



LIFE Project Number  
**LIFE15 ENV/GR/000257**

LIFE PROJECT NAME or Acronym  
**LIFE-F4F (Food for Feed)**



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<b>Action:</b>	C1 Monitoring of the impact of the project actions
<b>Partner:</b>	ESDAK - HMU - HUA
<b>Deliverable:</b>	Assessment of the initial situation

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## 1. Introduction

The strategy and development of integrated municipal solid waste management systems (even for alternative processes as the Food for Feed process) require the correct prediction of solid waste generation and composition. However, to achieve first-rate waste management objectives through a process of continuous improvement, it will not be enough simply to know the gross quantity of wastes being generated in a region or a business sector; both the quantity and spatial distribution of waste must be defined as well. With this specific knowledge, it will, for example, be possible to target waste prevention strategies to locations in which they are most needed. Appropriate waste management solutions vary from one locality to another (Diem Trang et al., 2007). Waste management models can improve the basis for decisions regarding waste management (Eriksson et al., 2003). Modelling of waste generation is a useful way to anticipate the design of waste management strategies as a function of demographic changes and development and to approximate future management needs based on predictions according to social and economic changes. This process should lead to a more sustainable approach to waste management.

Many hotels underestimate the cost of waste to their business, simply viewing it as a disposal cost. Municipalities in Greece charge a fixed rate for waste collections based on the surface area of the premises, hence waste prevention measures or the introduction of recycling schemes will presently have no impact on these fees payable to the municipality. However, this may change in the near future. The true cost of waste management is often significantly higher than just the collection and disposal cost as the poor management of resources and waste will also result in additional cost to your hotel and its operations, e.g. avoidable damage to raw materials, spoilage of food, handling of wastes, and staff time for transporting waste etc.

## 2. The Intervention area

The island of Crete is one of the greatest tourist resorts in Greece (Table 1) and numbers more than six hundred thousand residents (623,065, ELSTAT 2011). Furthermore, Crete is a combination of urban, mountainous, rural and purely tourist regions.

The City of Heraklion, geographically located in the centre of Crete with nearly 150,000 residents, is the metropolis of Crete. Chania and Rethymnon lie in the west and Aghios Nikolaos in the east. Regions with high seasonal variability in population due to tourism are Hersonissos and Malia, located east of Heraklion and west of Aghios Nikolaos. Ierapetra, located south of Aghios Nikolaos, qualifies as rural mainly because of the numerous greenhouses located there.

Hotels, or more broadly the accommodation sector represents one of the most important subsectors of the travel and tourism industry.

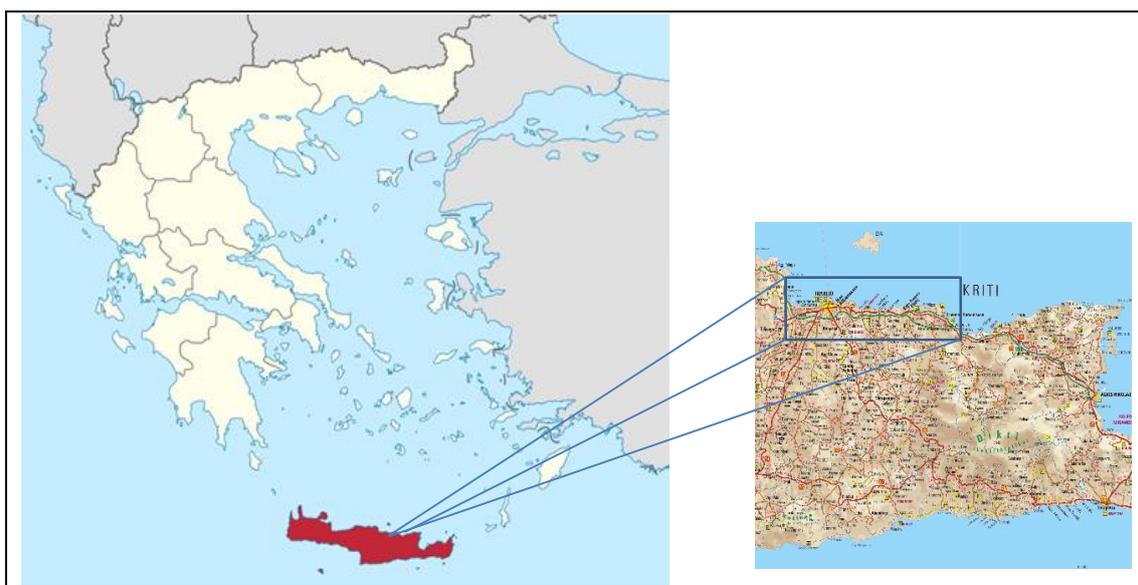
**Table 1: Main characteristics of the study area**

	Population <sup>(1)</sup>	Hotel beds <sup>(2)</sup>	Hotel rooms <sup>(2)</sup>
<b>Rethymnon</b>	85,609	31,509	16,530
<b>Heraklion</b>	305,490	68,838	35,722
<b>Lassithi</b>	75,381	24,646	12,647
<b>Chania</b>	156,585	43,689	23,715
<b>Crete</b>	623,065	168,682	88,614
<b>Greece</b>	10,850,000	788,553	407,146

Source: (1) ELSTAT, 2011 National Census, <http://www.statistics.gr/en/2011-census-pop-hous>

(2) Hellenic Chamber of Hotels, <http://www.grhotels.gr/EN/Pages/default.aspx>

The area of intervention (Figure 1) covered by two main Municipalities, the Municipality of Heraklion and the Municipality of Hersonissos.



**Figure 1. Intervention area.**

### 3. The tourist market effect

The *Municipality of Hersonissos* is a tourist resort, with thousands of visitors choosing it as a destination every year. In terms of the number of visitors and existing infrastructure, it is the largest tourist Municipality of the Prefecture of Heraklion and one of the largest in the Region of Crete. The visitors that flood the Municipality come from European countries and mainly from European Union countries.

The diversity and the beauty of the landscape and, of course, the crystal blue, blue waters of its coastline play an important role in choosing it as a holiday destination. Given the generally good weather conditions of Crete, the tourist season is quite prolonged compared to other areas of Greece. It starts in April and ends around the end of October, while in other parts of the country the tourist season lasts on average during the three summer months (June-July-August). As a result, the need to manage an increased generation of all types of waste during the months of the tourist season is paramount.

With data for the year 2012, the Municipality of Hersonissos accounted for almost 74% of the beds of the Prefecture of Heraklion and about 29% of the beds in the Region of Crete. In particular, the Municipality operated 65,600 beds, of which 81% corresponded to hotel accommodation and 18% to rooms to let. The remaining 1% was in beds of tourist furnished cottages/villas and campsites.

In the following table (Table 2), the number of beds in hotels and the corresponding number of rooms and apartments for rent is presented.

**Table 2. Total number of Beds in the Municipality of Hersonissos.**

	Hotels	Rooms for Rent	Tourist Homes/ Villas	Camping	Total
Region of Crete	<b>168.440</b>	50.313	5.600	2.531	<b>226.884</b>
Prefecture of Heraklion	<b>69.686</b>	17.146	997	982	<b>88.811</b>
Municipality of Hersonissos	<b>53.291</b>	11.749	178	382	<b>65.600</b>

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	Hotels	Rooms for Rent	Tourist Villas	Homes/	Camping	Total
% participation of the Municipality in the Prefecture of Heraklion	<b>76,5%</b>	68,5%	17,9%		38,9%	<b>73,9%</b>
% participation of the Municipality in the Region of Crete	<b>31,6%</b>	23,4%	3,2%		15,1%	<b>28,9%</b>

The quality of the beds of the hotel's hotel rooms is very high, since most of them, about 61%, is in beds of 5 and 4-star accommodation.

The *Municipality of Heraklion* is also an international tourist destination and therefore a considerable number of tourism businesses operate in the area. It includes about 500 catering companies and about 150 hotels.

One hundred (100) four (4\*) and five (5\*) star hotels of various sizes situated in the north coast around the City of Heraklion (25 km radius). Regarding hotels, is estimated that more than 10,000 rooms in 5-star and 4-star hotels are available.

In the tourism sector, there is an increased generation of waste and particularly of plastic, glass and organic waste.

In the following figures, the additional generated quantity of municipal solid waste, due to tourism, is presented for the Regions of Greece (Figure 2), together with the proportion that this increased generation of MSW represents for each Region Figure 3),.

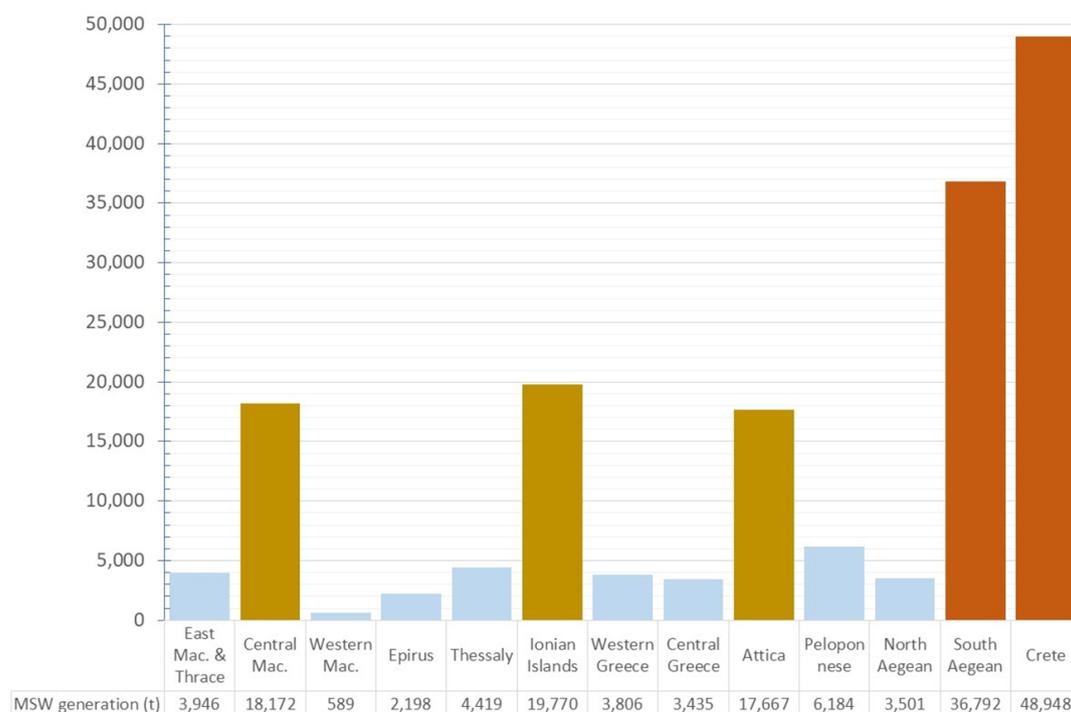
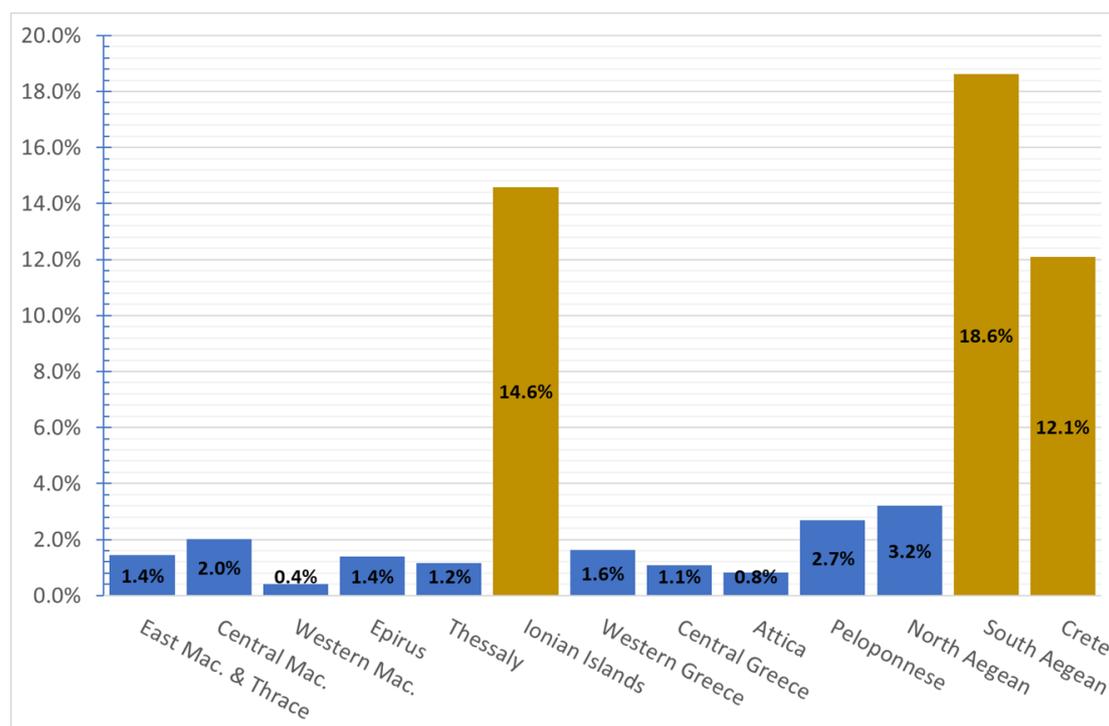


Figure 2. Generation of municipal solid waste (MSW) due to tourism



**Figure 3. The proportion of tourism participation in total MSW generation**

For the Region of Crete, the additional MSW generation approaches the 50,000 metric tonnes a year (the highest in Greece) and represents 12.1% more waste annually (the third highest in Greece). Also, high seasonality in waste generation presents a challenge to waste management systems in the area.

Finally, it is worth mentioning that there is a high concentration of waste in specific categories of businesses that mainly market food.

These are the following:

- Meat shops (about 200 stores) producing animal by-products that need special treatment.
- Grocery shops, (approximately 150) where a large production of food waste due to the removal of damaged products.
- Supermarkets (around 70), where packaging waste and food residues (withdrawn food) are produced.
- Prisons, from which food waste arise.

The concentration of so many thousands of visitors in the two municipalities every year creates increased requirements both for the protection of the natural environment and for the provision of high-quality waste management services. At the same time and given the probable increased environmental awareness of most European, there is a growing need to change the mindset of Greek citizens whether they are employed in tourism and reside occasionally or live permanently in the areas of the Municipality. In addition to the legal protection and proper management of the environment, residents of the municipality "learn" are sensitised by foreign citizens, who are particularly critical of situations or images that are inconsistent with the ones they have to get used to their homelands.

#### 4. Waste Generation and Management

The following table (Table 3) presents the best current estimation of Municipal Solid Waste and Food Waste generation for Greece, the Region of Crete and the Prefecture of Heraklion. Food Four hotels were selected for participating in the project.

**Table 3. Estimation of MSW and Food Waste Generation for Greece, Region of Crete and the Prefecture of Heraklion.**

	Greece <sup>1</sup>	Region of Crete <sup>2</sup>	Prefecture of Heraklion
Municipal Solid Waste generation (t.y <sup>-1</sup> )	5,354,000 <sup>3</sup>	366,250	179,155
Total food waste generation (t.y <sup>-1</sup> ) <sup>4</sup>	1,822,210	143,390	70,140
Food waste generation from commercial activities and services (t.y <sup>-1</sup> )	379,130	23,790	11,640
Food waste generation from hospitality and food service sectors (t.y <sup>-1</sup> )	102,500	18,050	8,840
Food waste generation from hotels (t.y <sup>-1</sup> )	64,110	14,940	6,335

Source: [ELSTAT (2018) 2011 National Census, National Tourist Organisation (2018) data 2010–2016]

About 30,000 metric tons of wastes per year are being disposed to landfill in the Municipality of Heraklion and another 30,000 tonnes are being disposed to landfill in the Municipality of Hersonissos. This corresponds to 21,000 tonnes of food waste that are landfilled in the area, and the emission of 52,500 tonnes of CO<sub>2(eq)</sub>, annually. In addition, Table 3 presents the MSW and Food Waste generation from the various sections and sub-sections (Commercial activities and Services - Hospitality and Food Service Sector - Hotels).

The hotels that have been selected to participate are being generated daily up to 1.0-1.5 t of source separated food wastes, about 200-240 tonnes annually.

The F4F project needs to report on its outcomes and be regularly monitored and evaluated based on the outcome indicators defined at the project level, in relation to the presented baseline situation. F4F project will have to report on a set of key indicators corresponding to the sector or priority area on which the project focusses, as well as on further mandatory key indicators concerning the project's societal and economic outcomes.

Up to now and during this reference period, the project is ongoing after the conclusion of the initial operational period. Concerning the evaluation of performance indicators, from this period of the project the following indicators have been assessed, as presented in Annex 9, Sub-Annex 9.1.: Deliverable C.1.1. First Evaluation of Performance Indicators.

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<sup>1</sup> Greek Ministry of Environment & Energy (2015): National Waste Management Plan.

<sup>2</sup> Region of Crete (2016): Regional Waste Management Plan of Crete.

[www.crete.gov.gr/attachments/article/11600/Μελέτη%20ΠΕΣΔΑΚ%20μετά%20την%20ενσωμάτωση%20παρατηρήσεων.pdf](http://www.crete.gov.gr/attachments/article/11600/Μελέτη%20ΠΕΣΔΑΚ%20μετά%20την%20ενσωμάτωση%20παρατηρήσεων.pdf).

<sup>3</sup> EUROSTAT (2018):

<sup>4</sup> EPPERAA (2012): Operational Manual for Source Separation Schemes & Systems for Biowaste Management, Greek Ministry of Environment & Energy.  
<http://www.epperaa.gr/el/Pages/NewsFS.aspx?item=194>.

## **5. Epilogue**

According to the data collected from this first period of the project, it seems that is feasible the goal of 450-600 tonnes of food wastes to be collected and managed separately from the mixed MSW in the project's area up to the project's end. This means that up to then 2 more fully operational periods are pending (one is already underway).

After the project's end and in case of the project's continuation, replication and/or transfer level partners estimate that this food waste collected quantity will be possible to approach 10,000 metric tonnes. This is an amount of 350 metric tonnes per year of collected food wastes and the capacity of the unit can support this income quantity. However, this means that the F4F unit should operate in full scale and with more staff.