



CDW Flow Optimisation Tool

User's Manual

Municipality of Seville



Citizen platform

Visit the platform here ([Optimisation of CDW flow](#))

When the user enters the CDW platform, they will encounter the form with the text inputs for the user's district, zip code and the date the user wants to go to the clean point. Below the form, the user will see the inputs to enter the amount of waste of each type they will be placed in the clean point. Additionally, there are checkboxes in case the user wants to dispose of a type of waste that is thrown away in an Ecopoint. Two buttons are found at the bottom of the form: one that submits the form (the one labelled "Search") and the other one to reset all the text boxes. Just before the buttons there is a reminder for the user to select the origin point on the map. At the right of the form, a map of Seville will be shown.

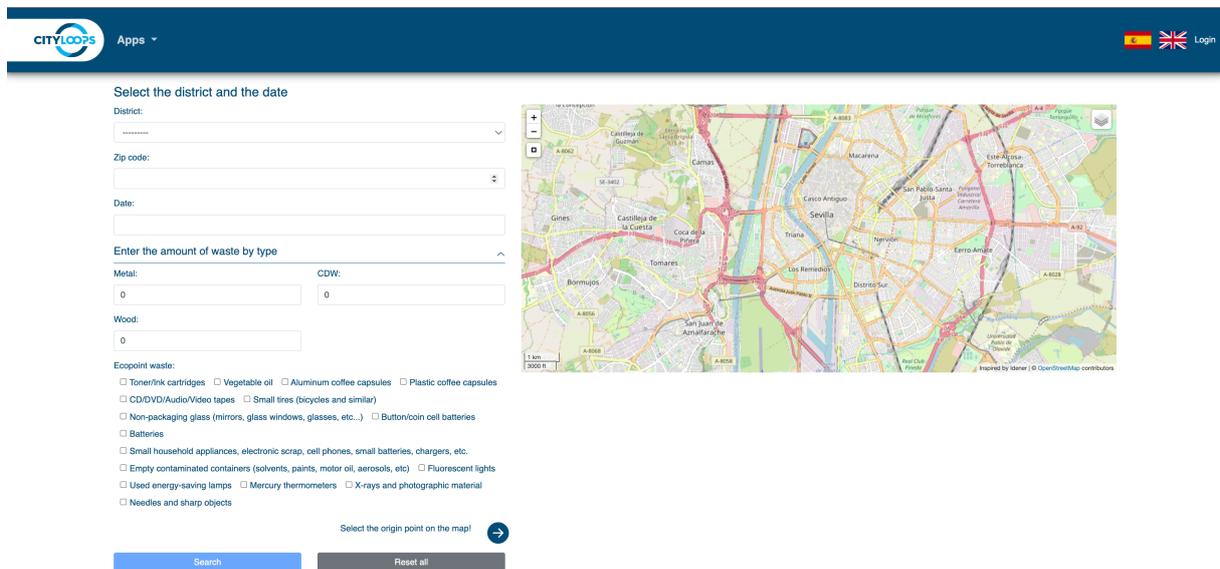


Figure 1. CDW platform main page.

Once the user fills in the form and hits the "Search" button, a column with the results will appear between the original form and the map. In this section, the user can expand each collapsible to show the information of each clean point, including the distance between the selected origin point and the clean point, an estimation of the container fill levels and the opening hours. The map will also show the distance between the origin point that the user selected and the best clean point for their needs. Finally, the user will see historical infographic on total CDW and metal collected at the bottom of the page.

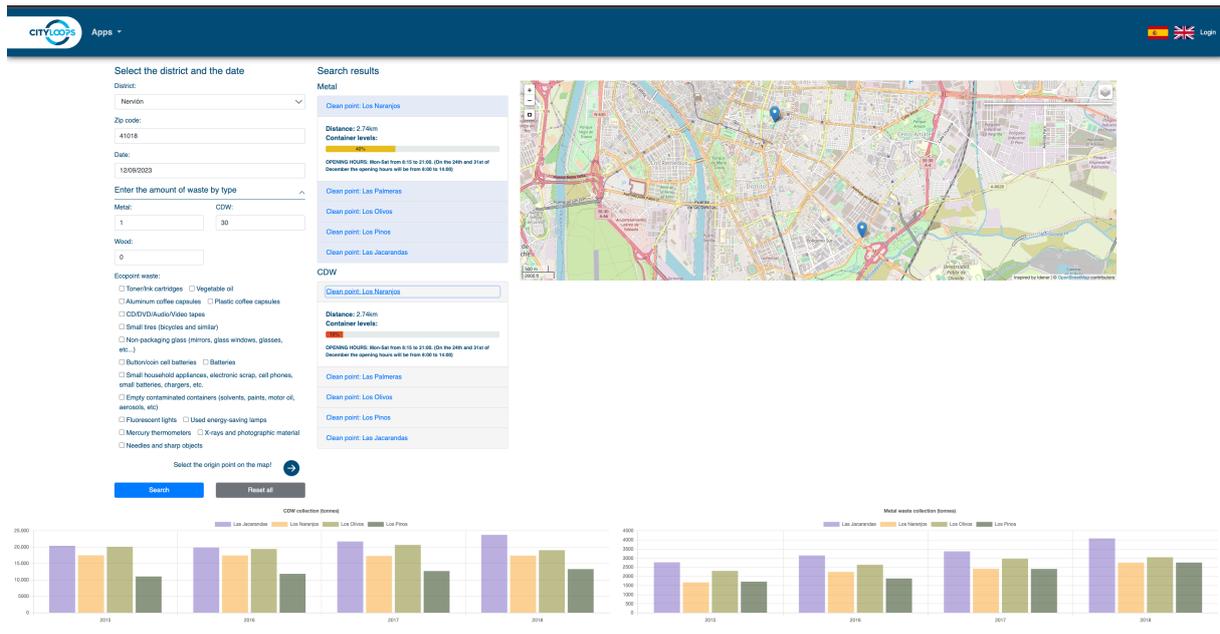


Figure 2. CDW platform main page showing results.

The user can only select any other waste types compatible with Ecopoints without entering any amount of wood, metal, or CDW (those last three ones are only collected in the clean points). In this case, the results page shows the clean points sorted by distance to the origin point and the list of Ecopoints sorted by distance to the origin point selected by the user. The user can decide to deliver the waste in both an Ecopoint or a Clean Point. Finally, the user will see historical information on the total other waste collected by graphics at the bottom of the results page.

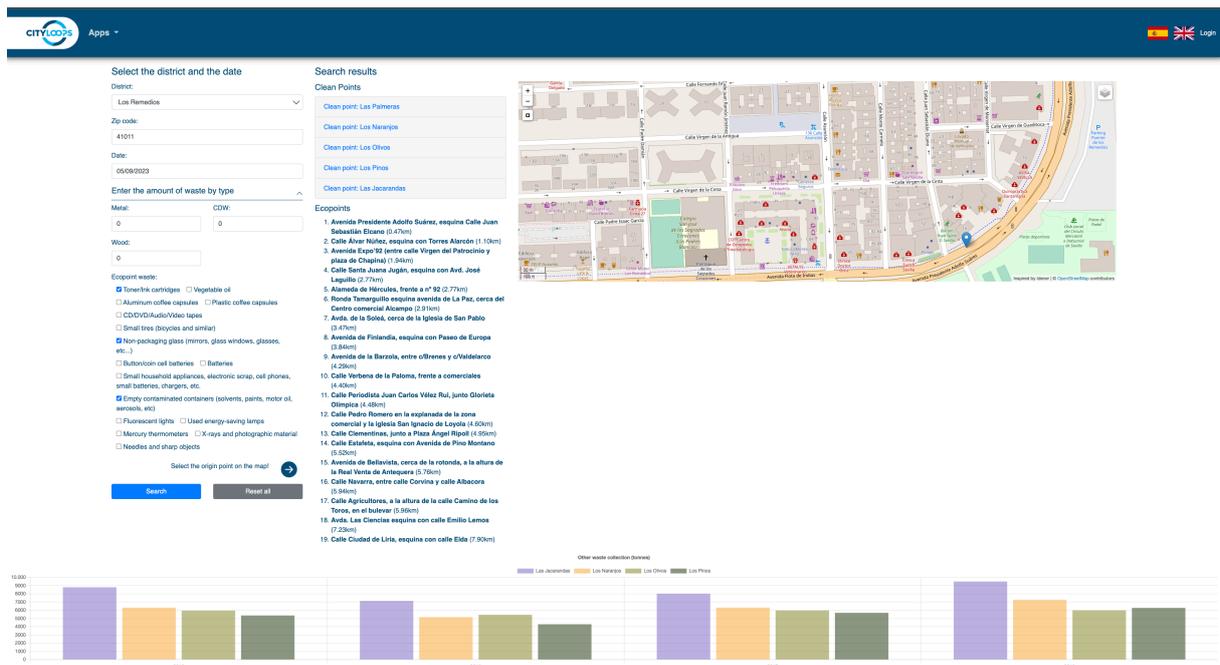


Figure 3. CDW platform main page showing results (Eco-points).

In a third case, the user can also select waste types compatible with Ecopoints at the same time along with CDW, metal, or wood (those last three ones are only collected in the clean points). The result page shows the clean points sorted by distance to the origin point selected by the user. In this case, only clean points are shown in order to deliver all types of waste at the same time. Finally, the user will see historical information on the total CDW, and other waste collected by graphics at the bottom of the results page.

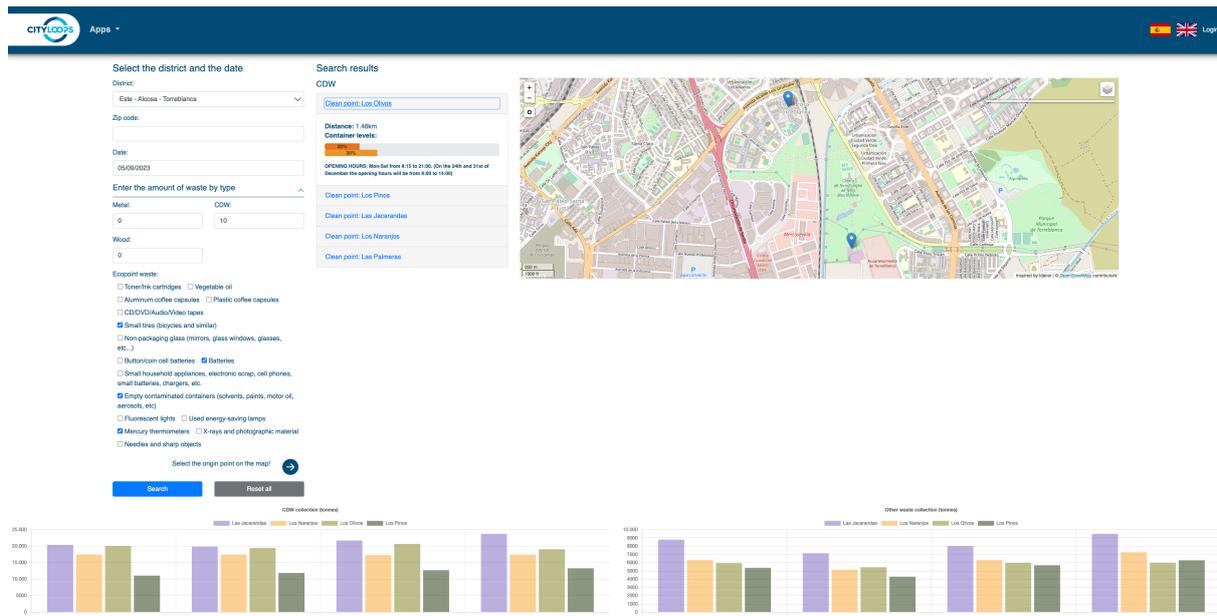


Figure 4. CDW platform main page showing results (Clean points with other waste).

Functionalities of CDW platform

- Forms for query: The citizen will provide data about its location and the type of waste placed in the “clean point”. Using this data and the status of the clean points, the CDW CityLoops platform for citizens will suggest the most suitable “clean point”.
- Map showing clean points and highlighting the most suitable one: A widget with a map (using OpenStreet Maps) will be presented to the citizens showing the current location of the “clean points” and after the results of the query, the most suitable one will be highlighted. At the same time, a route from the district origin to the proposed clean point will be suggested to the citizen based on OpenStreetMap.
- Dashboard showing the current status of the “clean points”: Clean points have different containers for different types of waste (e.g., bricks, wood, steel...). A dashboard will show the fill levels of the containers and the timestamp of the presented data.
- Control panel: A set of buttons will be included in the application to clean the forms, do the query, and export information. Logos of the involved partners (Emasesa, Lipasam, Municipality of Seville, Cityloops project) will be included providing additional information.

Manager platform

The manager platform has several pages to perform actions related to the management of the application and its resources.

To access the manager platform, the user must click the “Login” link at the top right corner of the page. This will lead them to the login page, in which they can enter their username and password to access the manager platform.

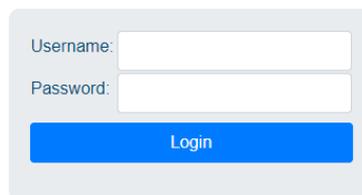


Figure 5. Login screen.

Once the user has logged in to the application, they will be able to access the pages to manage the entities of the application (containers, clean points, and districts). Each of the buttons located at the top bar of the page regarding these entities leads to the list of said entity. Through this list, the user can see the different attributes of each entity created. They can also create a new entity by clicking on the + sign located at the top right of the table, or edit any of the already created ones, by clicking the pencil icon at the end of each row.

Containers

#	Location	Waste type	Current level	Days until full	Created at	Updated at	Edit
4	LOS OLIVOS	DEBRIS	15	11	March 25, 2021, 4:28 p.m.	March 25, 2021, 4:28 p.m.	✎
5	LOS OLIVOS	DEBRIS	95	1	March 25, 2021, 4:29 p.m.	March 25, 2021, 4:29 p.m.	✎
6	LOS OLIVOS	METAL	65	1	March 25, 2021, 4:29 p.m.	March 25, 2021, 4:29 p.m.	✎
7	LOS OLIVOS	METAL	55	1	March 25, 2021, 4:29 p.m.	March 25, 2021, 4:29 p.m.	✎
10	Los Pinos	METAL	55	6	April 16, 2021, 12:08 p.m.	April 16, 2021, 12:08 p.m.	✎
11	Los Pinos	METAL	65	1	May 3, 2021, 8:14 p.m.	May 3, 2021, 8:14 p.m.	✎
12	Los Pinos	WOOD	45	3	May 3, 2021, 8:14 p.m.	May 3, 2021, 8:14 p.m.	✎
13	Los Pinos	WOOD	66	4	May 3, 2021, 8:14 p.m.	May 3, 2021, 8:14 p.m.	✎
14	Los Pinos	DEBRIS	85	2	May 3, 2021, 8:14 p.m.	May 3, 2021, 8:14 p.m.	✎
15	Los Pinos	DEBRIS	90	7	May 3, 2021, 8:14 p.m.	May 3, 2021, 8:14 p.m.	✎

Figure 6. Container list page.

When entering the page to create a new entity, the user will be supplied with two ways to create a new entity: to create it manually, entering the data in several inputs or uploading a file that contains the pertaining data. Note that the file uploaded must be in the correct format and contain the needed data to create a new entity.

Figure 7. Container creation page. On the left, the form to create the container manually. On the right, the input to upload a file with the containers data to create.

One of the main functionalities for the manager is to evaluate the evolution of the production of CDW in the city. To do this, a dataset with demographic information by districts have been set with socio-economical information as well as building licences, new construction licences, maintenance licences and available area of construction. The manager can update or modify the dataset through the CDW datasets menu. In this menu, the manager can also update or modify the other dataset used to study the evolution of the waste collected by the Clean Point (the other main functionality of the tool for managers).

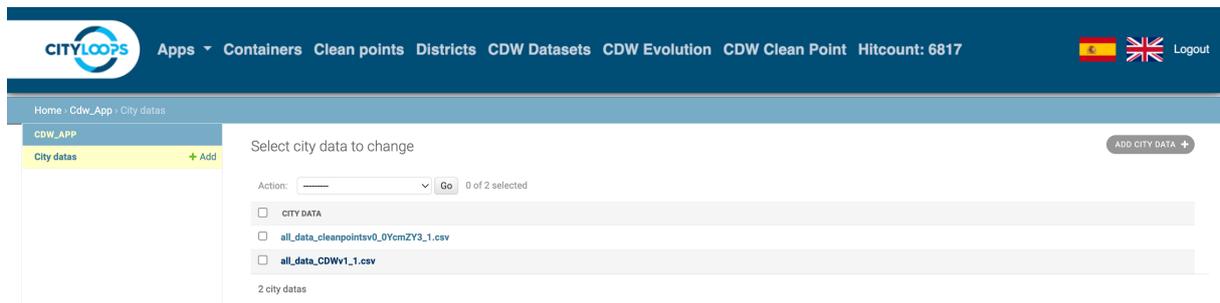


Figure 8. CDW Datasets page.

Once the manager checks the dataset, different estimations on the CDW production in the city can be done by the CDW evolution menu. Those simulations by ML contribute more information about the origin of the CDW in the city in order to make decisions in advance on the logistics, and infrastructures of the current Clean Points or the potential location of new ones if required. To get the estimations, the manager just selects the correct dataset and has to determine the year of study for the simulation.

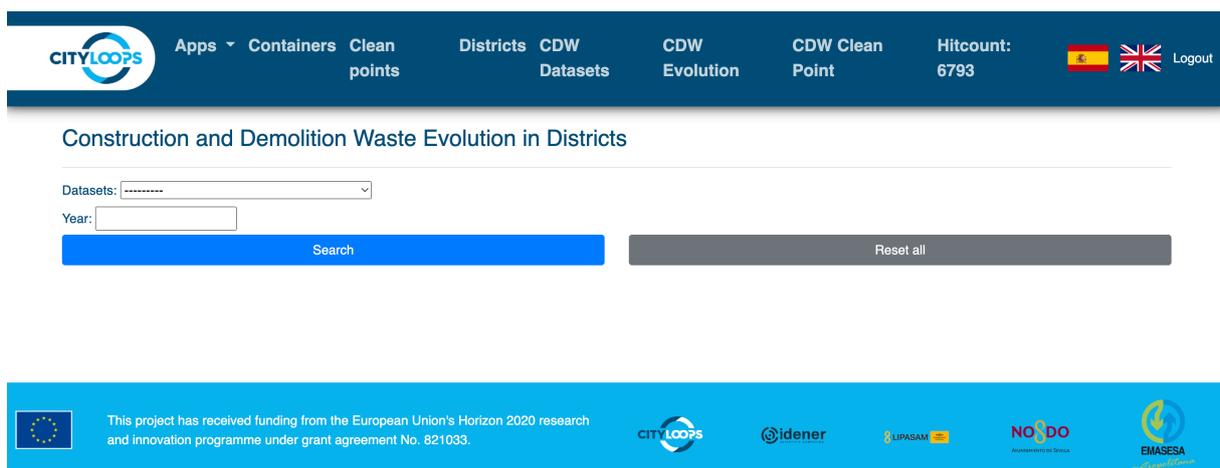


Figure 6. CDW evolution page.

Different simulations have been made by Lipasam's managers (some can be seen in Annex VIII) who keep increasing the dataset with internal data. Below an example is shown with a simulation of 2030. Results from this simulation showed similar CDW production amounts in most of the districts in the city with an exception. The centre of the city (Casco Antiguo) showed the most CDW production in comparison with the rest of the city. This result is due to the limited available construction area in the city as well as the economic framework in which new construction buildings are limited for several years. Therefore, the maintenance works in the centre of the city as well as reform works in old buildings show an upward trend with the related CDW production. Results will definitely help in the decision-making process to take the advance of this information and adapt the infrastructure as well as the CDW collection service in this potential scenario.

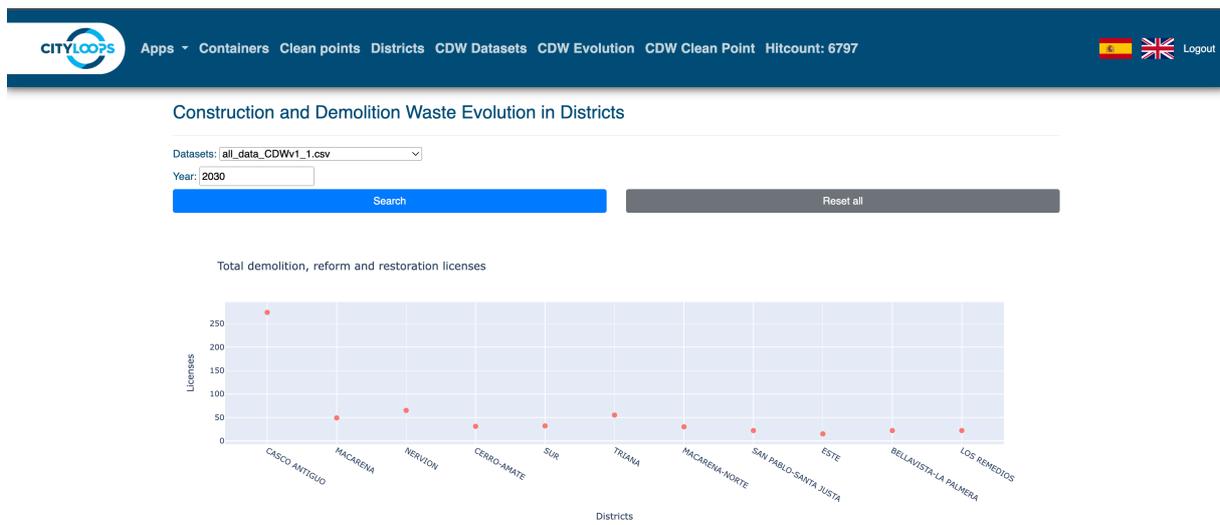


Figure 7. CDW evolution page (Results).

The other main functionality for the manager is to evaluate the evolution of the CDW collection in the different Clean Points in comparison with the other waste collected in such facilities. To do this, a dataset with demographic information by districts has been set with internal information from Lipasam. The manager can update or modify the dataset through the CDW datasets menu as shown previously. Once the manager checks the dataset, different estimations on the CDW collection can be done by the CDW Clean Point menu. Those simulations by ML contribute more information about the estimated CDW amount to collect in order to make decisions in advance on the logistics, and infrastructures of the current Clean Points. To get the estimations, the manager just selects the correct dataset and has to determine the year of study for the simulation.

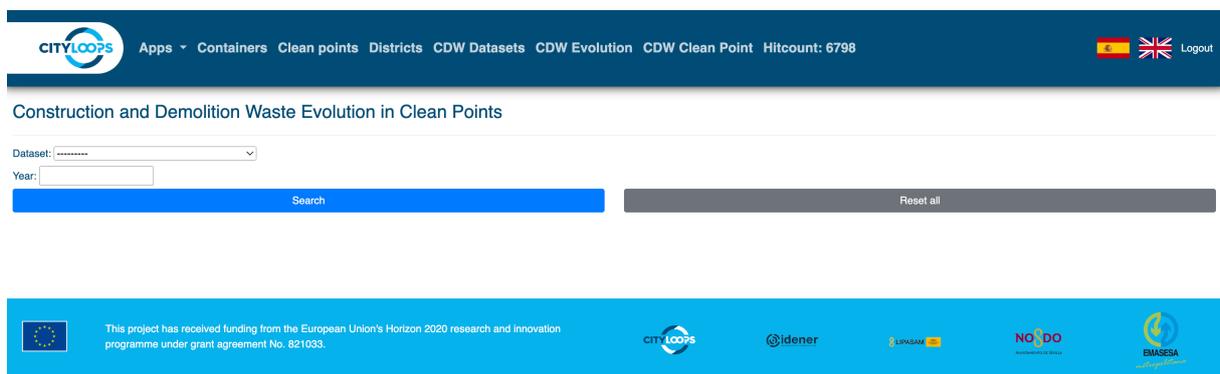


Figure 8. Clean Point evolution page.

Different simulations have been made by Lipasam's managers (some can be seen in Annex IX) who keep increasing the dataset with internal data. Below an example is shown with a simulation of 2030. Results from this simulation showed similar CDW collection amounts in most of the Clean Points with an exception. The Clean Point "Las Jacarandas" showed an

increase in CDW collection in comparison with the rest of the Clean Points. First, the short differences between the CDW collection amount in the Clean Points are explained because the construction activity in the city has been limited for several years because of the economic framework, so no significant changes are expected. Finally, the increase shown in "Las Jacarandas" results due to the proximity of the Clean Point to the several Industrial Estates which are more likely to the CDW production. Results will definitely help in the decision-making process to take the advance of this information and adapt the infrastructure as well as the CDW collection service in this potential scenario.

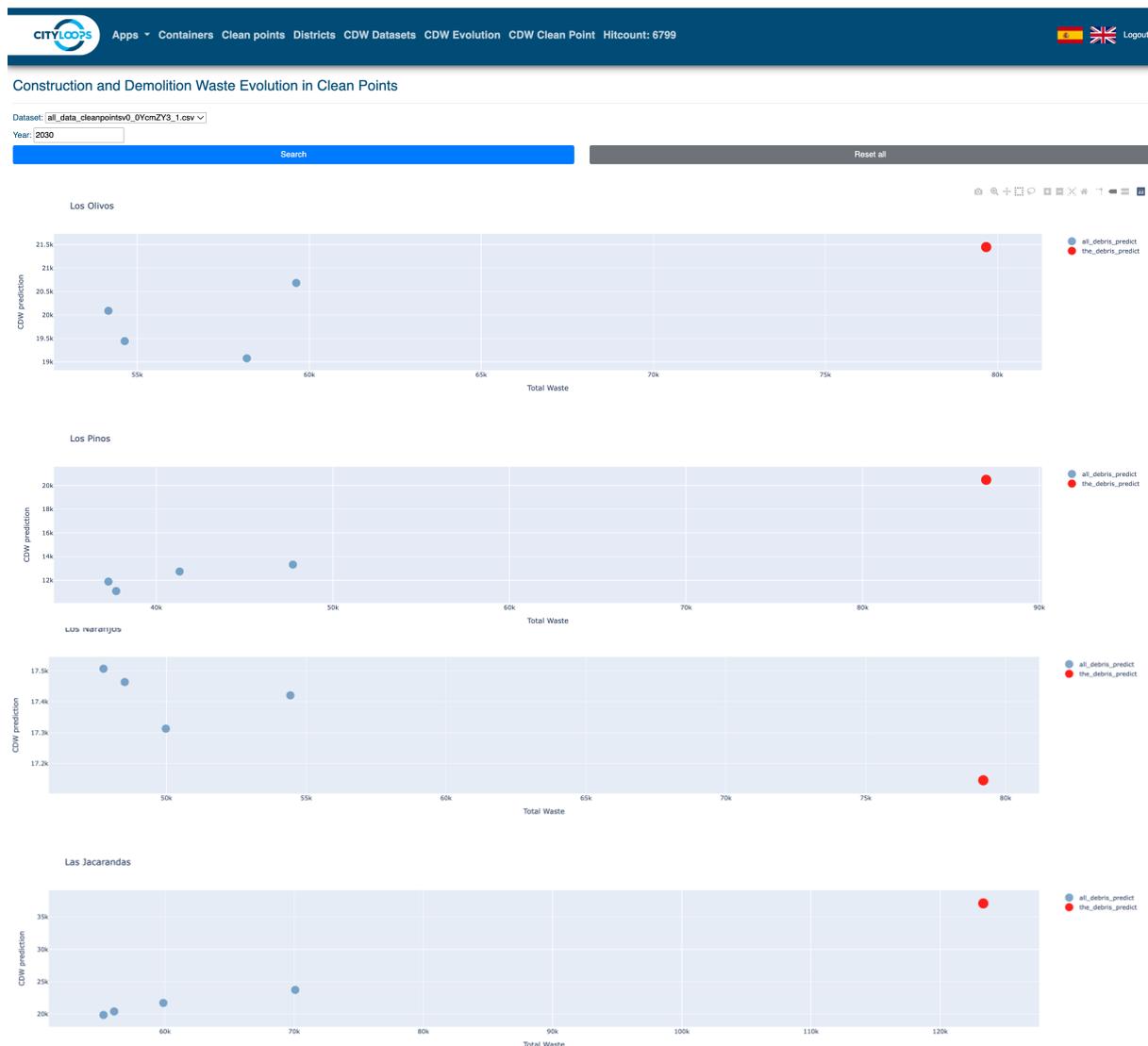


Figure 9. Clean Point evolution page (Results).

Functionalities of CDW platform for managers.

- District representation of Seville Data: The city of Seville will be divided into a discrete representation of districts and overlapped over a real map of the city.

- Data request of each district: Each district will be represented by different social and economic aspects, and the waste generation will be described. The remaining areas must be classified as “urban soil”, “urban land scheduled for development”, “rural areas” or “natural ecosystem”.
- Representation of the growth of the city: The growth of the city will be represented in a time-lapse showing in the last frame the projection of the next 3, 5, and 10 years according to the data provided by the manager through the platform.
- Location of potential future “clean points”: Using the data provided by the managers and machine learning techniques, the platform will present the areas where “clean points” could be placed in the next few years, according to the previously decided criteria.

CDW FLOW OPTIMISATION TOOL

Digital tools have been developed to optimise the use of Seville’s Clean Points for collection of CDW from citizens and small producers. Data will be shown through a web portal, with one interface for citizens to instruct them to the Clean Point best suited to receive their CDW, and one interface for city managers to understand the quantity of CDW at each Clean Point and plan for future scenarios of city growth to open new clean points. Data collected on the stocks and flows of CDW through the cities’ Clean Points will be used to continuously optimise their management. The collected CDW will be treated by Fermovert if need be, to ensure its safety and quality for further future uses. Lipasam, the waste management company of Seville, plans to analyse the composition of the CDW collected in Clean Points, in order to evaluate the potential uses of the material recovered and be able to take decisions with the aim of recuperating costs for the Clean Points management and CDW treatment. Finally, an awareness campaign will aim to introduce these tools to the public and encourage proper handling of CDW, in order to avoid the common practice of illegal dumping of CDW.

Lessons learned

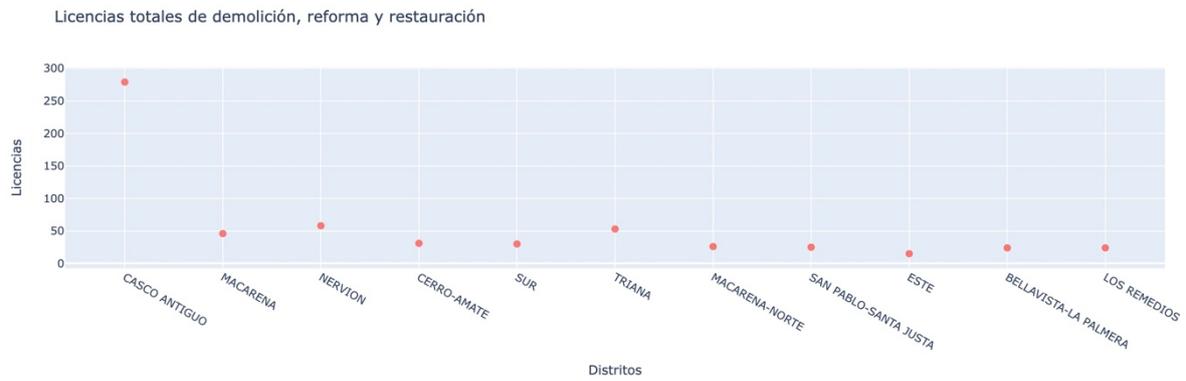
- Distributed presence of clean points around the city.
- Separate collection of as many fractions as possible and the possibility to drop off professional CDW, under the limits established.
- Training of the staff of clean points to maximize CDW recycling and appropriate management.
- Proximity of the sites to citizens (e.g., easily accessible with a car and nearby to residential areas).
- Long opening hours to enhance convenience for citizens.
- Regular inspection of “frequent” areas where waste is abandoned.
- Try to implicate the neighbourhood of the surrounding areas.
- Inform recurrently about possible sanctions for CDW abandonment.

- Maximise the divulgation of CDW collection service and facilitate users' actual information of the clean points (IT tool)
- Optimise the infrastructure and facilities according to actual requirements (including machine learning methodology to analyse available data)
- IT tools could increase the users' commitment, 6,824 visits to the tool in the last 12 months.

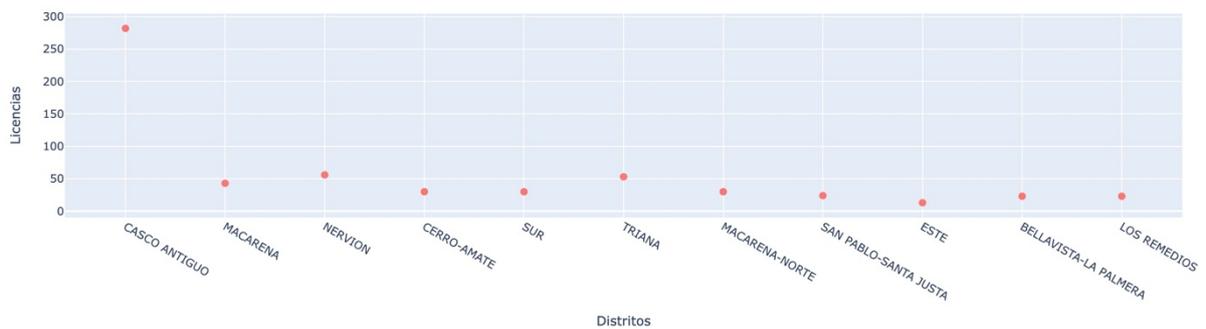
<https://cdw-app.idener.es/>

ML ANALYSIS BY LIPASAM MANAGERS (CDW PRODUCTION)

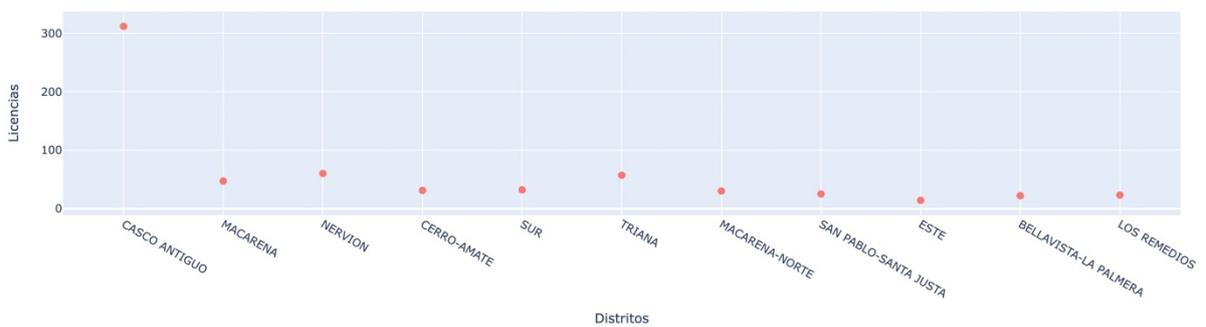
2023_ Evolution of CDW production



2025_ Evolution of CDW production

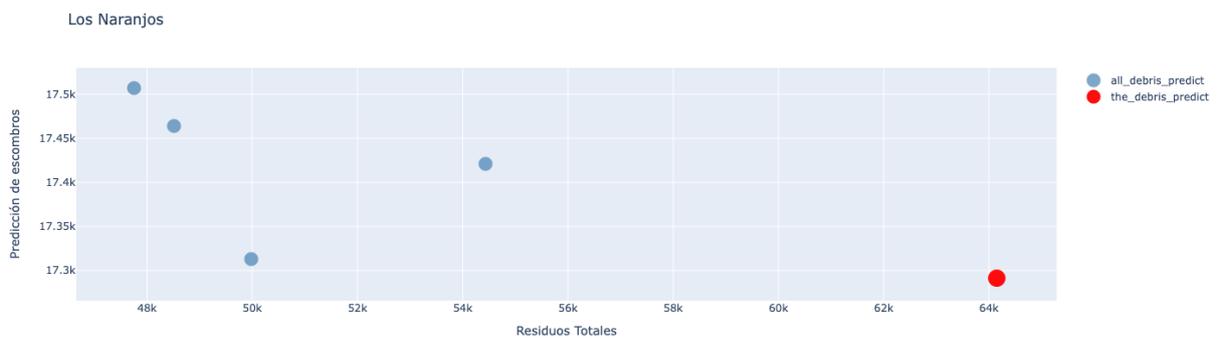
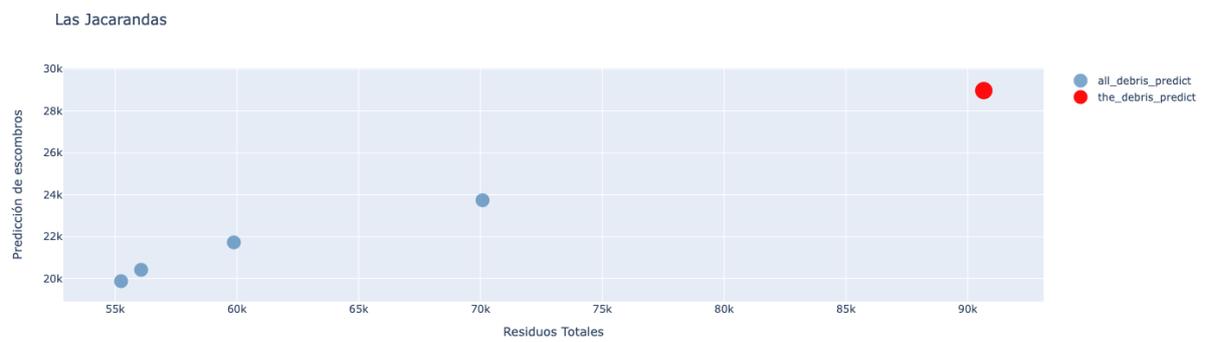
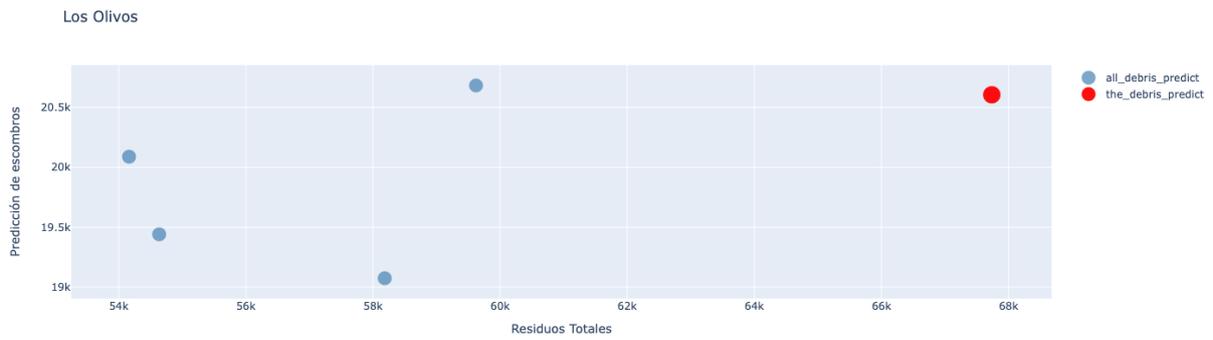
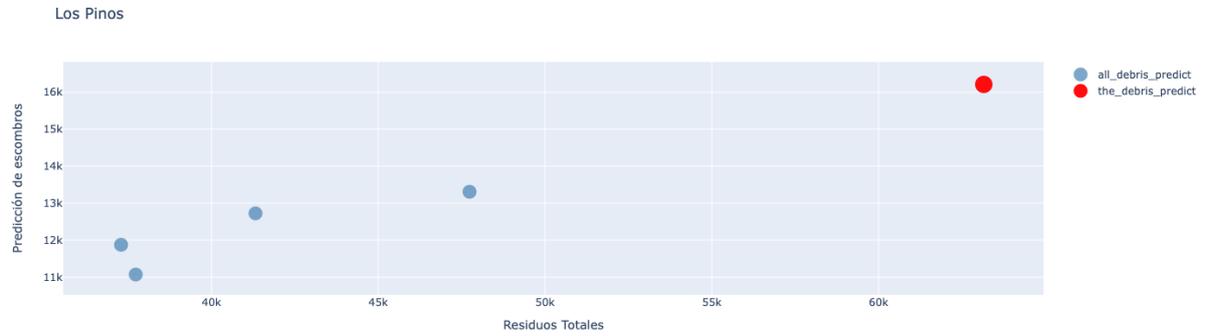


2040_ Evolution of CDW production

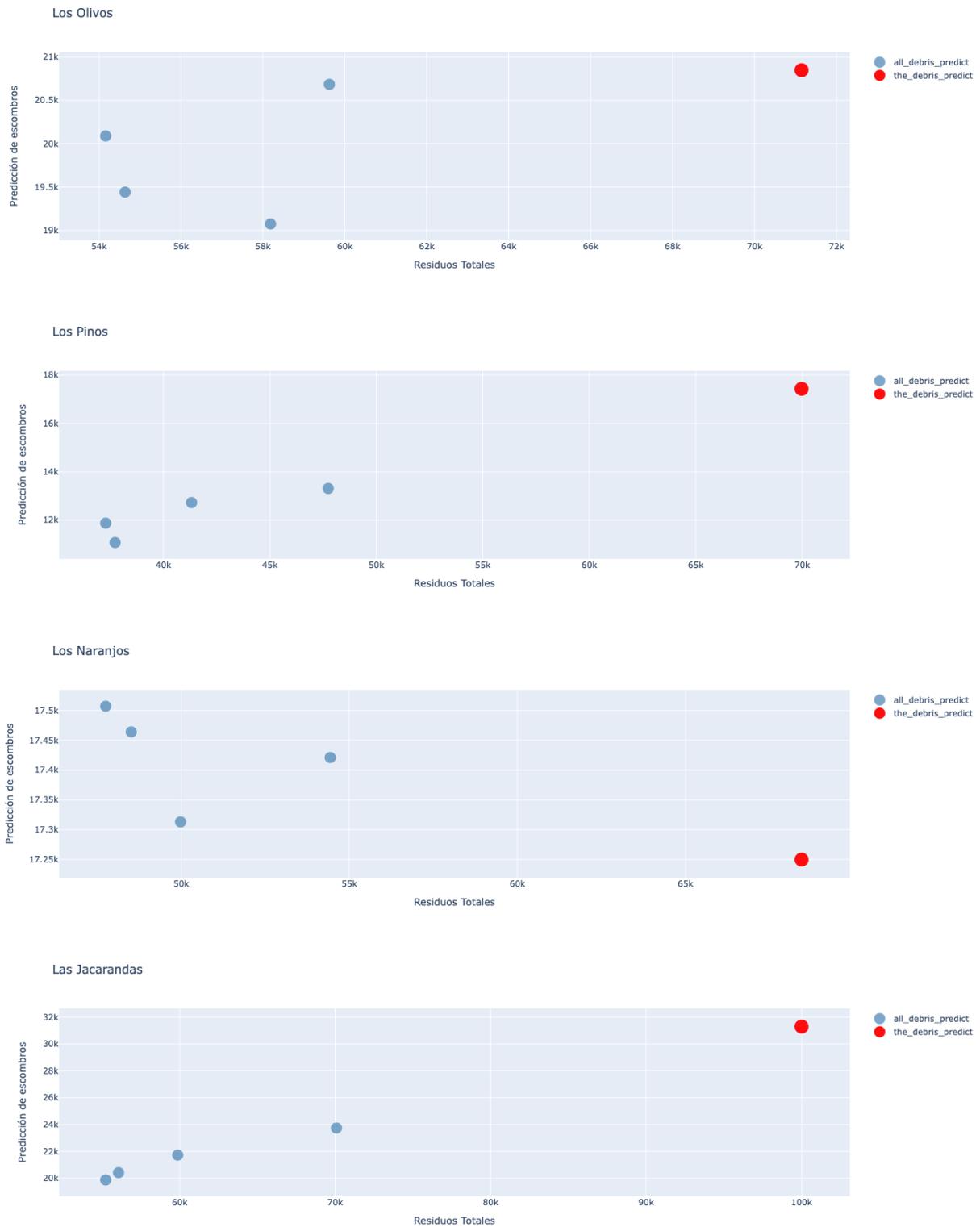


ANNEX IX. ML ANALYSIS BY LIPASAM MANAGERS (CLEAN POINTS)

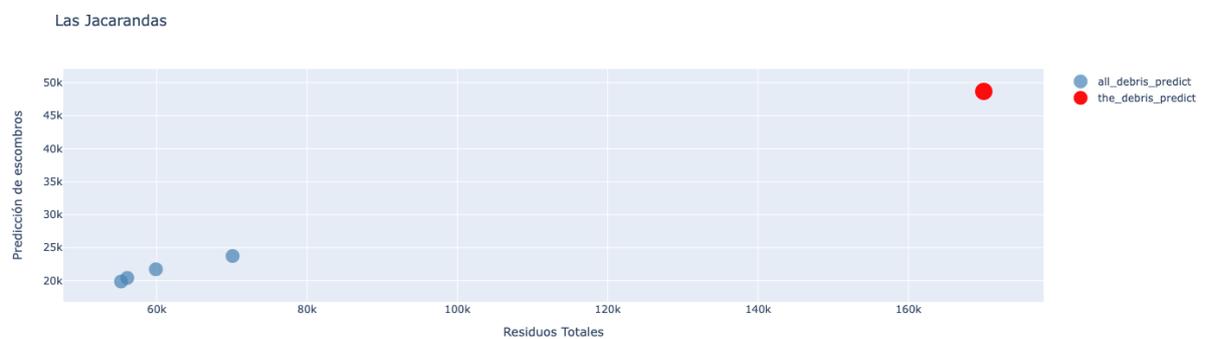
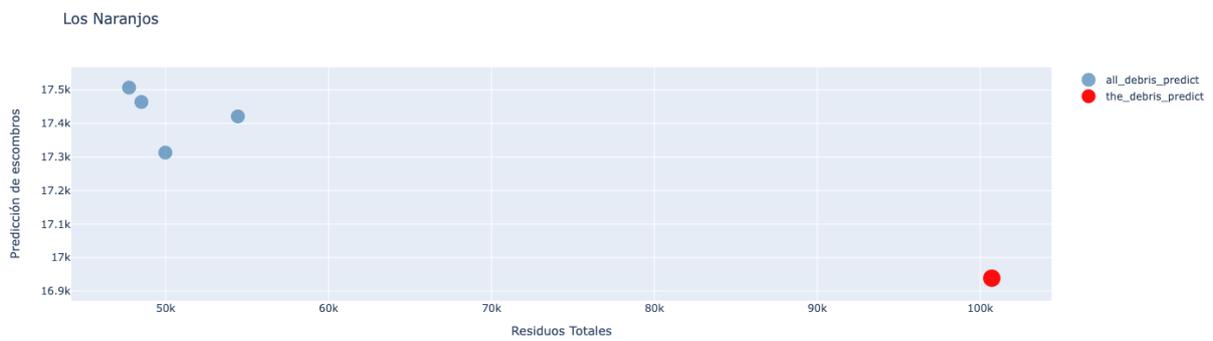
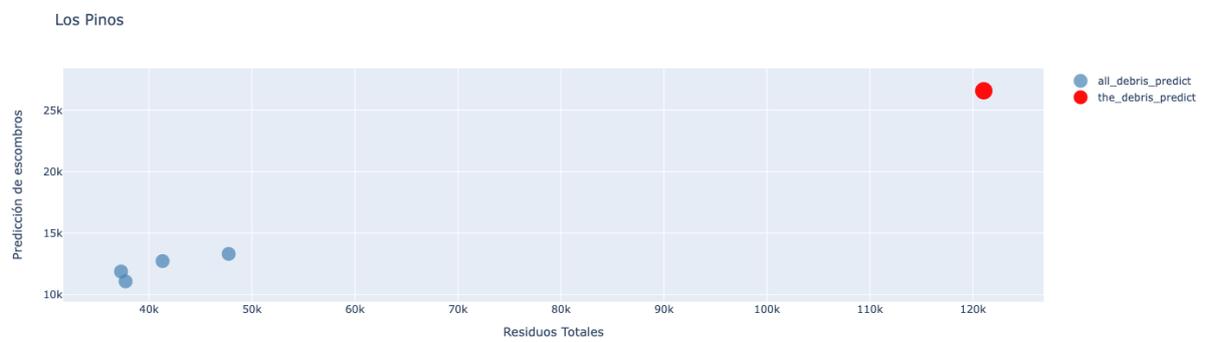
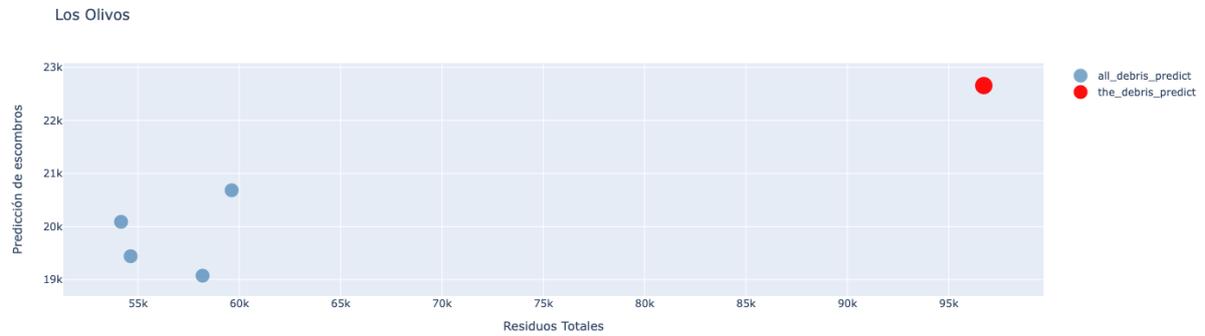
2023_Evolution of CDW collected by Clean Points



2025_ Evolution of CDW collected by Clean Points



2040_ Evolution of CDW collected by Clean Points



CITYLOOPS

CityLoops is an EU-funded project focusing on construction and demolition waste (CDW), including soil, and organic waste (OW), where seven European cities are piloting solutions to be more circular.

Høje-Taastrup and Roskilde (Denmark), Mikkeli (Finland), Apeldoorn (the Netherlands), Bodø (Norway), Porto (Portugal) and Seville (Spain) are the seven cities implementing a series of demonstration actions on CDW and soil, and OW, and developing and testing over 30 new tools and processes.

Alongside these, a sector-wide circularity assessment and an urban circularity assessment are to be carried out in each of the cities. The former, to optimise the demonstration activities, whereas the latter to enable cities to effectively integrate circularity into planning and decision making. Another two key aspects of CityLoops are stakeholder engagement and circular procurement.

CityLoops started in October 2019 and will run until September 2023.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 821033.

Disclaimer: The sole responsibility for any error or omissions lies with the editor. The content does not necessarily reflect the opinion of the European Commission. The European Commission is also not responsible for any use that may be made of the information contained herein.