

## **DELIVERABLE D.T.1.3.2.**

# **EUROPEAN EXPERIENCE IN WASTE MANAGEMENT AND RECYCLING IN TOURISTIC AND RECREATIONAL AREAS**



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Tourism as an industry plays an important role in many local and regional economies. At European level, there are regions where tourism is one of the main sources of income for both the local budget and local businesses. Thus, developing the tourism offer, creating opportunities for local SMEs to operate and, at the same time, ensuring that the growing number of tourists can be accommodated plays an important role in the strategies and priorities of many local and regional authorities.

However, the tourism industry not only brings some financial gains, but also employs a fairly large share of people - 9.4% of all employees in non-financial enterprises. If the number of these employees was extended to car rentals and other travel agencies, tour operators and accommodation, this share would increase to 11.8% (Eurostat, 2016).

The tourism industry should not be viewed solely by way of economic benefits. Tourism plays an important role in the urban socio-economic processes of many cities and regions, but tourism as an industry should also be analyzed in terms of environmental impact, as it is responsible for a small part of waste generation in Europe (approx. 6.7% of waste comes from the tourism sector) (UNEP, 2003).

The influx of tourists is an additional source of waste as the attractiveness of a tourist destination can be affected by the way of waste management, a tourist generates about 1 kg of solid waste / day, sometimes even more) (UNEP, 2003)

According to information from the **Best Environmental Management Practice in the Tourism Sector**, hotels generate, on average, about one kg of unsorted waste per guest per night. Tourists can generate up to twice the amount of waste normally generated by a resident.

The composition of waste in accommodation units is similar to that of household waste, but it varies to a certain extent depending on the services provided, for example hotels with restaurants have a higher share of organic waste.

Europe's cities are some of the largest tourist destinations in the world. The socio-economic impact of tourism is extraordinary in terms of the jobs it creates, the contribution to local economies and much more, but at the same time it brings a number of negative externalities, including high levels of unsustainable resource consumption and waste generation.

Compared to other cities, tourist cities have to face additional challenges related to waste prevention and management due to geographical and climatic conditions, to the seasonality of the tourist flow and to the specificity of the tourism industry and tourists as waste producers.

A series of various research, exercises and processes carried out through different projects have helped to understand the key links between urban metabolism, waste management in tourism and the added value of healthy ecosystems in urban areas. These



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findings have helped cities assess their own baselines and certain things and connections that work in their own local or regional reality.

European cities and regions are full of good practices, some of which are considered to be even best practices, solutions and replicable ideas. These practices, solutions and ideas must be adopted in other areas as well, not only within the borders where they were created.

Recently, waste generation and the solutions needed for its management have become increasingly important and a growing general public concern.

"Applied waste management" is becoming more and more a necessity – while looking for waste management solutions for specific circumstances.

A project of URBAN WASTE is presented to exemplify the European experience in terms of waste management and recycling in tourist and leisure areas, following that results should be distributed to the representatives of the tourist facilities and the participants in the training courses that will be organized.

The project launched the Charter of Commitments for Sustainable Resource Management and the Circular Economy in January 2018 and now includes the names of 27 signatory parties.

It is structured on the following chapters:

- Understanding the impact of tourism processes on waste generation and waste management
- Measuring the environmental impact, as well as the social and economic impact of innovative strategies
- Situational analysis of consumption, behavior and patterns of waste in tourism (the influence of tourism on waste generation)
- Overview of the economic, social and environmental benefits associated with drawing up a solid waste management program in recreational facilities.

The URBAN-WASTE project has shown that the tourism industry, including the hospitality sector, the goods and services, and even the means of transport used by tourists are quite unexplored areas when it comes to applied waste management.

As already mentioned, the number of tourists often does not exceed the local population, except for year-round destinations and small coastal resorts.

What this project has shown, involving 11 different cities and regions, is that there is a will to work together to improve and adapt waste management practices to different tourism processes.



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The amount of knowledge, skills and examples changed and tested over the 3 years has helped these cities and regions to be famous for what they have achieved by showing the way forward with this knowledge.

These guidelines are not only proof that certain improvements could work and achieve some GHG savings, but also that the local community is happy to see such improvements. The social impact assessment that has been explained in these guidelines shows that such strategies, easy to compare to an adventure or an experiment, bring the local community together and make it stronger and more aware of the problems around them.

The implementation of a successful strategy for addressing waste generated by tourism can be achieved by adopting the following principles:

- Establish a precise baseline scenario - necessary to understand the way tourism impacts waste generation and management and to identify where priorities should be placed;
- The development of a collaborative approach with the different local actors of the tourism sector (HORECA, the organizations that manage the tourist points) is essential to have a clear and concrete overview of the opportunities and barriers to be expected when implementing the measures. It is also a precondition for ensuring their involvement in the effective implementation of actions, for which they are likely to play an active role;
- Adopting a gender mainstreaming approach for the initial assessment, decision-making and defining and implementing measures to ensure that they target all tourists and optimize its efficiency;
- Ensuring the involvement of local players by signing partnerships and commitments and establishing detailed operational plans with a precise distribution of responsibility and adequate resources.
- Providing them with visibility through public events and media coverage is also very important, as well as a consistent follow-up of their involvement;
- The definition and implementation of an appropriate monitoring system to evaluate the results of the measures and the involvement of the organizations implementing the measures, is mandatory in order to optimize the strategy and improve the strategy.
- Environmental, economic and social impact assessment is also a good way to promote more tangible results to decision makers, potential participants and the general public.

Nevertheless, the project not only intended to provide guidelines and then enforcing cities and regions to copy the proposed approach, but also to look for other areas that are



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already implementing similar things, in a different manner, for the same purpose - A sustainable management of resources.

## 1. Understanding the impact of tourism processes on waste generation and waste management

Local and regional realities have been analyzed in 11 pilot cities and regions: Copenhagen, Dubrovnik - Neretva county, Lisbon, Nicosia, Ponta Delgada, Florence, Tenerife, Santander, Kavala, Nice Metropolis - Cote d'Azur and Syracuse.

The findings served as a basis for discussions with local and regional stakeholders that have been brought together under Good Practice Communities. Communities represented the place and opportunity to map, locate, identify and define the role of each stakeholder in these processes and to define the eco-innovative measures that pilots and stakeholders will implement subsequently.

The fact that these 11 pilot locations stretch from the Easternmost part of the Mediterranean Sea to the middle of the Atlantic Ocean and from the subtropical island of Tenerife to the Northern capital Copenhagen means that local realities were almost the same. This is why the project analyzed these pilot locations through different categories in order to better understand their local characteristics. These categories reflected the type of tourism of the pilot locations, the tourist offer, the seasonality of the tourism, the geographical and topographical characteristics and more.

The waste collection systems in selected cities in general and in tourist units in particular show substantial differences. There are cases where waste streams from tourist activities, mainly from hotels and restaurants, are collected either as municipal solid waste or as commercial waste. Based on city-specific data, it is therefore difficult to allocate quantities directly to tourism activities. This stems from the fact that such waste generated by tourism activities is often collected together with household waste and other similar waste to household waste.

Europe and its cities are diverse in terms of climate, architecture, socio-economic characteristics and this is reflected in the wide variety of waste management practices that different cities and regions carry out. One of the key consequences of this is how different fractions of waste are defined, levied, collected and treated. One of the waste streams that is particularly affected by these differences is the one generated by various industries and trade, including tourism. The fact that this waste can be assimilated to household waste or that it has a completely independent status, being simply called commercial waste, can also lead to different consecutive collection and treatment schemes. Therefore, knowing the nature of the data, the origin of the waste stream, those who have the right and responsibility to collect and treat it and the way it can be aggregated with other data plays an important



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role in understanding whether this waste can be part of an eco-innovative measure or strategy.

For a better evaluation of the waste generation process, derived from tourist activities, quantitative data on waste, the number of resident population, the number of tourists and the number of days / nights spent by tourists are required.

A key observation worth mentioning here, before starting the analysis of these data, is that the examination of monthly data provides better correlations, better results and, therefore, a better understanding of the different trends than the annual data. The reason behind this is that tourism is quite seasonal in the European context, as there are few areas in Europe that can be considered a year-round destination with a high tourist intensity that attracts a large number of tourists.

Analyzing only Tenerife as a pilot region, which could be considered as an entire year destination, it has been noticed that there is, in fact, a clear correlation between the higher number of nights spent by tourists (i.e. the intensity of tourism) and the production of residual waste. This could easily indicate that tourism has a significant influence on the island's waste generation, but as this special analysis only includes annual data, some significant conclusions and statements are difficult to make.

After analyzing the monthly data that led to more statistically significant correlations, the conclusion and suggested approach for examining the real impact that tourism has on waste management is to assess the monthly trends and available data.

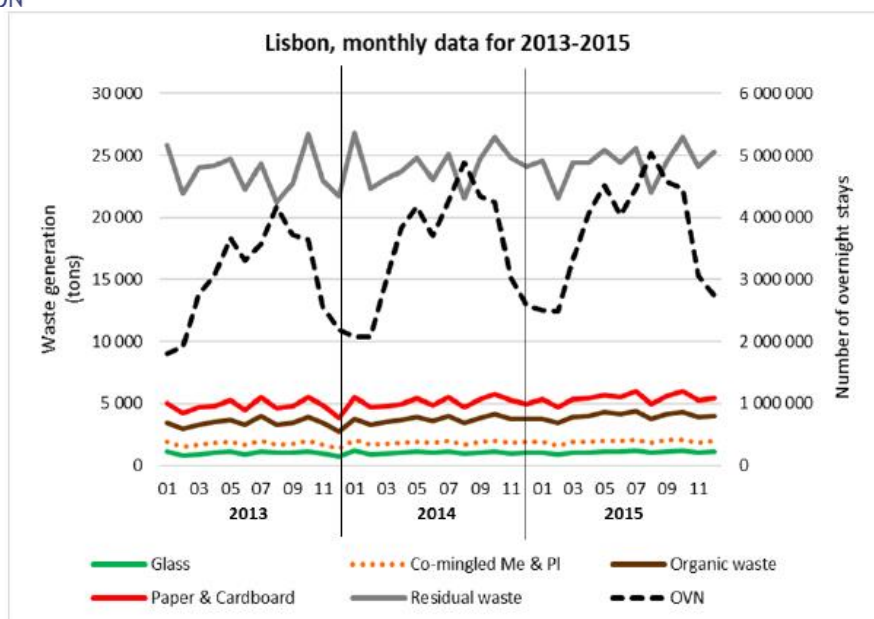


Figure 1. Comparison on waste production and number of overnight stays – Lisbon, during 2013 - 2015

What the Lisbon project noted was that in the months with the highest number of overnight stays (summer season), there is a significant decrease in waste quantities.

In fact, all recyclable materials as well as organic waste show very similar variations to residual waste, including a noticeable decrease in the quantities collected in months, with a peak in the number of tourists.

The interesting fact is that the amounts of waste generation increase again as the overnight stays decrease. The explanation lies in the fact that Lisbon has been classified as a dense urban area with a low tourist intensity, which means that it has a large local population, which can counteract overnight accommodation. Certain spring months and summer holidays (especially August) are the periods when the local population goes on holiday from Lisbon. At the same time, commercial activity is declining, which contributes nonetheless to waste generation. This case of Lisbon perfectly describes seasonality.

A completely opposite trend was observed in the pilot cities with lesser local population and a clear seasonality in terms of tourism. In Ponta Delgada, the summer months are the high season of tourism. As shown in Figure 2, the peaks in the number of nights are clearly visible for all summer months during 2013-2015.





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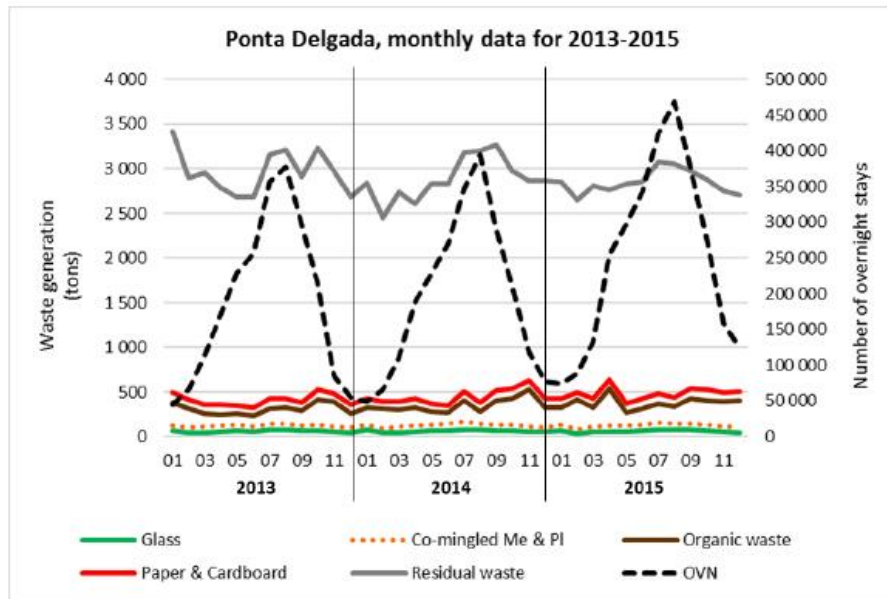


Figure 2. Comparison of waste production and number of overnight stays Ponta Delgada, in the period 2013 – 2015

A very similar conclusion can be made for the city of Santander, which is also a popular summer destination. Figure 3 shows similar trends for Santander and Ponta Delgada.

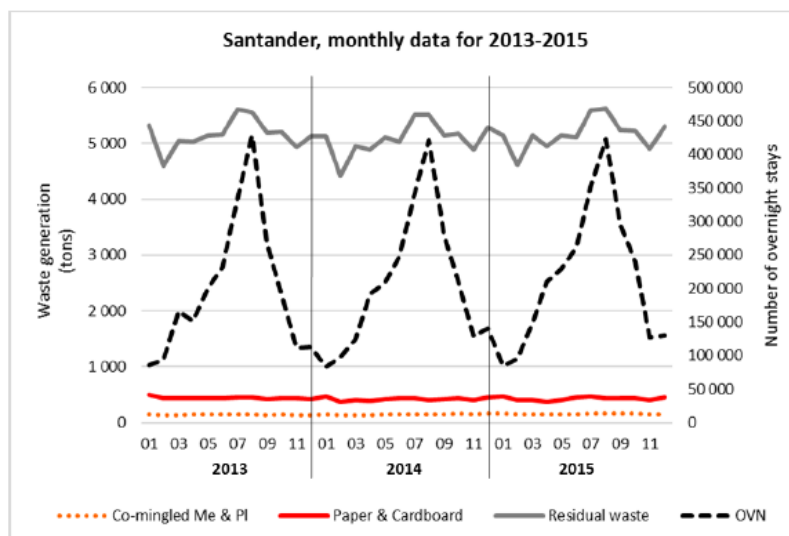


Figure 3. Comparison of waste production and the number of overnight stays in Santander, during 2013 and 2015

A completely different tourist pattern can be observed in Tenerife, as a representative of the group, including destinations with high tourist intensity, in Figure 4.



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A place like Tenerife records a high number of overnight stays almost all year round, except for a decrease during spring. In terms of waste generation, a very similar trend is visible, but the peaks are less significant than those related to tourism data (the same applies to separately collected recyclable materials). However, analyzing the data on bio-waste, a trend was observed that matches the peaks in accommodation.

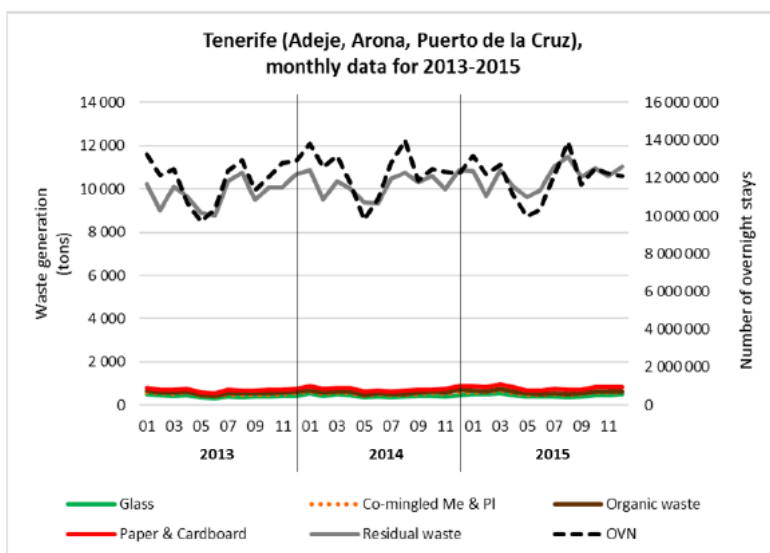


Figure 4. Comparison regarding the production of waste and the number of overnight stays in Tenerife, in the period 2013 – 2015

Measuring the environmental, the social and the economic impact of innovative strategies.

The purpose of this activity is to provide quantitative and qualitative data showing how waste prevention and improved waste management practices in a particular city or region have been performed compared to the baseline scenario.

The comparison of the "baseline" impact with the "innovative eco-strategies" implemented is based on the data collected during the monitoring phase.

The way of assessing the sustainability performance of certain measures implemented over a certain period of time was reviewed. Assessing this performance, including the environmental, social and economic characteristics, is important not only for the local or regional authority to demonstrate that it has invested human or financial resources, but also to return to the local stakeholders who made these things happen and provide them with quantitative and qualitative results of these measures. Some general observations and conclusions that can already be mentioned now are so simple and visible that those measures involving direct action have generally been considered to have a high awareness potential.



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Cases where staff training has been considered irrelevant reflect the fact that the measures are perceived as rather easy and appropriate for a particular unit.

In terms of job satisfaction and the perceived meaning of the measures can vary considerably.

According to the respondents' comments, the low ratings for these indicators can be explained by low job satisfaction, but it may also reflect that some work routines during the implementation of the measure were not significantly different from the normal situation. Regarding some general economic observations, most of the costs related to the measures were less than EUR 2,000, in the case of the project except for the few cases where investments in container facilities and other larger equipment were part of the implementation.

## 1.1 Understanding comparisons and methodologies

URBAN-WASTE has conducted a study using several pilot-units to see the impact of eco-innovative strategies that worked well and are worth being suggested as good practice.

In order to understand where the results come from, one must understand certain methodologies and assumptions used in evaluations. The assessments were made on the basis of environmental, social and economic indicators.

The environmental impact assessment is limited to the Global Warming Potential (GWP). The global warming potential was chosen due to its relevance as a high public and institutional interest and being one of the most pressing environmental issues of our time. In order to be able to transpose the environmental impact into GWP, three scenarios have been analyzed following different waste streams. The functional unit, which quantifies the performance of a measure, is used as the reference unit. In line with the target and with view to avoiding waste, as well as to improve waste management strategies, the functional unit has been defined as 1 kilo of prevented waste or 1 kilo of waste sent for recycling instead of incineration or storage.

**Material recycling:** the waste to be recycled at the end of life is sent to material recycling. Secondary material, the residual product is credited for the replacement of the primary material so as to distribute the loads appropriately between the different life cycles of the product. These further process steps are modeled using industry average stocks.

**Energy recovery:** in cases that materials are sent to waste incineration, they are linked to an inventory that accounts for waste composition and heating value, as well as regional efficiency and power heating. Credits are granted for power and calorific value using the mix of regional grid and natural gas thermal energy. The latter is the cleanest fossil fuel and therefore results in a conservative estimate of the avoided load.



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**Storage:** in cases where materials are sent to landfills, they are linked to an inventory that accounts for waste composition, regional runoff rates, landfill gas capture, as well as the utilization rates (flare vs. electricity generation). A power credit is granted using the regional network mix.

The social impact assessment was based on an online survey derived from the Social Life Cycle Assessment (SLCA) guidelines of the United Nations Environment Program (UNEP and SETAC, 2009).

The method was limited to a smaller number of mostly qualitative indicators that are relevant to the current context, i.e. work schedule, employment, training, perceived job satisfaction and significance in relation to the measures, within the categories of stakeholders workers and managers.

The economic impact was assessed based on the costs [€] associated with the implementation of a given measure. Specifically, investments in materials and equipment were assessed, as well as cost-saving opportunities.

Economic data were collected from the same survey as social data, with expenditures divided into predetermined intervals.

The measures that have been implemented have ranged from waste prevention, increasing selective collection to environmental awareness and certification. Unfortunately, there were measures that could not be assessed by the LCA, therefore quantitative data could not be provided. The scope of the measures covered various topics such as prevention, reuse, waste collection, sorting and recycling while reflecting the state of the art of waste disposal / minimization in certain cities and regions. An overview of the different measures is to be found in Table 1.



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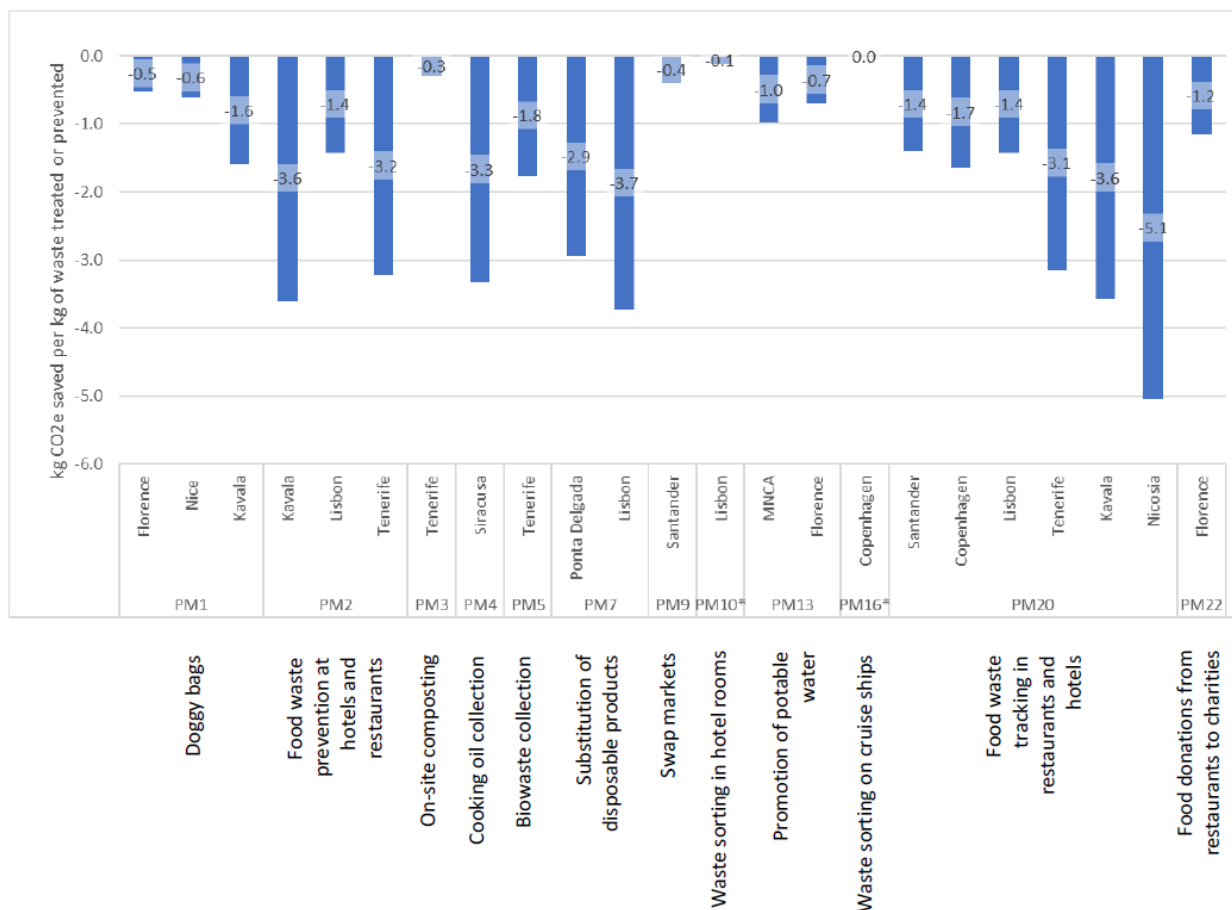


Table 1. Assessed measures

<b>Prevention, reuse and recycling of organic waste</b>	<b>Prevention of disposable products generation</b>	<b>Increasing selective collection</b>
"doggy bags" for food waste prevention	replacing single use products in hotels	collection points for the used cooking oil
prevention of food waste in restaurants and buffets	promoting the use of drinking tap water	waste sorting in hotel rooms
collection of bio-waste in hotels and restaurants	exchange markets	recycling advisers for the tourism sectors
donating excess food from restaurants and hotels to charities		installing waste sorting bins in public and tourist areas
in situ composting at tourism units		providing instructions on the selective collection of waste in different languages
		providing information on the selective collection of waste on cruise ships

Source: translated from Guidelines for City Managers and Policy Makers URBAN-WASTE

Figure 5 shows the comparative analysis of GHG emissions saved per kg of treated or prevented waste. It may not be easy to interpret and therefore the guidelines will divide it into different categories, as in Table 1.



Source: Guidelines for City Managers and Policy Makers URBAN-WASTE

Figure 5. GHG emissions saved per kg of treated or prevented waste

It is important to know that the results and savings shown in Figure 17 do not take into account the number of restaurants or hotels or any other beneficiary and show the average savings per kilogram of waste prevented or treated. The results are therefore highly dependent on the baseline scenario and reflect several important factors and indicators:

- The share of the separate collection in a specific city or region;
- Treatment options carried out in a specific city or region (waste storage, material recovery / recycling, incineration or other energy recovery options);
- The origin of the primary material or object (impact of its transport).



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The social and economic assessments will be described together with the measures and will complement them once conclusions are drawn on the most appropriate measures for different cities or regions.

Each measure will be assigned a color code for difficulty vs. the benefits it entails.

Green is used for measures with a satisfactory impact, yellow for those with an impact that could be greater with some improvements or if they are implemented in a different way setting and red for measures that have not led to sufficiently positive impacts.

## 1.2 Prevention of disposable products

Tourism activities generate short-lived disposable products that can be easily replaced with other environmentally friendly solutions. Actions that promote the replacement of disposable products and the promotion of drinking water can avoid all the production of plastic products and plastic waste, which have a high GWP. These actions also tend to lead to economic savings. This is especially true for plastic containers with soap and plastic bottles. When it comes to plastic soap containers, a hotel in Lisbon and one in Ponta Delgada have been replaced with reusable dispensers. Florence and the Nice Cote d'Azur Metropole (MNCA) have promoted drinking water to replace plastic water bottles that are waste generators. Santander tried to include a wider range of waste types which are quite bulky, WEEE and paper and organized its first exchange market.

The impact of the measures on the categories mentioned above is presented below.

### PREVENTION OF THE SINGLE USE PRODUCTS

#### Replacing single use products in hotels

##### Description of the measure

340 reusable soap / shampoo dispensers have been distributed in Lisbon and 213 in Ponta Delgada to replace disposable plastic containers. Each dispenser was assumed to be in use for one year.

##### Environmental impact

This measure can be considered quite good in terms of GHG savings per kg of waste reduced or treated - 3.7 kg of CO<sub>2</sub> equivalent in the case of Lisbon. The fact that Ponta Delgada is rather remote and the transport of goods, as well as their treatment, lead to increased GHG emissions make this score slightly lower in the Azores - 2.9 kg CO<sub>2</sub> equivalent. The Lisbon score is in fact the second best of all the pilot measures, because it avoids waste generation



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and it is the capital, i.e. the distances for goods and waste are shorter. So, from the point of view of plastic waste prevention, this pilot measure obtained a better score than the one in Florence and the Nice Cote d'Azur Metropolis (MNCA), which will be analyzed later on.

### Social impact

This measure can be considered quite good in terms of GHG savings per kg of waste reduced or treated - 3.7 kg CO<sub>2</sub> equivalent in the case of Lisbon. The fact that Ponta Delgada is rather remote and the transport of goods, as well as their treatment, lead to increased GHG emissions make this score slightly lower in the Azores - 2.9 kg CO<sub>2</sub> equiv. The Lisbon score is in fact the second best of all the pilot measures, because it avoids waste generation and is the capital, ie the distances for goods and waste are shorter. So, from the point of view of plastic waste prevention, this pilot measure obtained a better score than the one in Florence and the Nice Cote d'Azur Metropolis (MNCA), which will be analyzed later.

### Economic assessment

The hotel in Ponta Delgada reported no change in costs, while Lisbon saw a decline. "It's cheaper to refill than to use disposable bottles. The highest cost was for the dispensers purchased for all the hotel rooms ", reported the Lisbon hotel. The costs were EUR 500 in Ponta Delgada and EUR 2,000 - EUR 5,000 in Lisbon. The savings from fewer shampoos and soaps have been estimated at less than € 500 in Ponta Delgada and over € 10,000 in Lisbon.

## **Drinking water promotion**

### Description of the measure

Florence and the MNCA focused on the 3 water coolers and promoted them to reduce the production of plastic water bottles. It was assumed that each reusable bottle would be refilled 7 times before being discarded

### Environmental impact

The GHG savings per each kg of waste avoided by this pilot measure were among the lowest of all, with only 0.7 kg of CO<sub>2</sub> equivalent in Florence and 0.98 kg CO<sub>2</sub> equiv. in the MNCA. The reason why the MNCA got a better score is due to a lower plastic waste recycling performance than Florence and therefore GHG savings were better.

### Social impact

This pilot measure did not change the social impact at all, because the water coolers were already in use; however, this measure has been recognized by city administrators and staff as a measure that can raise awareness. The MNCA decided to install 4 new water coolers during the project.

### Economic evaluation

n / a





## Exchange markets

### Description of the measure

Santander organized the first exchange market in the city during World Environment Day where the city wanted to stimulate the principles of reuse in the city. As the exchange market included all types of goods and articles, the functional unit for environmental impact and GHG savings was decided to be one kg of a book produced from virgin paper.

### Environmental impact

The first exchange market in Santander ended with 128 kg of goods and items that were exchanged which led to a GHG saving of 0.41 kg CO<sub>2</sub> equivalent per kg of waste avoided / prevented.

### Social impact

This measure had a rather high social impact, as it obtained a score of 5/5 in terms of raising awareness of the potential scale and being a measure that is visible to the public. This measure does not require any specific training, but it results in overtime if the market is not organized on a working day. However, the city can also work to make the local population responsible for starting to organize such events on their own. In any case, it was reported that the local authority in Santander really liked the measure and decided to turn it into an annual event.

### Economic assessment

The costs of materials and equipment ranged between 500 - 2,000 euros and represent communication material and certain logistics. Unfortunately, the yields are not significant, almost non-existent, but such events also help raise awareness among the local population as they stimulate community engagement and allow them to retrieve perfectly functional items instead of buying a new one.

Consequently, the environmental impact assessment shows that the baseline scenario plays an important role in the potential success of a measure. Florence and the MNCA, being large municipalities and regions that receive many tourists and have a fairly warm climate throughout the year, decided to promote drinking water and try to avoid the generation of plastic waste. The overall impact was remarkable, as the measure itself would have saved 41.7 t CO<sub>2</sub> equivalent and 50.4 t CO<sub>2</sub> equivalent if it had taken place throughout the year. However, once this result is aggregated to the local reality, the options and treatment of waste management, as well as GHG emissions associated with the production of refilled bottles we can see that GHG savings per kg of waste avoided are not greater than 1 kg CO<sub>2</sub> equivalent. In the case of Lisbon and Ponta Delgada, a city like Lisbon can achieve great savings given the large number of hotels and being well positioned, close to the place of



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production of reusable goods, resulting in reduced transport impact on the environment. Ponta Delgada took advantage of the environmental performance of the reusable dispenser, but the distance made it less efficient.

In terms of social and economic impact, these measures had a very high potential to increase the awareness of tourists and locals. So this can be considered an added value.

Most of the measures did not require additional working hours, except for the exchange market, as it was the local authority that organized it. From an economic point of view, most of the existing measures were used, such as water coolers or required moderate investments of several thousand euros. However, even these investments have resulted in reported revenue increases for the Lisbon hotel. Economic and social assessment thus promotes the drinking water from wells as an easy way to reduce the impact on the environment, as it does not require too many resources to support it, and especially not human or financial resources (unless in case it is about installing new water coolers).

### 1.3 Prevention, reuse and recycling organic waste

The measures presented in this subchapter aim to prevent the production of biological waste, either in the form of kitchen waste or food waste. Some measures also concern the recovery of food waste, if it is generated.

The principle underlying these measures was that bio-waste has a comparatively higher global warming potential (GWP) than other waste streams, which means that it represents a significant potential for reducing GHG emissions.

The analysis below summarizes them in terms of environmental, social and economic impact and also provides a color code, which indicates the potential for replicability and overall potential achievements.

## PREVENTION, REUSE AND RECYCLING OF ORGANIC WASTE

### Bags/ packaging for the leftovers (doggy bags)

#### Description of the measure

The bags allow guests to take their uneaten portion of the ordered menu, preventing it from becoming a waste of food at the restaurant. This measure not only avoids waste generation, but can replace another meal and thus reduce production, preparation and, ultimately, more food waste.

#### Environmental impact

This measure requires a production of packaging. However, since the potential of GWP is only 65 g CO<sub>2</sub> equivalent, it is almost negligible. In fact, the assessment shows that the total GHG savings are about 5 times higher than the production of bags.



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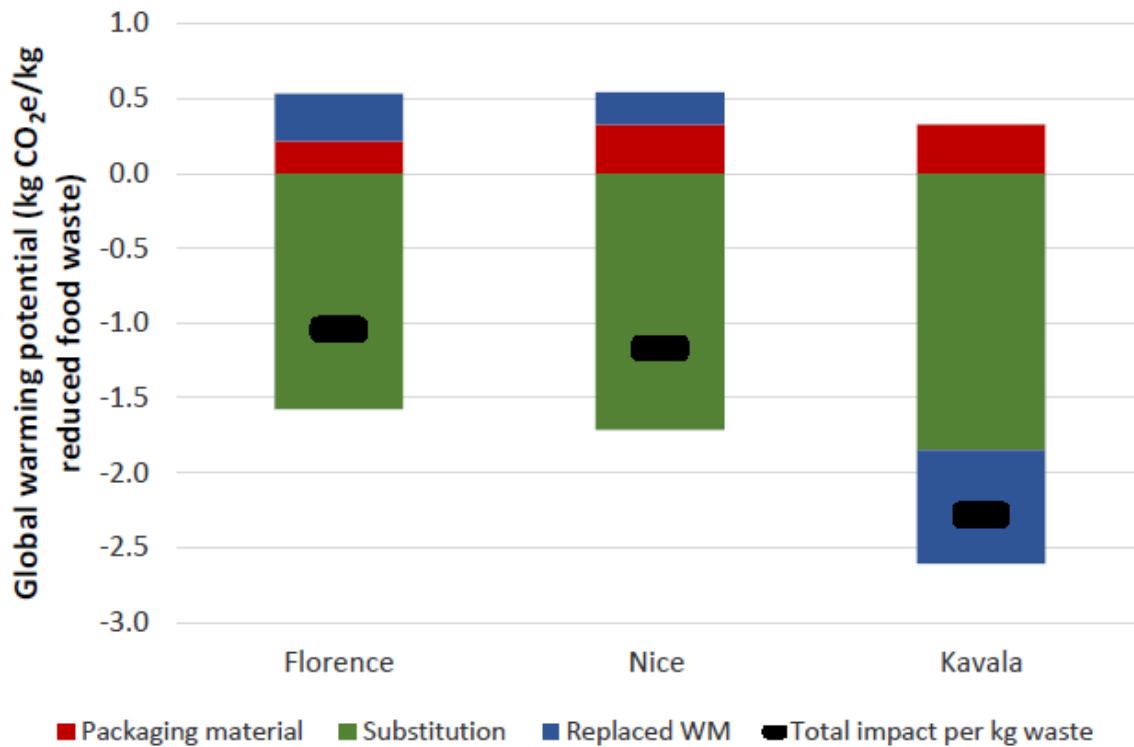


This impact assessment assumes that at least half of the leftover food in the bag is actually consumed, as it is difficult to track what happens to the food once it has left the restaurant.

This measure is a perfect one to describe the importance of the baseline of the scenario, as did the pilot areas that implemented this measure - MNCA, Florence and Kavala have three completely different kinds of bio-waste treatments.

Because bio-waste landfills have much higher GWP than Florence anaerobic digestion or composting and incineration in MNCA, GHG savings per kg of reduced food waste in Kavala were 1.6 kg CO<sub>2</sub> equivalent compared to 0.5 kg CO<sub>2</sub> equivalent and 0, 6 kg CO<sub>2</sub> equivalent in MNCA and Florence, respectively (it is worth mentioning that Florence has a lower GWP through intensive treatment of bio-waste, thus saving more in MNCA).

The comparative analysis is presented in the figure below.



Source: Guidelines for City Managers and Policy Makers URBAN-WASTE

Figure 5. GW Potential of the bags in three participant pilots

### Social impact

All participating restaurants reported that the workload did not change over time through the implementation of this measure. Staff training, achievements and public acceptance have determined even managers to consider other prevention options.



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Public acceptance / approval contributed to a high potential for awareness raising, 4.7 / 5, because they felt part of the solution. Public acceptance and awareness potential has even increased in cases where restaurants have been actively working to promote them.

From a gender perspective, the decisions to implement the bags came from men, however it was women who implemented the measure.

Economic evaluation - n / a

## Food waste prevention at buffets and restaurants

### Description of the measure

Other measures have been implemented to fight the increase in food waste: hotels serving the surplus food to employees competing with each other in Copenhagen's largest economies or the inclusion of food scraps in the preparation of other dishes, portion optimization or rearrangement of the food appearance in the buffet (using a convex tray rather than a flat one to keep the appearance of a full load) in Tenerife, among others.

### Environmental impact

This measure did not require the purchase of any material or other equipment or product, with the exception of Lisbon, where the pilot included communication materials, relying mainly on changing innovative practices and solutions. This is why both Kavala and Tenerife had only GHG savings. The baseline scenario proved to be important again, as Kavala becomes the most efficient, avoiding 3.6 kg CO<sub>2</sub>eq per kg of food waste, due to the fact that their food waste has been diverted from the landfill. The GHG savings in Tenerife per kg of avoided food waste were 3.2 kg CO<sub>2</sub> eq and 1.4 kg CO<sub>2</sub> eq in Lisbon as Lisbon sends its food waste to the anaerobic digestion plant and Tenerife composts or dumps it.

### Social impact

Staff initially reported some difficulties, which led to a job with lower satisfaction, feedback 3.3 / 5, but improved as staff became accustomed to new practices, once they understood the reasons for the changes. On the contrary, managers were more satisfied with the new approaches.

### Economic assessment

In most cases, the initial costs were below EUR 500, except for a restaurant in Tenerife, where the cost went up to 5,000 euros. However, what matters for economic evaluation are the savings. In some cases, the savings were below EUR 500, mainly based on avoiding food waste, while there were cases of savings over EUR 10,000 including savings from reducing and adjusting the food preparation. A hotel in Copenhagen reported savings of € 1,050 per day.



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## On-site composting in tourist units

### Description of the measure

A hotel in Tenerife opted for an on-site composting practice, turning its own biological waste into compost that ended up in the hotel gardens. Prior to the measure, this bio-waste was partially sent for off-site composting and the rest was sent to landfill.

### Environmental impact

In the 5 months of implementation, 34.57 kg of biological waste per compost day were added, composting a total of 3,071 kg of biological waste (out of 14,284 kg produced in that period).

The result was 1,151.7 kg of compost. The overall GHG savings were only 0.33 kg CO<sub>2</sub>eq which is not high compared to other measures. This is mainly due to the reduction of landfills and transport savings by replacing off-site composting with on-site composting. This measure could achieve much more if implemented in a city or region with poorer waste management performance.

### Social impact

Because only one hotel has implemented this measure, it is difficult to assess the social impact. However, he reported that the training required was quite burdensome in terms of the time required.

### Economic assessment

Of course, the equipment made most of the financial burden, up to EUR 5,000, however, the manager said he preferred to wait for the long-term evaluation.

## Collection of bio-waste at hotels and restaurants

### Description of the measure

Six hotels and restaurants were involved to this extent, all in Tenerife. Overall, the objective was to install a separate collection scheme for bio-waste produced at these plants.

### Environmental impact

To assess the impact on the environment, it was assumed that the compost produced would replace mineral fertilizers. A positive GWP comes from its transport, because there had been no selective collection before, so new routes had to be implemented. During the 5 summer months of implementation, 4.2 tons of biological waste were collected and sent for composting. The net reduction of this action was calculated at 1.1 kg CO<sub>2</sub> eq per kg of separately collected waste. The main benefit of this pilot measure is the large amount of waste that can be collected separately. However, it may be difficult to extend this measure much further due to the limitations of the capacities available for this type of treatment.



Social impact - n/a

Economic assessment - n/a

## Donation of restaurants and hotels food to charitable organisations

### Description of the measure

Six hotels in Florence donated their remaining food to charities, saving a total of 795 kg of food and 72 liters of beverage in the 5-month implementation phase. However, it has been assumed that 20% of the donated foods will end up as food waste because it would not be completely consumed either.

### Environmental impact

Donations have had a positive GWP impact on transport, but it is quite low compared to the low impact of prevented food waste. Since donations have replaced anaerobic digestion in Florence, there has been very little positive impact on GWP (anaerobic digestion would replace fossil fuels). In any case, food donation in Florence has led to a slightly lower GHG saving per kg of food donated compared to the average GHG of other food prevention measures.

### Social impact

This step had an incredibly good impact on the social perspective. High job satisfaction and high visibility and media coverage have ranked this measure as having a fairly high social impact. In order to carry out this measure, additional time was needed, between 10 and 20 hours per week in one of the locations. The organized training sessions were not evaluated as very necessary.

### Economic assessment

Most of the staff who implemented the measure said that there were no costs or that the necessary equipment already existed. One unit spent between EUR 500 and EUR 2,000 on bottles, bags and food containers. The savings were also small, but it was all about charity.

The results of the assessment impact confirmed the initial expectations regarding food waste and the prevention of bio-waste in general can generate quite large savings in GHG emissions. GHG savings ranged from 0.5 kg CO<sub>2</sub>eq. to 3.6 kg CO<sub>2</sub>eq. per kg of food wasted. The differences were mainly caused by the material or equipment needed to carry out the measure. Therefore, the best savings have been achieved through measures based on adapting food waste preparation and innovative and creative solutions to avoid food waste.



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The diversion of bio-waste and food waste from landfills is always a good idea, and positive trends have been observed, however limited due to transport. Another important observation is related to groups of cities that have implemented the same measure in the same way, but which have had quite different achievements. These occurrences were often caused exclusively by the different baseline scenarios and the way bio-waste is treated in those cities and regions. Cities and regions that rely heavily on landfills can achieve impressive savings if they divert food waste from landfills. The same can be concluded in the case of cities that rely on incineration, as was the case in the MNCA. An interesting fact is that cities and regions that use anaerobic digestion to treat bio-waste have actually had a reduction in GHG savings compared to other cities with no anaerobic digestion. This only reinforces the importance of a correct assessment of the baseline scenario.

On the other hand, almost all measures had a high score in terms of social impact. This was caused by job satisfaction, the feeling that the measures give good visibility and promotion to stakeholders and the fact that most of them did not require much training or adaptation. For some, however, it resulted in several extra hours. From an economic point of view, savings can be made in optimizing portions and therefore wasting less waste, even up to EUR 1,000 per day, as in the case of Copenhagen.

Some measures, especially the one that included charitable donations, caused almost no savings, but they were considered very satisfactory due to their charitable nature.

#### 1.4 Increasing selective collection

In larger urban areas or metropolitan areas, including capitals such as Lisbon, Copenhagen, Syracuse or Nicosia, selective collection is already in place due to the size of the territories or the population, and it was considered necessary to adopt such a system. Therefore, such cities and regions have decided to go for the extension of the selective collection system in tourism units by raising awareness and making the same selective collection as a service available to tourists. Some measures did not have sufficient quantitative or qualitative data to be compared, therefore they have not been evaluated from this point of view.

### INCREASING SELECTIVE COLLECTION

#### Collecting cooking oil

##### *Description of the measure*

The measure was implemented in the city of Syracuse located on the island of Sicily, in the Ortiga area, an area that takes pride in its restaurants. There was no such system for collecting used cooking oil in this area.



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About 23 restaurants (approximately 50% of the total restaurants in the area) have been evaluated for a period of 2 weeks.

The collected oil is planned to be converted to biodiesel and industrial soaps instead of being disposed of as waste at the local landfill.

### Environmental impact

As a result of the implementation of this measure during the 2 weeks, 25 kg of cooking oil were collected.

The environmental assessment included the necessary transport of the collected oil, as well as the environmental assessment of the biodiesel produced and its combustion as fuel. In fact, these two were the only results that contributed positively to the GWP. Based on avoiding storage in the landfill, as well as the replacement of fossil fuels, 1 kg of collected cooking oil led to GHG savings of 3.33 kg CO<sub>2</sub>eq.

### Social impact

As there was no collection before this measure, the number of working hours for the staff increased, but less than 10 hours per week. The training was quite simple and the measure did not require any major information. Overall, the local pilot reported a high job satisfaction rate as it was a new practice within the pilot.

### Economic assessment

While the savings resulting from the implementation of this measure were below EUR 500, mainly as a result of the reduction of food waste, the initial investment was quite large, that is up to EUR 6,000.

## **Waste sorting in hotel rooms**

### Description of the measure

This measure aimed to increase the selective collection of waste in hotel rooms and common areas of hotels. This measure was implemented in 3 hotels in Lisbon, by means of weighing separately collected waste before and after its implementation. The targeted fractions were paper, plastic packaging, glass and organic waste.

### Environmental impact

The selective collection rate before the implementation of the measures was 65%, and after the implementation an increase of up to 74% was observed. There was also a decrease in residual waste from 35% to 26%. The measure reached a net positive GHG emission level of 0.33 kg CO<sub>2</sub>eq. However, a selective collection performance that led to GHG savings of 0.22 kg CO<sub>2</sub> equivalent before the implementation of the measure made this increase only slightly more impactful after implementation. Since the treatment options for different waste streams differ and the global warming potential of their treatment differs from one

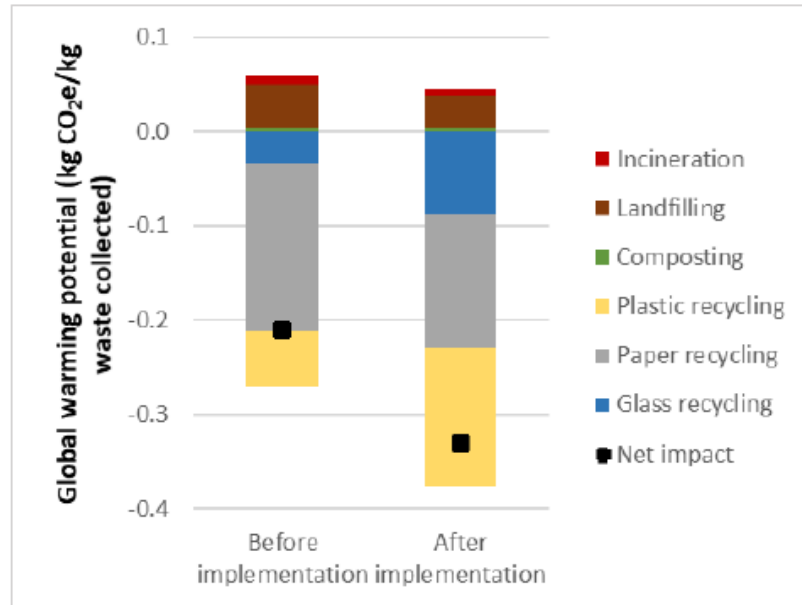




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flow to another (GHG emissions from landfill glass are neutral, which is not the case for bio-waste), in order to understand where the biggest savings come from, it is necessary to study the graph in the figure below.



Source: Guidelines for City Managers and Policy Makers URBAN-WASTE

Figure 6. GW Potential of selective collection in hotels

### Social impact

The workload increased slightly, but the number of employees remained the same during the implementation phase. 6-10 employees received training and, in general, the increase of selectively collected waste fractions, as well as the high rate of significance of the measure both for staff and from the management perspective made the manager consider other options for waste prevention in future.

### Economic Assessment

Labor costs increased slightly during the implementation of the measure, but other costs were incurred to obtain the various types of waste baskets and bags. These costs were nevertheless small, below EUR 500.

The measure led to a decrease in residual waste, but these savings have not been estimated.



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## Recycling consultants for tourism units

### Description of the measure

Nicosia and Ponta Delgada trained around 70 different people, who were responsible for visiting and consulting the different tourist units (bars, restaurants, hotels) observing different waste prevention measures and potential improvements.

### Environmental impact

The implementation of this measure has inspired the local management of four units to consider other options for waste reduction measures, such as changing the packaging for some products and improving purchasing practices.

### Social impact

While the local authority in Ponta Delgada used its existing staff, the one in Nicosia hired 2-5 more employees to implement the measure. Both the management and the staff had a fairly high satisfaction at work (4.2 / 5), as the measure increased the dialogue between the authorities and local tourist units. The gender assessment showed that most of the management responsible for making decisions were men, while recycling advisors were almost well-balanced.

### Economic assessment

In addition to hiring recycling advisers in Nicosia, there was a single location also situated in Nicosia, that incurred equipment costs between 5.000 and 10.000 Euros.

## Dumpsters for the selective collection in public spaces

### Description of the measure

Syracuse had the idea to increase the number of waste bins for selective collection in public spaces and areas frequented by tourists.

### Environmental impact - n / A

### Social impact

During the implementation of the measure, the workload decreased for the staff in the waste management field, as there were more bins and therefore larger capacities. This is also reflected in their job satisfaction (4/5).

### Economic assessment

Labor costs increased as there were more bins to empty within the selective collection scheme. These expenditures were between 5.000 - 10.000 €.

The savings were difficult to estimate, but it was assumed that increasing waste selective collection would generate income for the waste management company.



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Recycling advisers in tourist units are not an active solution to waste reduction per se, but they contribute a lot by improving and focusing on behavioral change. Social assessment has already shown an increase in awareness.

However, the success of the initiative depends on how much information people receive and the extent to which the message of recycling is translated into concrete action by a third party. The other measures, more concrete and quantifiable, included the extension of the selective collection scheme. The impact on the environment was difficult to assess due to the short implementation period.

More than half of the tourists want to recycle and dispose of waste selectively, and by offering tourists the same collection services as for the locals, they could improve the process of selective collection in different cities and regions, especially in currently unexploited areas, such as accommodation and other tourist units.

## 1.5 Situational analysis of consumption and behavior and patterns of waste in tourism

### Current knowledge

- Little is known about the behavior of waste in tourist areas.
- Waste behaviors are only one aspect of sustainability in tourism.

Two gaps between:

- Intensity and behavior.
- At home and when traveling.

*"The low level of tourist involvement in tourism sustainability indicates that there is still a lack of a good understanding of the barriers that prevent tourists from behaving responsibly."*

### Survey among tourists

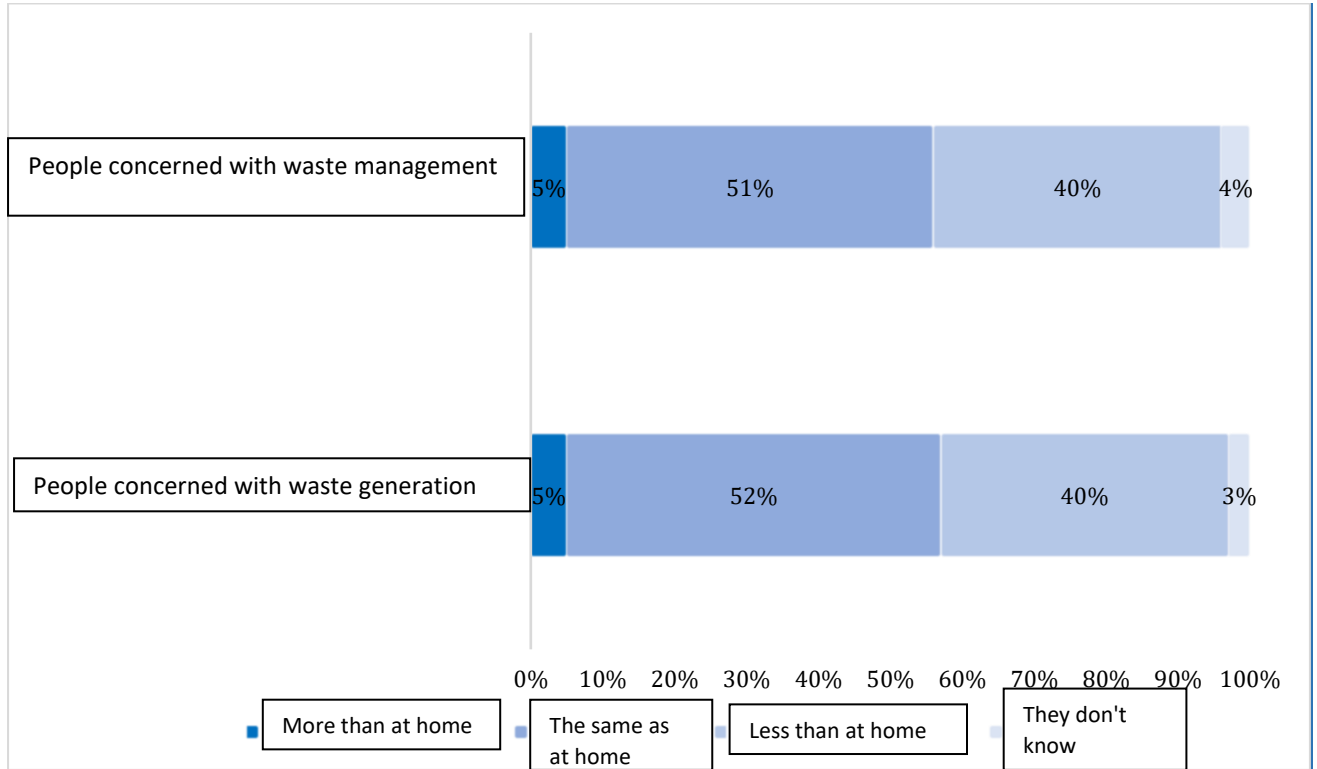
- period: 2016 - 2017
- 11 cities / case examples depending on the regions
- No of tourists = 617 (of 39 different countries)
- Questions about:
  - Attitude and behaviour on waste
  - 9 different waste fractions



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According to the study conducted within the URBAN – WASTE project, there is a relative balance between the share of respondents who are more, equally or less concerned about the production and management of waste (sorting) when traveling compared to the periods when they stay at home.



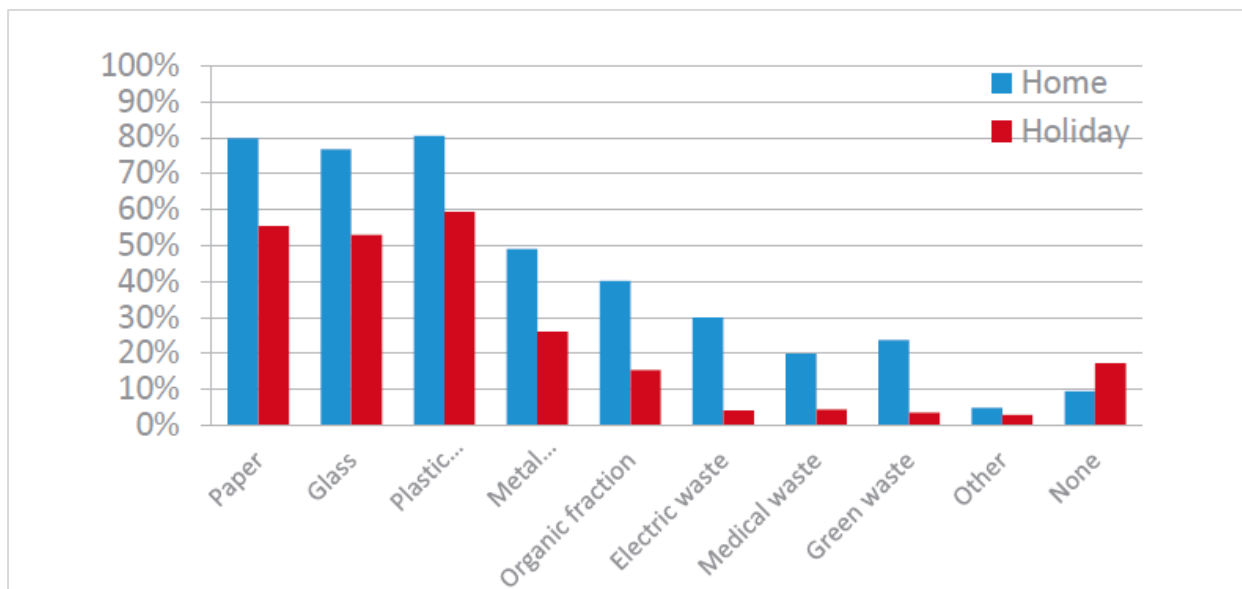
Source: adaptation of *Situational analysis of consumption and waste behaviour and patterns in tourism*

Figure 7. The share of respondents who are more concerned with waste production and waste management (sorting) when traveling than at home

As regards the share of respondents who sort waste on different fractions at home or when traveling, it is observed that most people practice selective collection at home. Of the selectively collected waste, the largest share is paper, glass and plastic.



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Source: Situational analysis of consumption and waste behaviour and patterns in tourism

Figure 8. The share Ponderea respondenților care sortează diferitele fracții de deșeuri acasă și în călătorii

According to the information presented in the graph below, the cities / regions with the most people who care less about waste production during the holidays are: Nice, Ponta Delgada, Florence and Dubrovnik, at the opposite pole are Lisbon, Kavala and Tenerife.

Most people who care less about waste management during the holidays are from the cities / regions of Ponta Delgada Nice, Nicosia and Dubrovnik, in contrast with Lisbon and Kavala.



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Source: Situational analysis of consumption and waste behaviour and patterns in tourism

\* Takes less care about waste production during holiday

Takes less care about the waste management / sorting during holiday

Negative waste fractions gap (4 waste fractions)

Figure 9. Behavioural gap according to the city / region

**A series of explanations for the behavioural gap could be:**

- Age, sex and level of education;
- Country of residence
  - Foreign/ domestic visitor
  - OECD recycling index
- Level of waste management / recycling in case of cities
  - Information on the waste management and recycling

## Results of the bivariate tests

Variables	Attitudes towards waste/ trip behaviour					Behavioural gap			
	Concerned with the food waste during the holiday	Number of fractions sorted during vacation	* Paper sorted during accomodation	Glass sorted during accomodation	Plastic sorted during accomodation	Metal (packaging) sorted during accomodation	Concern with waste generation equally as at home	Concern with waste management equally as at home	Gap in the number of sorted fractions
Gender									
Age							*		
Level of education		*							
Foreigner / local									*
Country of origin OECD recycling index						*	*	*	*
City / region	*	*	*	*	*	*	*	*	*
Type of accomodation			*						*
Quality of information on waste management and recycling	*	*	*	*	*	*	*	*	*

Source: translated and adapted based on *Situational analysis of consumption and waste behaviour and patterns in tourism*

## Statistical tests

- However: within logistic regression, two variables remain significant in explaining the gap in terms of waste fractions
  - Quality of information (in most models)
  - Foreign/ domestic visitor (in some models)



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## **2. A general presentation of the economic, social and environmental benefits associated to building a solid waste management program in recreational facilities**

The two main objectives that the parks and recreational facilities have in common are aesthetics and leisure.

Communities around the world have seen the benefits of parks, playgrounds, sports compounds and recreation centers of all kinds. These are the types of places that community members gather, which is why they often strongly reflect community values.

Clean land, environmental awareness and general aesthetics can have a major impact on the community's experience in these influential spaces, with the right waste management program.

Many municipalities have already taken steps to improve their public waste program, such as adding recycling flows, while developing a standardized and easy-to-follow system for all users.

A proper recycling program can drastically improve the image in several ways. Here is a short list of major benefits to having a successful waste management program:

### **2.1 Economic impact**

Implementing a new program or revising the existing program involves additional costs on the one hand, but once implemented there are methods that lead to saving money.

In addition to the many obvious social and environmental benefits of recycling, here's how it can be economically beneficial:

#### **1. Drastically reduced waste disposal costs**

Garbage disposal costs can be exorbitantly expensive, especially in densely populated cities or remote areas. By eliminating paper, plastic and other recyclable materials from the waste stream, parks and recreation centers can reduce their waste disposal costs by up to 50%. Of course, the cost of each installation will differ and there is always a cost associated with waste collection for recycling. However, the price paid for waste collection for recycling is often recovered by the savings of less waste being collected by your waste carrier.

#### **2. A healthy economy promotion**

In a study by Waste Wise, they point out that “Recycling is an important segment of the national and state economy, it creates jobs and saves money for waste generators. The local businesses, institutions and government entities highlighted in this report all understand that recycling makes sense for both the environment and the economy”. The number of jobs supported by the recycling industry has a major impact on the overall economy.





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### **3. Purchasing recycled materials**

Many recyclable materials are valuable enough to be sold and reused. This not only promotes a circular economy, but also creates potential cost savings from your recyclable materials carrier.

### **4. Clean buildings and parks**

Providing more options and communicating a clear waste management system encourages guests to refrain from leaving rubbish in illegal places. This can not only improve the aesthetics and clean environment of your park or facility, attracting and pleasing to more guests, but can also reduce the cost of care or maintenance staff. Encouraging guests and staff to use the new and improved waste management system correctly will lead guests to clean up.

## **2.2 Social impact**

Parks and leisure hubs are known for their social atmospheres that bring people together. Successful facilities are often involved in philanthropic and social causes to promote their interest in the success of their community. Hence, what social benefits can come from expanding your waste management program?

- Parks and public hubs that actively recycle and collect organic products send out the message that they are passionate about the environment;
- Green actions show a commitment to a greener future, which can help empower guests and employees for additional personal action;
- Setting a green standard in the community creates more jobs. These jobs support a common transition to a more sustainable and resilient society. In fact, the Institute for Local Self-Reliance reports that industries engaged in sorting and processing recyclable materials employ 10 times more people than traditional waste disposal companies.
- People tend to feel a sense of social pressure to participate in recycling themselves if they see that they are encouraged in all aspects of their community.
- The same social pressure applies to keeping public spaces clean. Guests are more likely to use recycling bins and waste properly if the environment around them is litter-free and waste recycling and organic options are offered.



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## 2.3 Impact on the environment

The need for action to save our planet is becoming more important every day, and the pressure on municipalities to make changes is more intense than ever. One of the most effective ways in which a public facility has a major impact is to expand their collection beyond waste to include recycling and organic products, while communicating their program effectively.

So far, you are probably familiar with the main environmental benefits of recycling, but here's a recap of what recycling can do in your park or recreation center for our planet:

- recycling helps reducing pollution caused by waste, as harmful chemicals and greenhouse gases are often released from plastics and other recyclable materials in landfills;
- recycling reduces the need for raw materials so that rainforests can be preserved, allowing natural habitats to remain safe;
- large amounts of energy are used in the manufacture of raw materials. Recycling requires much less energy and therefore helps to conserve natural resources.

Apart from that, the environmental benefits of recycling are plentiful, but one has to consider the additional benefits of including organic collection on site.

Some people think that food will simply decompose once it reaches the landfill, but this is not usually true. The diversion of organic matter from the waste stream has many environmental benefits, including, but not limited to, the following:

- reducing methane emissions, a greenhouse gas 21 times stronger than CO<sub>2</sub>.
- minimizing the leachate formation, a toxic leakage that threatens groundwater and surface water.
- the return of nutrients to the soil, which improves soil health and reduces the need for chemical fertilizers.
- increasing the soil's ability to retain water and decreases runoff.

In addition to organic matter, landfills mainly contribute to the production of greenhouse gases in the United States.

Garbage decomposition generates methane, which is about twenty times more efficient than carbon dioxide at capturing heat in the Earth's atmosphere, according to the



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EPA. That being said, all the waste generated in your community ends up in landfills and has a direct negative impact on climate change.

As in any discussion on environmental change, the common thought is that any of these efforts is just a drop in the ocean, however, the program has a much greater influence than one might think. Making these kinds of changes in waste management not only sets a standard for all other public spaces outside the community, but also provides a positive example for every visitor, encouraging them to practice proper recycling and disposal of waste in their daily lives. Making changes to the program reflects the community's interest in the environment and potentially encourages thousands of others to reconsider their recycling habits.



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## Bibliography



1. G. Obersteiner, M. Eriksson, S. Gollnow, M. Wojtowicz, Tourism and waste- Brussels, 2019-05-08
2. Obersteiner G., Touristic Influence on Waste Generation,
3. Cooley, A., The Positive Impacts of Implementing a Successful Waste Management Program at Parks and Recreational Facilities, May 19, 2020
4. Comisia Comunității Europene, Ghidul privind aproximarea legislației de mediu a Uniunii Europene tradus de Radu Huluta, Ianuarie 1998, pp. 1 – 138
5. Cohesion Policy Support For The Circular Economy, Iunie 2016, pp. 1 – 4 ([https://ec.europa.eu/regional\\_policy/sources/docgener/guides/cohesion\\_policy\\_circular\\_economy.pdf](https://ec.europa.eu/regional_policy/sources/docgener/guides/cohesion_policy_circular_economy.pdf))
6. UNEP, A Manual for Water and Waste Management: What the Tourism Industry Can Do to Improve Its Performance, 2003, pp. 3-46
7. Bel, J. B., Buckingham, S., Fertner, C., Jørgensen, G., Lopez, J., Obersteiner, G., Gollnow, S., Kayadjanian, M., Guidelines for City Managers and Policy Makers, Urban Waste, 2019, pp. 7- 164
8. Louw, E., Situational analysis of consumption and waste behaviour and patterns in tourism, Urban Waste
9. López-Murcia, J, Sustainable tourism as a joint venture: cooperation between authorities and stakeholders, Urban Waste
10. Styles D., Schönberger H., Galvez Martos J. L, Best Environmental Management Practice in THE TOURISM SECTOR, Chapter 6. Waste and Waste Water Management in Tourist Accommodation, pp 318 - 360
11. Claudia de Luca, Perello, M., Romein, A., Louw, E., Fertner, C., Große, J., Buckingham S., Urban strategies for Waste Management in Tourist Cities, Urban Waste, 2017, pp. 8-83



Editor of this work: Tehnopol Association of Galați  
Address: No. 20 Săliște street, Galați

Phone: 0236493277  
e-mail: [office@tehnopol-gl.ro](mailto:office@tehnopol-gl.ro)  
website: [www.tehnopol-gl.ro](http://www.tehnopol-gl.ro)

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