



Measure Evaluation Result

LIM 5.2 - Promotion and creation of network for collecting of used cooking oil

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Executive Summary

Before DESTINATIONS, cooking oil was mostly thrown away by restaurants and hotels, resulting in the loss of a valuable secondary raw material. Under such circumstances, the local partners identified the opportunity to convert the used cooking oil into biofuel, contributing to the achievement of Sustainable Development Goals (SDGs) and specifically to the affordable and clean energy, sustainable cities and communities, responsible consumption and production, and climate action.

To achieve this, there was a need to create a network for the collection of Used Cooking Oil (UCO) from entities of Limassol. A feasibility study was carried out about the most suitable way to collect the oil, as well as an analysis for economic aspects of the system. A network for UCO collection was created in Limassol with the participation of 8 hotels and 13 restaurants (3 hotels and 3 restaurants more than initially stated in the Grant Agreement).

Moreover, the hotels which were involved in this action were awarded as Green Hotels for providing their UCO for recycling during the ceremony that took place on 12th July 2019, as described in measure LIM 6.2 - Business cases for combined tourist and mobility products. Additionally, the stakeholders wanted to continue keeping the label of green hotels and continue to contribute towards the preservation of the environment.

Key stakeholders expressed their willingness to participate in this measure and recycle the UCO from their hotels and restaurants. Tourists and residents were informed about the collection and recycling activities of UCO from the entities involved in the measure, and they supported the entities and were happy to know that Limassol was becoming more environmentally friendly. A specific route was chosen based on the distance between the hotels and restaurants to avoid additional driving. Collecting and recycling the used cooking oil has positive effects on local businesses as well as the environment, due to the minimization of waste production and the conversion of the waste into a biodiesel product for use in the sustainable mobility sector and mobility logistics, as well as being useful for heating buildings and powering vehicles.

Through the implementation of the measure, 70% of people who participated in the survey stated that they were aware of the measure, and 90% accepted it. Also, several stakeholders who had not been involved were aware about the action and showed interest in participating in the UCO network and recycling their UCO in the future.

The recycling of UCO should be adopted by businesses and further promoted at a global level. With the development of this measure, it is expected to guide locals in introducing the future vehicles that use biodiesel fuels.

A Description

Stratagem Energy Ltd, with the cooperation of Limassol Tourism Board, have created a network for collecting used cooking oil (UCO) from hotels and restaurants (Figure 1) in Limassol in order to recycle the used cooking oils and use them as a sustainable biodiesel product for the mobility sector. UCO Containers have been distributed to hotels and restaurants who participated in the measure. Hotels that have already implemented this measure have been awarded with the “Green Hotel” label. This measure has been promoted in the eco-driving campaigns of DESTINATIONS for further awareness among local people.

The Kaz Oil company is responsible for the collection of the UCO from the involved hotels and restaurants of Limassol. The UCO is collected twice per week from the involved businesses, enhancing the amount of oil that is collected and recycled. The collected UCO is shipped abroad, specifically to the United Kingdom, Greece, and Netherlands, where it is recycled and used as a sustainable biodiesel product in the mobility sector.

The principle behind bio-dieseling is to take cooking oil and process it into a fuel that is thin enough to spray from a regular diesel engine’s fuel-injection system. This is done chemically, by converting the oil into two types of compounds: biodiesel, which shares the original oil’s combustibility, and glycerin, which retains the oil’s thick, viscous properties. Drain away the glycerin, and you are left with a fuel that you can pour into any diesel vehicle with no further modification. The chemical reaction will not proceed to completion if the temperature is too low, thus we need to prepare the biodiesel in a room-temperature (70 F).



Figure 1: Collection of UCO from Hotels and Restaurants

A1 Objectives and outputs

City policy level objectives

The measure is in line with Limassol Municipality, aiming to create and promote a network for collecting used cooking oil, contributing to the below objectives:

- Reduce environmental pollution
- Introduce a large number of stakeholders who recycle cooking oil
- Decrease the price of the fuels
- Awareness of recycle cooking oil and its use as biodiesel
- Increase the total share of citizens that use smarter and more fuel-efficient mobility modes
- Change habits of local people and tourists
- Contribute to the newest “Zero Waste Management Hierarchy for Europe” developed by the Circular Economy network Zero Waste Europe (ZWE) for Closing the Loop

Measure specific objectives

- Create a network for collecting the used cooking oil from restaurants and hotels in Limassol
- Reduce pollution through the use of recycled biofuel
- Change behaviour and work together with local businesses for a common vision, for a friendlier and cleaner environment
- Establish co-operation between tourism and mobility sector

Outputs

- Involvement of 5 hotels and 10 restaurants in the UCO network
- The outcome for this measure will be the creation of this network for collecting the used cooking oil from hotels and restaurants in Limassol
- Involve an additional 3 restaurants and 3 hotels¹

Supporting activities

Limassol Tourism Board has approached restaurants and hotels to become suppliers of cooking oil for the implementation of this measure, while Limassol Municipality has approached and contacted restaurants to inform and involve them in the measure.

A2 Inter-relationship with other measures

LIM 6.2 *Combined tourist and mobility products: Green Label Award and Tourist Mobility Card* measure aims to enhance tourism and leisure transport through the implementation of a Tourist Mobility Card, which is supported by Green Label partners. Hotels which were involved in this action were awarded as Green Hotels for providing their UCO for recycling during the ceremony that took place on 12th July 2019 (as described in LIM 6.2).

A3 Target groups and/or affected part of the city or region

Tourists and residents moving across Limassol region will be influenced by this measure.

A4 Stakeholders involvement

Stakeholder name	Activities description
Restaurants Association	Provide the list and the network of Restaurants to be involved in the measure
Hotels Associations	Provide the list and the network of Hotels to be involved in the measure

Table 1: Stakeholder involvement

¹ Extra output with DESTINATIONS budget

B Measure implementation

B1 Situation before CIVITAS

Cooking oil was mostly thrown away by restaurants and hotels, resulting in the loss of a valuable secondary raw material. This used cooking oil could be converted into biofuel, thus contributing to the achievement of Sustainable Development Goals (SDGs) and specifically to the affordable and clean energy, sustainable cities and communities, responsible consumption and production, and climate action. For these reasons it was essential to create a network for the collection of used cooking oil and for the recycling of the used cooking oil into biofuel.

B2 Innovative aspects

The most innovative aspect of this measure is related with the **new conceptual approach**. The new developed network for the collection of used oil and the recycling of it into biofuel was a totally new approach introduced within Limassol city.

With the creation of the network for the collection of the UCO and the successful use of the network, more and more entities will be included in the network, increasing the amount of UCO used for the generation of biodiesel, increasing the supply amount of biodiesel, and allowing the use of biodiesel in more applications. These activities will contribute to waste minimization, increase the resource efficiency sustainability, and introduce new biofuels. Also, cities adopting the UCO network can succeed in becoming more environmentally friendly.

B3 Technology development

Not applicable.

B4 Actual implementation of the measure

A feasibility study was undertaken, including meetings with hotels and restaurants where presentations of the measure and its activities have been undertaken.

Key stakeholders expressed their willingness to participate in this measure and recycle the UCO from their hotels and restaurants. Limassol Tourism Board and Limassol Municipality have been involved in the process of the identification of hotels and restaurants and approached key stakeholders to become suppliers of UCO. Moreover, the Kaz Oil company ensures the successful collection of the UCO from the hotels and restaurants of Limassol.



Figure 2: Collection of UCO from Hotels and Restaurants

A network for the collection of used cooking oil from hotels and restaurants in Limassol has been created during November 2018, where 8 hotels and 13 restaurants have been involved. The Kaz Oil company is responsible for the collection of UCO from the involved hotels and restaurants. Hotels which were involved in this action were awarded as Green Hotels for providing their UCO for recycling.



Figure 3: The Green Label award

The used cooking oil is collected twice per week from the involved businesses, enhancing the amount of oil that is collected and recycled.

Through the implementation of this measure, a total amount of 18,480 kg of UCO was collected from the involved businesses during 2019. The collected cooking oil is shipped abroad, specifically to the United Kingdom, Greece, and Netherlands, where it is recycled and used as a sustainable biodiesel product in the mobility sector.

C Impact evaluation

C1 Evaluation approach

Expected impacts and indicators

Impact category	Impact indicator	Unit of measure
Energy	1-Used cooking oil collection	Total volume of UCO collected - m ³
Society	2-Awareness level about the collection of used cooking oil	%
Society	3-Acceptance level about the collection of used cooking oil	%

Table 2: Expected impact and indicators

Method of measurement

Impact indicator	Method*	Frequency			Target Group	Domain (demonstration area or city)
		Bef	Dur.	After		
1-Used cooking oil collection	DC	16	28	40	Population of demonstration area	demonstration area
2-Awareness level about the collection of used cooking oil	DC/S	n.a.	21-26	34-41	General public, operators (residents and visitors), PT customers.	demonstration area
3-Acceptance level about the collection of used cooking oil	DC/S	n.a.	21-26	34-41	General public, operators (residents and visitors), PT customers.	demonstration area

*(Data collection (DC), Estimation (E), Survey (S))

Table 3: Method of measurement

Detailed description of the indicator methodologies:

1- Used cooking oil collection – This indicator was gathered using data provided from the Kaz Oil company. The data revealed the total amount of collected UCO.

2 - Awareness level about the collection of used cooking oil and 3 - Acceptance level about the collection of used cooking oil – Data for these indicators was collected through 350 surveys applied to tourists and residents in 2018 (172 tourists; 3 locals) and 2019 (175 tourists), in which it was asked: “Are you aware about the collection of used cooking oil from hotels and restaurant in Limassol?” and the question “Would you recycle your UCO if you had the option?”

The Business-as-Usual scenario

Considering the type of indicators, mostly comprised of surveys and indicators whose information was gathered for the first time, carrying out a BAU analysis was not possible. However, the local partners understand that without the project implementation, Limassol city would remain without an innovative way to convert the used cooking oil into biofuel, which mostly contributes to reducing pollution through the use of recycled biofuel.

C2 Measure results

Impact category	Impact indicator	Unit of measure	Baseline	Ex-Ante	Ex-Post
Energy	1-Used cooking oil collection	Total volume UCO - m ³	0	30	35
Society	2-Awareness level about the collection of used cooking oil	%	0	40	70
Society	3-Acceptance level about the collection of used cooking oil	%	0	40	90

Table 4: Measure results

C2.1 Energy

1 – Used cooking oil collection

This innovative measure that has been implemented in Limassol for the first time reached 35 m³ of collected UCO, a very promising amount. The raw resources will be substituted by the recycled ones, and thus the use of resources will be preserved. Using biodiesel can reduce carbon dioxide emissions, resulting in a high reduction of greenhouse gas emissions in the environment.

C2.2 Society

2 – Awareness level about the collection of used cooking oil and 3 – Acceptance level about the collection of used cooking oil

Following the implementation of this measure, it was understood that 70% in 2019 and 23% in 2018 of the surveyed people were aware of the UCO collection initiative, positively answering the question “Are you aware about the collection of used cooking oil from hotels and restaurant in Limassol?”. In addition, 90% in 2019 and 85% in 2018 answered “Yes” to the question “Would you recycle your UCO if you had the option?”, which is a very positive result and indicates that most of the surveyed people have accepted the measure and are ready to recycle their UCO as well.

Also, several stakeholders who had not been involved in this measure were aware of this action and showed interest in participating in the UCO network and recycling their UCO in the future.

C3 Quantifiable targets

No.	Target	Rating
1	Reduction of environmental pollution	N/A
2	Achieving a large number of stakeholders who recycle cooking oils	***
3	Decrease the price of fuels	N/A
4	Greater awareness of options for recycling cooking oil	***
5	Increase of the total share of citizens that use smarter and more fuel-efficient mobility modes	N/A
6	Change habits of local people and tourists.	N/A
7	*Increase the collected amount of UCO in Limassol: 30 m ³	***
8	*Increase the awareness and acceptance level of people regarding the UCO by 50%	***
<p>N/A = Not Assessed 0 = Not Achieved * = Substantially achieved (at least 50%) ** = Achieved in full *** = Exceeded</p>		

*New targets, not in GA

Table 5: Assessment of quantifiable targets

Targets 1 to 6 were planned in the Grant Agreement, but Targets 7 and 8 were new targets adapted to the scope of the measure. In the evaluation phase, after having implemented all the actions envisaged in the measure, it became clear that the impacts indicated in the GA for Targets 1, 3, 5, and 6 were not quantitatively measurable, although they would have been reached to a certain extent.

Despite these GA Targets not being possible to be assessed under this measure due to lack of such statistical data, the local partners understand that through this measure, a reduction of environmental pollution was achieved (Target 1).

Target 2 has been Exceeded. The implementation of this measure was able to achieve a large number of stakeholders who showed interest in recycling their cooking oils, reaching in total 8 hotels and 13 restaurants. Stratagem will continue the efforts to convince more hotels and restaurants to recycle their used cooking oil after DESTINATIONS.

Target 3 was not possible to be assessed due to a lack of data for the use of recycled cooking oil as biofuel and the application of this into vehicles. The collected UCO is shipped abroad, specifically to the United Kingdom, Greece, and Netherlands, where it is recycled and used as a sustainable biodiesel product in the mobility sector and therefore in Limassol the use of biofuel is not a common practice yet. For that reason, the estimation of the price of fuels cannot be assessed.

Target 5 was not possible to be assessed due to a lack of data on modal share, but it is expected that the total share of citizens that use smarter and more fuel-efficient mobility modes has been increased, following the implementation of actions under other DESTINATIONS measures.

Target 6 was not possible to be assessed due to a lack of quantitative data. However, it is expected that actions carried out closely with the restaurants and hotels staff will contribute to a change in habits of local people and tourists. This outcome is also accompanied by the survey question regarding the intention to recycle their UCO if they had the option, to which 90% of people answered positively.

Target 7 has been Exceeded, due to the number of participating hotels and restaurants. In total, 8 hotels and 13 restaurants have been involved in the action, compared to the initial target of 3 and 10 respectively. This allowed data to be collected and analysed from a larger number of entities. Therefore, 35 m³ of UCO were finally collected.

Targets 4 and 8 were Exceeded. With the creation and promotion of a network for collection of used cooking oil, residents and tourists are more aware of other options for recycling cooking oil. In addition, considering the results of the surveys in 2019, it was assessed that 70% of the surveyed target group were aware of the measure activities, and 90% are ready to recycle their own UCO. Additionally, it is expected that people working in those hotels and restaurants are now informed about the recycling of used cooking oil and will adopt this practice not only in their homes, but they will spread the news to other people as well.

C4 Up-scaling of results

Not applicable.

D Process Evaluation Findings

D1 Drivers

Key stakeholders expressed their willingness to participate in this measure and recycle the UCO from their hotels and restaurants. Tourists and residents were informed about the UCO collection and recycling activities from the entities involved in the measure, and they supported the entities and were happy to know that Limassol is becoming more environmentally friendly. Additionally, it was of great importance to promote sustainable mobility with less fossil fuel emissions in the centre of Limassol.

D2 Barriers

The main barrier for the collection of used cooking oil was that hotels and restaurants might have needed to be on the same road of the collection track to avoid excess movement around the city. However, a specific route was chosen based on how close they were to the route, allowing the evaluation to proceed.

D3 Main Lessons Learned

Collecting and recycling the used cooking oil has positive effects on the local businesses as well as the environment. By recycling the UCO, the waste will be significantly reduced. Also, the recycled UCO can be used as a biodiesel product in the sustainable mobility sector and mobility logistics, as well being useful for heating buildings and powering vehicles. Using biodiesel can reduce carbon dioxide emissions, resulting in a reduction of greenhouse gas emissions in the environment. Therefore, the recycling of UCO should be adopted from businesses and further promoted at a global level.

Tourists enjoy their leisure trips in a friendlier and cleaner environment. The behaviour of local stakeholders was changed towards a more sustainable environment. Also, several stakeholders that had not been involved in this measure will now be aware of this action and will start participating in the UCO network and recycle their UCO in the future.

E Evaluation conclusions

The evaluation demonstrated positive aspects. Most importantly, through the created network for collecting UCO from hotels and restaurants, it made it feasible for the hotels and restaurants to participate in the measure, who otherwise may have found it difficult to take their UCO to a collection point. The increase in the number of involved hotels and restaurants was the most relevant achievement. Additionally, the UCO collection and the “Green Hotels” award contributed to raising the awareness level of people regarding the possibility of recycling UCO. Following this, most of the surveyed population (90%) were willing to recycle their own UCO produced in their households. Stakeholders who did not have the chance to be involved in this measure previously also now showed interest in participating in the UCO network and recycle their UCO in the future.

F Additional information

F1 Appraisal of evaluation approach

Most of the targets were impossible to be estimated due to a lack of statistical data, and although it is expected that all of these targets have been achieved, the grade of achievement is unknown. This belief is supported by the information of tourists and residents about the collection and recycling activities of UCO from the entities involved in the measure through social media. Moreover, they supported the entities and were happy to know that Limassol is becoming a more environmentally friendly city.

F2 Future activities relating to the measure

Used Cooking Oil is mostly generated in restaurants and hotels. With the creation of the network for the collection of the UCO and its successful use, more and more entities will be included in the network, increasing the amount of UCO used for the generation of biodiesel and increasing the supply amount of biodiesel. This can result in a greater environmental gain from waste (UCO) management. Also, cities included in the UCO network can succeed in becoming more environmentally friendly.

Stratagem will maintain contact with the Kaz Oil company after the end of the project, ensuring the successful collection of UCO from the hotels and restaurants in Limassol. This is benefited by the recycled cooking oil being a successful business case for the companies that will collect it, lowering their waste and the amounts which they must spend for their waste management procedures. With the development of this measure, the local partners hope to guide locals in introducing future vehicles that use biodiesel fuels.

Additionally, the stakeholders want to continue keeping the label of green hotels, wanting to continue to contribute towards the preservation of the environment. Moreover, having the Green Label award might assist the awarded entities to attract more reservations from clients with increased environmental ethic and behaviour.