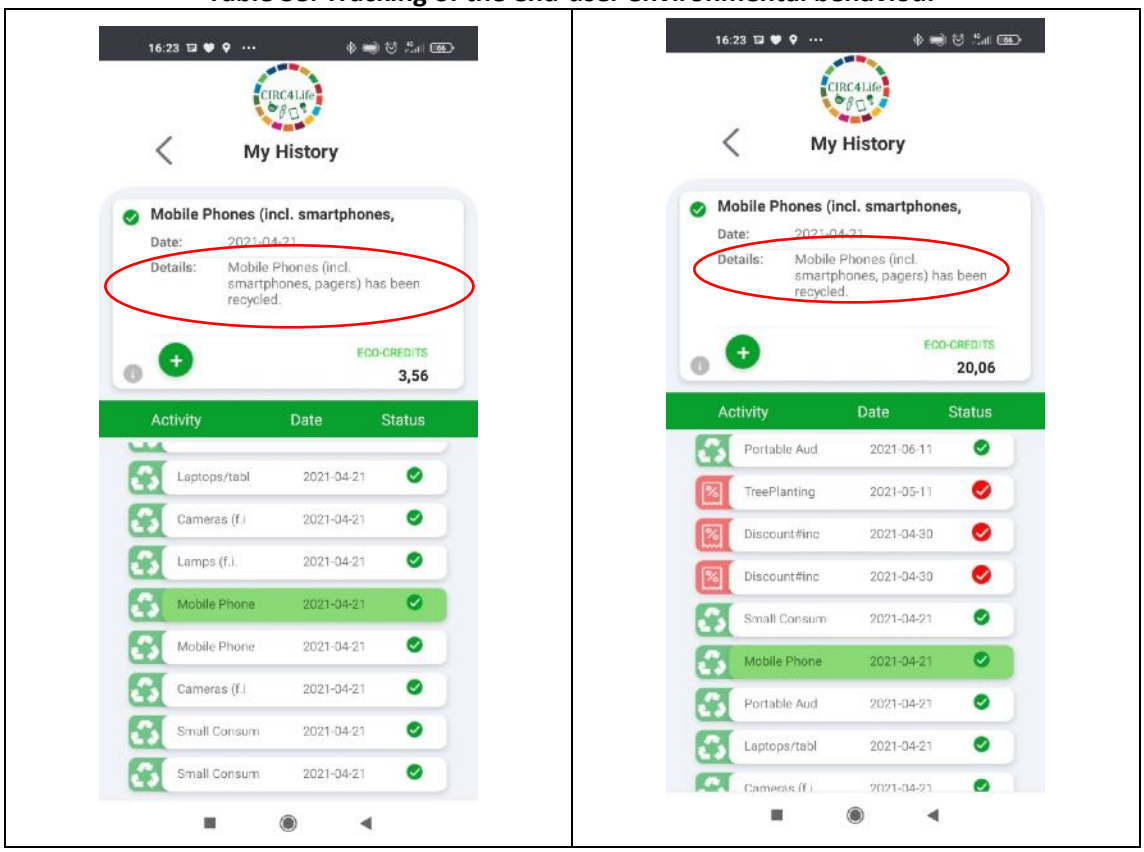
The second approach for demonstrating the sustainable consumption with tablets has been the tracking by the end-user of their daily impacts/footprints via the CIRC4Life App, to encourage them to use the environmental products and hence improve their awareness of sustainability.

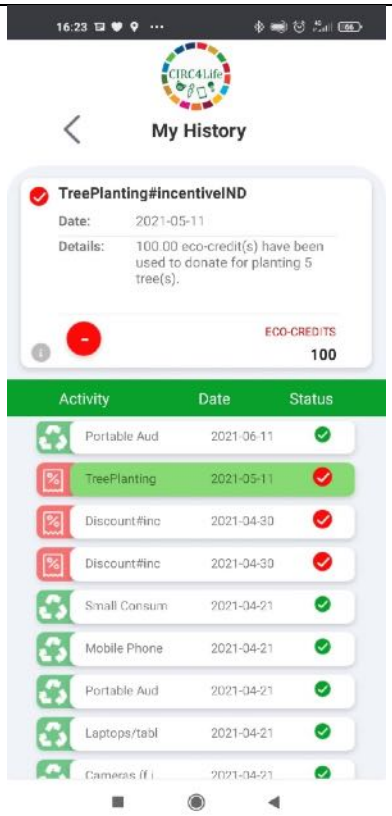
For that, after the waste disposal, Indumetal's analysis and the checking of the obtained eco-credits, the end-user can use them for a better environmental behaviour and an improvement of his environmental footprint.

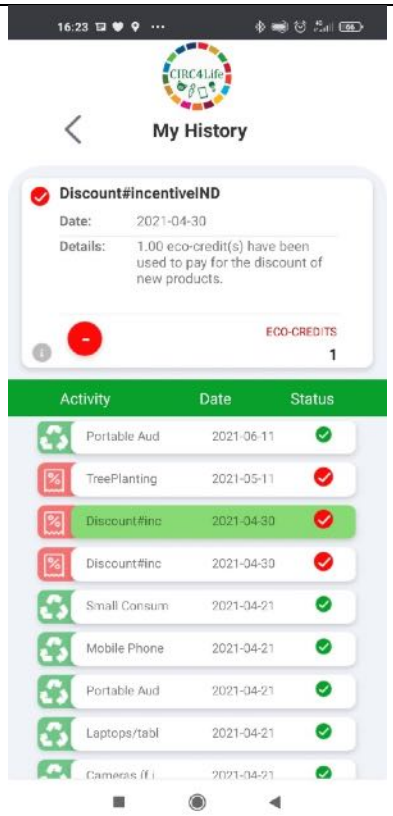
In the global framework of CIRC4Life, this can be executed with purchase actions in the Demonstrations that offer it (for example, to acquire the eco-designed products of ALIA or ONA), however in the demonstration with tablets, it is reflected in the proposal an implementation of the incentive of planting trees versus the purely economic incentive of discounts in an appliance store.

Additionally, after the disposal of the item, the end-user is informed that the item has been received. Afterwards, the eco-credits resulted from this recycling action are added to the end-user eco-account. The value of the eco-credits is determined using the method developed in D2.4. This information can be viewed in "My History" section and selecting any of the detailed activities as it is showed in Table 38.

Table 38. Tracking of the end-user environmental behaviour




My History
TreePlanting#incentiveIND
Date: 2021-05-11
Details: 100.00 eco-credit(s) have been used to donate for planting 5 tree(s).
ECO-CREDITS
100
Activity
Date
Status
Portable Aud 2021-06-11
TreePlanting 2021-05-11
Discount#inc 2021-04-30
Discount#inc 2021-04-30
Small Consum 2021-04-21
Mobile Phone 2021-04-21
Portable Aud 2021-04-21
Laptops/tabl 2021-04-21


My History
Discount#incentiveIND
Date: 2021-04-30
Details: 1.00 eco-credit(s) have been used to pay for the discount of new products.
ECO-CREDITS
1
Activity
Date
Status
Portable Aud 2021-06-11
TreePlanting 2021-05-11
Discount#inc 2021-04-30
Discount#inc 2021-04-30
Small Consum 2021-04-21
Mobile Phone 2021-04-21
Portable Aud 2021-04-21
Laptops/tabl 2021-04-21

5 Key Performance Indicators (KPIs)

Included in WP6 is apart from demonstration also validation and therefore, a validation framework was developed (see D6.5). Included below is KPIs relevant for demo 2, based on the KPIs in the validation document.

CEBM	KPI Description	Unit of measurement	Target Value	Notes
Co-Creation	Proposals by end-users accepted in the Project (vs total number of proposals)	%	>5%	57%
Recycling & Reuse	Collection of reusable devices (vs total collected devices)	% in number	>10%	Total WEEE devices: 680 Broken: 616 Working: 64 9.4% vs 90.6%
		% in weight	>3%	Total kg of WEEE: 385 Broken: 371 kg Working: 14 kg 3.6% vs 96.4%
	End-users involved: app downloads	Number		685
	End-users involved: visits to the bin	Number		- 45 different users have interacted with the intelligent bins and generated around 600 events (wastes disposed): 13,33 events per user on average. If the 4 big users (schools) are removed, then the average would be 5 events per user.
	Satisfaction in schools	Punctuation from 0 to 10	>7	Value obtained from the satisfaction survey (see Appendices): 7.9
	Satisfaction in the city council	Punctuation from 0 to 10	>7	Value obtained from the satisfaction survey (see Appendices): 7
	Indicators from the communication			- Google Ads campaign: 5.436 clicks and 1.509

CEBM	KPI Description	Unit of measurement	Target Value	Notes
	campaign			clicks in Google Play - Facebook Ads campaign: 83.573 people have visualized the advertisement with 3.084 clicks.
Sustainable Consumption	Efficiency of environmental incentives: redeemed eco-credits for tree planting vs total received eco-credits	%	>50%	3.329 eco-credits redeemed for tree planting 6.934 total received eco-credits 48,0% (considering that schools only have tree planting as incentive)

6 Showcases

A showcase has been organised in Getxo, in collaboration with the City Council, with the aim of illustrating the implementation of CEBMs as well as the results achieved. For this event, all the relevant agents participating in the demonstration have been invited in order to share with them the results and also to get their feedback regarding those issues that should be improved, or the lessons learnt during the experience.

The showcase has been held the 28th of September 2021, in Romo Cultural Centre and the agenda for the day is detailed in Figure 33.

Figure 33. Agenda for the showcase in Getxo

As mentioned previously, all the main participants (see Table 39) in the demonstration in Getxo have been invited to this event.

Table 39. Summary of the participants during the showcase and their role in the demonstration

Participants	Role in the demonstration
City Council of Getxo	Municipality where the demonstration has been implemented
Indumetal Recycling	Demonstrator
Recyclia	Demonstrator
Expert Mancia	Incentivizer
Environmental Classroom of Getxo	Contact with the schools
Ihobe (Environmental Agency of the Basque Government)	Contact with the different municipalities
Romo Eskola	Primary school
Julio Caro Baroja	Secondary school
Colegio Larrañazubi	Primary school
Arana Comunicación	Responsible of the communication campaign

During the showcase, besides the broadcast of a video summarizing all the activities carried out during the demonstration in Getxo and the delivery/donation of refurbished tablets to the schools, a round table has been performed with the aim of discussing and identifying the main detected barriers, the positive results or the possible steps for a big scale implementation. The main conclusions of this round table are gathered below:

- Need of continuing with the collection by means of the intelligent bins.
- A future implementation would require an economic feasibility assessment.
- City Council is open to continue with the collaboration.
- All the agents present in the showcase agree on the environmental incentive as the first choice for the redeem of the eco-credits.
- It is important to combine communication and proximity to the citizen in order to succeed with the initiative.
- It is a great success that industrial companies are involved in training and awareness-raising at school level. The schools also showed their satisfaction with the awareness, the campaign, and the incentives
- Digital gaps are highlighted by some agents.

Finally, some photos of the showcase are presented in Table 40.

Table 40. Photographic summary of the showcase


CIRC4Life
DEMOSTRACIÓN CON LOS CENTROS EDUCATIVOS
Principales resultados
MESA DEBATE
MESA DEBATE

7 Conclusions and Recommendations

7.1 Conclusions drawn from the demonstration of the three CEBMs

CO-CREATION

- After conducting three consumer surveys which included one topic about "Reuse and Recycling attitudes", a more sustainable incentive was demanded.
- Tree planting donation was defined as an environmental incentive according to the feedback received from the survey participants.
- A modification and update of the ICT platform, CIRC4Life App and eco-shopping module was done to allow users to choose the tree planting donation and to redeem the obtained eco-credits.

COLLABORATIVE RECYCLING AND REUSE

- After several meetings, the following external agents decided to participate and collaborate in the demonstration:
    - City Council of Getxo, making possible the contact with the Environmental Classroom of Getxo, the locations for the bins and the dissemination of the communication campaign
    - Expert Mancia as incentivizer offering a discount of 5% in new purchases
    - Viveros Fadura as local nursery for the tree planting
    - Arana Communication as responsible of the communication campaign in Getxo
- The labelling of the intelligent bins and the information materials were developed by an iterative co-creation process carried out in collaboration with NTU and LAUREA partners. With the aim of validating the developed materials, a real test was performed with external end-users. Finally, based on the conclusions and recommendations obtained in the real tests, the intelligent bins were labelled, and two roll ups produced.
- A communication campaign was developed and launched, with the following actions:
    - Google and Facebook Ads
    - Leaflets
    - Informative roll ups next to the intelligent bins
    - Articles for a local newspaper
    - Labelling of public battery waste containers with information about the demonstration
- The intelligent bins were located in three different public spaces of Getxo:
    - Romo Cultural Centre
    - Fadura Sport Centre
    - Villamonte Cultural Centre
- Indumetal gathered periodically the wastes disposed by citizens in the intelligent bins and analysed them, using the traceability module developed within the project. During the analysis, the wastes were set as *Broken*, if the device has any irreparable damage or cannot be turned on, and as *Working*, if the device can be turned on or still works.
- The total amount of wastes collected in Getxo from citizens during the demonstration is 249 kg.
- Among the working devices, the most recent models and with a good appearance were separated and sent to the preparation for reuse centre. These eight devices were assessed following a specific protocol in order to verify a possible refurbishing but only three of them were refurbished.
- 46,27% of the eco-credits have been redeemed for tree planting
- The collaborative recycling and reuse business model was also demonstrated in three primary schools, installing the intelligent bin temporarily and conducting an awareness session focused on the circular economy and the sustainable consumption.

- CEIP Romo, IES Julio Caro Baroja and CEIP Larrañazubi participated in the demonstration, collecting 47, 14 and 75 kg respectively and obtaining subsequently 1734.54, 493.91 and 1029.12 eco-credits. The three schools opted for tree planting incentive and therefore, the total amount of eco-credits was transformed directly into euros. For that, Viveros Fadura designed a detailed planting plan, considering the amount of euros and the green spaces of each school.

SUSTAINABLE CONSUMPTION

- The sustainable consumption business model was demonstrated by means of the following approaches:
    - The obtaining of eco-credits and their checking by the end-user, via the CIRC4Life App. For that the end-user, after disposing his waste and being this analysed at Indumetal's facilities, can check the obtained eco-credits in "My balance" section of CIRC4Life App.
    - The tracking by the end-user of their daily impacts/footprints via the CIRC4Life App, to encourage them to use the environmental products and hence improve their awareness of sustainability.

7.2 Lessons learnt and recommendations to other businesses

- Co-creation activities proved to be very important in order to take into account the opinions of end-users and other stakeholders. The engagement of these agents in the co-creation process is essential, as well as to involve public bodies and local businesses for alternative incentives.
- The traceability related aspects of this demo are perceived to have worked well in the project and made it possible e.g. to trace devices and engage end-users in the incentive scheme.
- There needs to be co-creation activities related to all tools developed.
- It is important to ensure a simplified process for the end-users since some difficulties, especially during the rewarding of the eco-credits, have been detected.
- Regarding the incentive scheme, it has been identified that there needs to be a continued dialogue with the end-users, e.g. to inform them about the stages of the process and notifying them on the status of the assessment of the devices, issues that currently are not performed by CIRC4Life App.
- Awareness campaigns on circular economy have been very valuable activities providing insights and raised awareness among users.
- The support of public administration is critical for the good achievement of the demonstration activities.
- Re-use activities present difficulties, especially for small IT devices, not only due to hardware issues (damages in collection) but software restrictions (obsolete versions to use some software).
- Incentives are important to foster the participation of end-users in Circular Economy initiatives, at least in an early stage.
- The active work with schools and feedback from and to them has been perceived as very positive and resulted in an extended social network and increased communication activities.
- The collaboration with key peers and stakeholders, to hold a life cycle perspective and to promote well oriented communication activities are essential in the transition towards circularity.

Appendices

COMMUNICATION CAMPAIGN: Offers elaborated by Arana Comunicación

1st Proposal of activities (November 2019)

CAMPAÑA DE COMUNICACIÓN
Y SENSIBILIZACIÓN CIRC4LIFE
EN GETXO
Noviembre 2019

CIRC4Life

Indumetal llevará a cabo en Getxo una demostración de los nuevos modelos de economía circular desollados con las tablets en el marco del proyecto CIRC4 LIFE, instalando dos contenedores inteligentes en diversos puntos de Getxo.

Mensajes principales

Para concienciar a la ciudadanía de Getxo desea lleva a cabo una campaña de comunicación que incentive la entrega de los materiales electrónicos en los contenedores inteligentes. Para ello la campaña deberá

- **Detallar claramente los residuos que se van a recoger**
- **Dar información acerca de la APP/web que el usuario podrá emplear**
- **Contenedores inteligentes, que son y como funcionan**
- **Explicar el sistema de incentivos, qué son y dónde conseguirlos**

FASES

1ª Fase. Lanzamiento y primer punto de recogida

Se desarrollará una campaña inicial de mayor intensidad de tres semanas de duración en la que se trasmitirá la información de la campaña, su funcionamiento objetivos y forma de participación de la ciudadanía.

ACCIONES PROPUESTAS

Rueda de prensa

Se realizará una rueda de prensa para explicar a los medios los objetivos del proyecto y el funcionamiento de la campaña, convocando a los medios en uno de los puntos en que se ubiquen los contenedores si es posible, para que puedan verlos y tomar imágenes de los mismos.

Suplemento en Getxo Berri

Redacción y maquetación de 4 páginas (2 en castellano y 2 en euskera) en el periódico municipal Getxo Berri que edita semanalmente el Ayuntamiento de Getxo.

Panel informativo

Diseño y producción de dos paneles informativo con fotografías, esquemas y textos que recoja de forma clara y atractiva la información general de la Demo.

Estos paneles informativos se colocarán junto a los contenedores inteligentes al objeto de explicar el proyecto y se trasladan junto con ellos a las distintas ubicaciones programadas.

- Expositor con folletos

Junto a cada contenedor y panel se habilitará un expositor para colocar folletos informativos sobre la Demo.

Rotulación

Rotulación del contenedor con los logos de los actores participantes.

Buzoneo de triptico

Diseño y redacción de un triptico informativos con la información general de la campaña en castellano y euskera.

Se editarán 30.000 ejemplares que se irán distribuyendo por los buzones de las viviendas más cercanas al punto donde estén ubicados los contenedores.

Cada vez que se desplace a otro punto se volverá a repetir el buzoneo en los aledaños de la nueva ubicación.

Oppis metro

Se diseñara un cartel publicitario de la campaña para exponerlo en los expositores (OPPIS) de las cuatro estaciones de metro Getxo.

Proponemos una campaña de dos semanas en la que se contratarán 2 carteles en cada estación (uno en castellano y otro en euskera). Uno en cada sentido.

Rotulación de cilindors de recogidad de pilas

El Ayuntamiento de Getxo dispone de alrededor de una veintena de cilindros de recogida de pilas repartidos por el municipio que suele ceder para la realización de diversas campañas de carácter medioambiental principalmente.

El coste de rotulación y colocación corre a cargo del anunciante.

Página web

Proponemos la creación de una página web o landing page sobre la campaña de Getxo, si no existiera, que recoja toda la información acerca de la campaña y de la que se pueda descargar la app.

Banner

Se creará un banner animado para colocarlo en en banner en la página web del Ayuntamiento que dirigirá a la landing page o web de la campaña

Campaña de anuncios en Facebook

Facebook, la mayor red social del mundo tiene un potencial enorme a la hora de promocionar aplicaciones y la tasa de éxito es muy alta. Cuenta con millones de usuarios cuyo uso principal es el móvil, por lo que la instalación de la app solo cuesta dos clicks desde que ven el anuncio. Además en este tipo de campañas se incluye Instagram y el Audience Network con lo que el alcance potencial de usuarios es muy grande.

Proponemos la creación de una campaña de anuncios en Facebook para dar a conocer la campaña y fomentar la descarga de la app.

En la primera fase proponemos una inversión de 500 € durante dos semanas.

En las siguientes fases las inversiones serán de 300 euros en cada ocasión.

Publicidad en comercios colaboradores

A los comercio coladores de la campaña se les facilitara los siguientes soportes publicitarios.

- 2 Cartel A3
- 1 Dispensador de folletos
- 100 Folletos

2ª Fase. Recordatorio

Dado que el proyecto se prolongará durante 15 meses, se realizarán durante este periodo acciones de comunicación para volver a impactar en el público objetivo con lo mensajes deseados.

- En cada cambio de ubicación de los contenedores se realizará un buzoneo del tríptico informativo por las viviendas del entorno.
- Se realizará un campaña en Facebook de dos semanas de duración.

CROMOGRAMA

	ACCIONES
1 FASE Diciembre 2019	Rueda de prensa
	publicación en Getxo Berri
	Alquiler 2 semanas Mupis de metro
	Contenedores con panel
	Buzoneo tríptico
	Landing Page
	Campaña en Facebook
	Reparto material comercios
	Rotulación contenedores de recogida de pilas
2 FASE. Recordatorio. Abril 2020	Campaña en Facebook
	Buzoneo tríptico
3 FASE. Recordatorio. Septiembre 2020	Rueda de prensa de evaluación
	Campaña en Facebook

ARANY

PRESUPUESTO

A continuación presentamos un presupuesto orientativo

	producción precio sin IVA	dirección/ diseño
METRO 12 caras durante una semana en las estaciones: Areeta, Gobela, Neguri, Aiboa, Algorta y Bidezabal Mupi de 120cm base x 175 cm alto	3.600	
Impresión de 12 carteles para mupis metro	160	200
Impresión de tríptico 30.000 ejemplares de DIN A4 plegado en tríptico a 4 + 4 en papel de 130 gr.	954	250
Buzoneo Buzoneo de 30.000 trípticos Hasta 10.000 unidades: 20,00 €/Millar De 10.000 unidades en adelante: 18,00 €/Millar	600	
Panel Photocall "interior" (300 x 200 cm. / 4+0 / Foam de 10mm. + peanas traseras.)	288	300
Rotulación contenedores	150	100
Landing page Dominio y hosting por un año Diseño e implementación	100 350	400
Campaña en Facebook		
Contratación anuncios por valor de	1000	
Diseño de anuncios y realización de campaña		350
Diseño Getxo Berri Diseño y maquetación de 4 páginas	Consultar Ayuntamiento	250
Material para comercios impresión y distribución	por determinar número de comercios	
Cilindros de pilas rotulación de 18 contenedores de pila	1200	200
Dirección y creación de de campaña		400

2nd proposal with updated activities and budget (January 2021)

ARANY

CAMPAÑA DE COMUNICACIÓN Y SENSIBILIZACIÓN CIRC4LIFE EN GETXO

CIRC4Life

PRESUPUESTO ACTUALIZADO

29 de enero 2021

En lugar de la contratación de Oppis de metro proponemos destinar ese presupuesto a campañas publicitarias de descarga de aplicaciones en Google Ads y Facebook. Arana Comunicación facturará los honorarios de dirección, puesta en marcha y seguimiento de las campañas. El coste de los anuncios será facturado directamente al cliente por Google y Facebook en función de la evolución de la campaña.

El presupuesto de buzoneo de tríptico está contemplado para una impresión y buzoneo de 30.000 ejemplares. Se adaptará al número que finalmente se haga en función del calendario de desplazamiento del contenedor y de la extensión del buzoneo.

Está sin contemplar la realización de soportes informativos para facilitar a Exper Mancia.

ARANY

	producción	dirección/ diseño
Campaña en Google Adwors Contratación anuncios por valor de	2500	
Diseño de anuncios y animación y realización de campaña		500
Impresión de triptico 30.000 ejemplares de DIN A4 plegado en triptico a 4 + 4 en papel de 130 gr.	954	250
Buzoneo Buzoneo de 30.000 tritpticos Hasta 10.000 unidades: 20,00 €/Millar. De 10.000 unidades en adelante: 18,00 €/Millar	600	150
Rool up Realizacion de 3 rooll ups	150	300
Rotulación 2 contenedores Rotulacion de logos e instrucciones	380	360
Campaña en Facebook		
Contratación anuncios por valor de	1500	
Diseño de anuncios y realización de campaña		350
Diseño Getxo Bent Diseño y maquetación de 4 páginas	0	250
Material para comercios impresión y distribución	?	
Cilindros de pilas rotulación de 19 contenedores de pila	1200	200
Dirección y creación de campaña		400
Totales	7284	2760
TOTAL precios sin IVA	**10.044**	

MATERIAL FOR AWARENESS-RAISING IN THE SCHOOLS

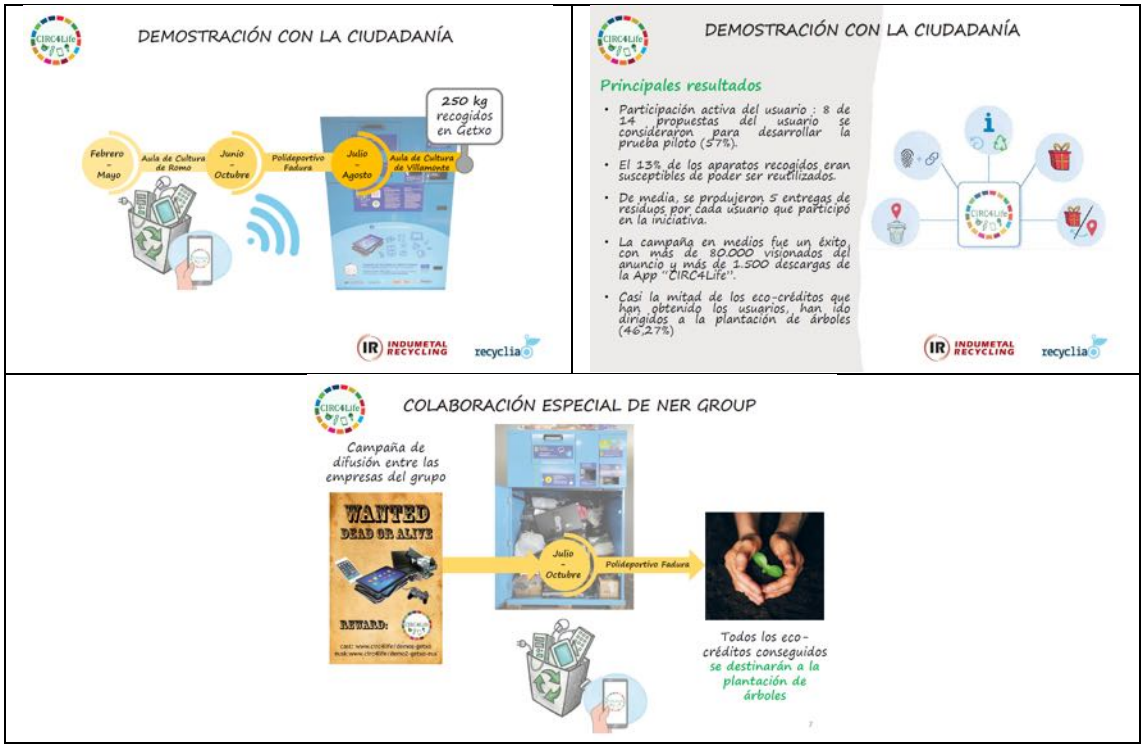

Ekintzak ekonomia zirkularrean
BIRDISEINATU
Ekintzak ekonomia zirkularrean
BIRZIKLATU
BIRZIKLAPEN LANTEGIAK
Kontsumo jasangarria
Kontsumo jasangarria
BIZITZA LUZATU
BIGARREN AUKERA BAT EMAN
Tablet baten desmontaila
Zer egingo dugu gaur?
Zertarako balio du?
Gailu elektrikoak
BERZIKLATZEKO
eta
BERRERABILTZEKO
Eta ekintza honekin eko-kredituak irabazteko!
Zer dira gailu elektriko eta elektronikoak?


Zeintzuk dira hondakin interesgarriak?


Nola dabil?
APP-a mugikorrean
Irakasle bat izango da APP-aren arduraduna.
Ikasleek hari emango dizkiote hondakinak, eta berak eramango du lortutako eko-kredituen kontrola.


Eta... Saria??
✓ Emandako gailu bakoitza erregistratu egingo da.
✓ Emandako gailu bakoitzagatik eko-kredituak emango zaizkio edukiontzira bota duen pertsonaren klaseari.
✓ Gailua zenbat eta egoera hobean egon, orduan eta eko-kreditu gehiago eskuratuko dira. Bereziki, berrerabili badaiteke.
✓ Irabazitako eko-kreditu guztiekin zuhaitzak landatuko dira Romoko Eskolan
Anima zaitezte!
Birziklatu etxean jada erabiltzen ez dituzuen etxetresna elektrikoak!

MATERIAL FOR SHOWCASE


DEMOSTRACIÓN CON LA CIUDADANÍA
250 kg recogidos en Getxo
Febrero - Mayo
Aula de Cultura de Romo
Junio - Octubre
Polideportivo Fadura
Julio - Agosto
Aula de Cultura de Villamonte
INDUMETAL RECYCLING
recyclia
DEMOSTRACIÓN CON LA CIUDADANÍA
Principales resultados
Participación activa del usuario : 8 de 14 propuestas del usuario se consideraron para desarrollar la prueba piloto (57%).
El 13% de los aparatos recogidos eran susceptibles de poder ser reutilizados.
De media, se prodjueron 5 entregas de residuos por cada usuario que participó en la iniciativa.
La campaña en medios fue un éxito con más de 80.000 visionados del anuncio y más de 1.500 descargas de la App "CIRC4Life".
Casi la mitad de los eco-créditos que han obtenido los usuarios, han ido dirigidos a la plantación de árboles (46,27%)
INDUMETAL RECYCLING
recyclia
COLABORACIÓN ESPECIAL DE NER GROUP
Campaña de difusión entre las empresas del grupo
WANTED
DEAD OR ALIVE
REWARD:
Julio - Octubre
Polideportivo Fadura
Todos los eco-créditos conseguidos se destinarán a la plantación de árboles

SATISFACTION SURVEY MADE TO THE SCHOOLS AND CITY COUNCIL

SCHOOL SURVEY (punctuation from 0 to 10)

1. Was there more perceived interest on the part of the students in sustainability, environment or circular economy?
2. Has the training been delivered to more classes or courses, or will this be incorporated into other academic years?
3. Does the amount of waste collected match the school's expectations?
4. Has the incentive of planting trees helped to get more waste collected?
5. Are you satisfied with the activity?

Question	Romo Eskola	IES Julio Caro Baroja	Larrañazubi	Mean
1	7	6	8	7
2	10	10	10	10
3	7	5	8	6.7
4	8	8	8	8
5	8	7	8	7.7
Mean				**7.9**

CITY COUNCIL SURVEY (punctuation from 0 to 10)

1. Is it problematic the installation of this type of intelligent and to be protected containers? (0 to 10)
2. Do the results justify a larger scale test?
3. Has the municipality perceived more citizen participation in waste collection that can be attributed to this activity?
4. Has the campaign been sufficient?
5. Are you satisfied with the activity?

Question	Getxo City Council
1	6
2	8
3	7
4	6
5	8
Mean	**7**