Business Plan for the Development of a Used Cooking Oil Collection System

Dimitropoulos V.

Karasavva K.

SCHOOL OF ECONOMICS, BUSINESS ADMINISTRATION & LEGAL STUDIES

A thesis submitted for the degree of
Executive MBA

January 2016
Thessaloniki – Greece

Student Name:	Vasileios Dimitropoulos Konstantina Karasavva
SID:	1101140007 1101140014
Supervisor:	Prof. Vangelis Souitaris

We hereby declare that the work submitted is ours and that where we have made use of another's work, we have attributed the source(s) accordingly.

January 2016

Thessaloniki - Greece

Abstract

This dissertation was written as part of the Executive MBA course at the International Hellenic University.

The study deals with the Used Cooking Oil collection industry that lies at the intersection of two very promising sectors of the economy, the biofuels/biodiesel industry and the waste management industry. These sectors are heavily influenced by the guidelines and the incentives provided by the regulatory framework. For this reason an extended review of the existing regulatory framework is included in the study.

The study also analyses the industry practices and methods applied in Used Cooking Oil collection and attempts to identify any business opportunities in market segments that are still underdeveloped. Such is the household segment, where the collection efficiency in both the European Union and Greece remains low.

Building on the experience of previously implemented pilot programs and business initiatives, the study attempts to provide a business plan for a Greek company involved in the Used Cooking Oil collection industry, targeting at the household segment in the region of Attica.

The suggested approach is the establishment of Used Cooking Oil collection points at the existing network of gas stations in the region of Attica. It appears that in order the suggested business initiative to be successful a wide consensus is required by a substantial number of oil companies.

The present dissertation was carried out under the supervision of Professor Souitaris, whom we would like to acknowledge for his support.

Keywords: Used Cooking Oil, UCO, Biofuels

Vasileios Dimitropoulos

Konstantina Karasavva

January 2016

Abbreviations

ATEI	: Higher Technological Educational Institute (Greek)
EC	: European Commission
ESDA	: National Plan on Waste Management (Greek)
ESPA	: Partnership Agreement Development Framework (Greek)
EU	: European Union
EU-27	: European Union before the last enlargement in 2013
EU-28	: European Union including Croatia (2013 enlargement)
FAME	: Fatty Acid Methyl Ester
FQD	: Fuel Quality Directive 2009/30/EC
GEMI	: General Electronic Commercial Registry (Greek)
GHG	: Greenhouse Gas
HORECA	: Hotels / Restaurants / Café
HVO	: Hydrotreated Vegetable Oil
IKA	: Social Security Fund for Employees (Greek)
ILUC	: Indirect Land Use Change
ISCC	: International Sustainability & Carbon Certification
ITB	: Invitation To Bid
JMD	: Joined Ministerial Decision
LTD	: Limited Company
MBA	: Master of Business Administration
MS	: EU Member State
OAED	: Manpower Employment Organization (Greek)
PC	: Private Company
PESDA	: Regional Plan on Waste Management (Greek)
RED	: Renewable Energy Directive 2009/28/EC
SME	: Small Medium-sized Enterprise
SRP	: Social Responsibility Program
UCO	: Used Cooking Oil
UCOME	: Used Cooking Oil Methyl Ester
VAT	: Value Added Tax
VOME	: (Virgin) Vegetable Oil Methyl Ester

Units of Measurement

Standard Units of Measurement

g : Gram

J : Joule

lt : Litre

m^2 : Square meter

m^3 : Cubic meter

t : Metric tonne

toe : Crude oil equivalent tonne (41,868GJ)

Non-Standard Units of Measurement

cp : Number of UCO collection points

hab : Number of inhabitants

y : Year

Unit Multiples

k : Thousands

M : Millions

G : Billions

“.” : Thousands separator

“,” : Decimal point

Table of Contents

1. Introduction 1

2. Literature Review 2

2.1 EU Regulatory Framework on Energy & Waste Management 2

2.2 Greek State Regulatory Framework 4

2.2.1 Renewable Energy 4

2.2.2 Waste Management 5

2.3 Current Situation 6

2.3.1 UCO Production 6

2.3.2 UCO Collection & Utilization 7

2.4 UCO Market Outlook 10

2.4.1 UCO Utilization 10

2.4.2 UCO Prices 12

2.5 UCO Collection Industry Practices 12

2.5.1 UCO Collection in Gas Stations – The MOL Example 19

2.5.2 UCO Collection in Greece 21

3. Data Analysis 24

3.1 Data Transformation 24

3.2 Regression Variables 25

3.3 Regression Analysis 26

3.4 Confidence Intervals 27

3.5 Application of the Regression Equation 29

4. Business Plan 30

4.1 The Concept 30

4.2 The Context 30

4.3 The Market 31

4.4 The UCO Supply Chain in Greece 32

4.5 The Oil Industry 33

4.6 Strategy Outline 33

4.6.1 Strategy Analysis 36

4.7 The Operations 40

4.7.1 Collection Method 40
4.7.2 Collection Containers 41
4.7.3 Collection Vehicles 42
4.7.4 Activities at the Collection & Delivery Points 43
4.7.5 Required Activities by the Gas Station Operator 44
4.7.6 Certification Scheme 44
4.8 The Company 45
4.8.1 Legal Form 45
4.8.2 Organizational Structure 46
4.8.3 Human Resources 48
4.8.4 Recruitment & Training 48
4.8.5 Trade Name & Corporate Philosophy 49
4.9 The Marketing Strategy 49
4.9.1 Market Analysis 50
4.9.2 Market Segmentation & Positioning 51
4.9.3 Marketing Mix 52
4.10 Finance 54
5. Conclusions 56
5.1 Suggested Timeline 56
5.2 Concluding Remarks 58
References 61
APPENDIX - A 77
APPENDIX - B 83
APPENDIX - C 89

1. Introduction

Following the recent dioxin crisis that expanded through the food chain and the competition of conventional biofuels with edible oils and food crops, the EU has taken initiatives to exclude potentially harmful by-products from the food chain and instead to promote the production of renewable biofuels from such wastes, including Used Cooking Oil (UCO). Unfortunately, the collection efficiency of UCO originating from the household sector in Europe is low, due to the absence of well-organized collection networks. On the other hand, given the incentives provided by the regulatory framework, the UCO prices have risen since 2009 and currently match those of the virgin palm oil.

The present business project will attempt to address the low collection efficiency of UCO originating from the Greek households in the region of Attica. The suggested approach is to establish collection points at the existing network of gas stations. The project will provide a business plan for a recycling company that collects UCO from gas stations which subsequently transports and sells to wholesalers operating temporary storage facilities in the region of Attica.

The business project is structured in a) the literature review chapter, where the existing regulatory framework is summarized and the UCO market and industry are described, b) the data analysis chapter, where, based on data from similar initiatives, a statistical analysis is applied and estimates of the expected UCO collection efficiency are provided, c) the business plan chapter, where detailed suggestions for the incorporation of a UCO collection company are given, and d) the conclusions chapter, where a timeline of events for the company incorporation is provided followed by concluding remarks about the feasibility of the proposed business initiative.

2. Literature Review

The business opportunity in the UCO industry is heavily influenced by the existing regulatory framework. For this reason part of the literature review chapter is dedicated to the presentation of the applicable regulations in the European Union (EU) and in Greece. The European and the Greek markets are also analysed regarding current UCO collection efficiency and improvement potential. Finally, the UCO industry is examined focusing on the applicable practices.

2.1 EU Regulatory Framework on Energy & Waste Management

The European Union's energy policies are driven by the following strategic objectives:[1]

- Security in energy supply.
- Competitive energy market and affordable energy prices.
- Sustainable energy consumption by lowering greenhouse gas (GHG) emissions, pollution and fossil fuel dependence.

Coherent with these objectives are the EU targets for 2020 and 2030 regarding GHG emissions and renewable energy:[1-3]

- Reduce GHG emissions (compared to 1990) by at least 20% for 2020 and 40% for 2030.
- Increase the share of renewable energy in the EU's energy mix to at least 20% by 2020 and 27% by 2030.
- Increase the share of renewable energy in the transport sector to at least 10% by 2020.

In order to promote the use of energy from renewable energy sources, the European Parliament and the European Council adopted in 2009 the Renewable Energy Directive (RED) 2009/28/EC:[4]

- RED confirms the EU's targets for 20% share of renewable energy in the energy mix and for 10% share of renewable energy in the transport sector by 2020.
- Sets default values of GHG saving from biofuels depending on their origin and production process.
- Introduces the concept of biofuels sustainability. Biofuels should not compete with food crops and their production should not encourage the destruction of

biodiverse or agricultural land (a process known as Indirect Land Use Change – ILUC).

- For the purpose of Member States (MS) compliance with the renewable energy utilization targets, the contribution of biofuels produced from wastes, residues, non-food cellulosic and lingo-cellulosic material shall be considered to be *twice* that made by other biofuels.

Under the framework of using common fuels specifications within the European Union, the European Parliament and the European Council adopted in 2009 the Fuel Quality Directive (FQD) 2009/30/EC. This amending directive sets new specifications in petrol (gasoline), diesel and gas-oil. Among other provisions the directive sets the maximum biodiesel (FAME – Fatty Acid Methyl Ester) content in diesel at 7%.[5]

In September 2015, the European Parliament and the European Council amended the RED and FQD directives and set specific limitations to the biofuels feedstocks. More specifically the amending directive (EU) 2015/1513:[6]

- States that the share of energy from biofuels produced from cereal and other starch-rich crops, sugars and oil crops and from crops grown primarily for energy purposes on agricultural land, shall be no more than 7% of the energy consumption in transport by 2020.
- Includes a list of feedstocks (Annex IX part A&B of the directive) for biofuels production for which the contribution to the renewable energy utilization targets shall be considered *twice* their energy content. This list explicitly includes used cooking oil (UCO) in Annex IX part B.
- Requires that by 6 April 2017, each MS shall set a national target for biofuels production from feedstocks included in Annex IX part A of the directive. A reference value for this target is 0,5% share in the energy content in all forms of transport by 2020.

In addition, the European Union includes UCO in the 'catering waste' category, under the regulation on animal by-products (EC) No.1774/2002[7-8] as interpreted by an EC guidance in 2004[9]. Under the provisions of these regulations, EU prohibits the feeding of catering wastes including UCO to animals, following the recent dioxin crisis that expanded throughout the food chain due to the lack of traceability of such materials.

Only UCO from the food industry (other than catering waste from restaurants or household kitchens) where a credible system of traceability can be ensured may be used in animal food. However, the EU allows recycling of UCO from all sources into technical products for industrial use, such as soaps, lubricants, biofuels etc.[9]

Furthermore, the European Union under the waste framework directive 2008/98/EC[10] encourages the separate collection of bio-wastes (i.e. biodegradable municipal wastes from households and similar wastes from commercial and industrial premises) in order to improve their disposal. Waste edible oil and fat (including UCO) are classified according to the European waste catalogue[11] as 20 01 25, where the 20 01 category includes the "separately collected fractions" of municipal wastes.

Overall, according to the regulations and directives adopted by the European Union, it appears that the European Union intends to promote the incorporation of UCO in biofuels in order to:

- Improve domestic energy efficiency.
- Improve food safety and agricultural land efficiency.
- Minimize waste disposal.

2.2 Greek State Regulatory Framework

The Greek regulatory framework regarding renewable energy and waste management is analysed into two separate sections, where the specific regulatory interventions adopting the EU directives are cited.

2.2.1 Renewable Energy

The Greek regulatory framework tends to comply with the EU's energy strategy and related directives. Certain articles of the Renewable Energy Directive (RED) 2009/28/EC were adopted by the Greek state through a) law 3851/2010[12] where the national targets of 20% share of renewable energy in the energy mix and 10% share of renewable energy in the transport sector by 2020 are confirmed, b) law 4062/2012[13] where is included the provision that the contribution of biofuels originating from wastes, residues, non-food cellulosic and lingo-cellulosic materials shall be considered twice that of other biofuels.

In addition, the provision of the Fuel Quality Directive (FQD) 2009/30/EC for limiting the maximum biodiesel (FAME – Fatty Acid Methyl Ester) content in the automotive

diesel oil to 7% is adopted by law 3769/2009[14] and the related decision of the Supreme Chemical Council of the State included in JMD 460/2009[15].

Finally, the full compliance with the amending directive (EU) 2015/1513 is expected by the 10th of September 2017 while the specification of a national target for biofuels production from feedstocks included in Annex IX part A of the directive is expected by the 6th of April 2017.

It should be noted that in Greece the biodiesel production is allocated to producer by the state according to a quota system. According to law 3769/2009, the quota system takes into consideration the following factors regarding the feedstock of the biodiesel plants (other factors being the plant capacity, the price premium requested etc.):

- existing contract agreements of the biodiesel producer with suppliers of feedstock from Greek energy crops,
- purchase invoices of Greek cotton-seeds and cotton-seed oil,
- purchase invoices of Greek origin used cooking oil (UCO).

The weighting factor of existing purchase invoices of UCO was until recently 7,5% out of 37,5% allocated in aggregate to all feedstock factors.

In a recent amendment of law 3769/2009 by the joint ministerial decision JMD 2497/2013[16], the quota system criteria have been modified. The weighting factor of existing purchase invoices of UCO is currently 12,5% out of 76,5% allocated in aggregate to all feedstock factors.

Thus the importance of UCO as a weighting factor in biodiesel allocation to producers has been considerably increased lately (although not proportionally to other feedstocks, presumably due to the limited availability of UCO). It appears that the Greek state supports the biodiesel production from Greek non-food crops and Greek origin used cooking oil.

It should be noted also, that in order the purchased UCO to be considered in the quota system, the UCO supplier must be licensed by the Greek state according to the mandates of the joint ministerial decision 50910/2727/2003[17].

2.2.2 Waste Management

Regarding waste management policy, the waste framework directive 2008/98/EC has been adopted by the Greek state through law 4042/2012[18]. EU regulations and

commission decisions, such as the 1774/2002/EC on animal by-products and the European waste catalogue, are directly applicable in all Member States.

The joint ministerial decision 50910/2727/2003 defines the requirements for licensing the "collection" and "transport" activities regarding non-hazardous solid wastes, which are classified according to the European waste catalogue, including UCO. Licensing is granted by the regional administrative authorities where activities take place and these activities shall be in consistency with the regional planning on waste management (PESDA / ΠΕΣΔΑ).

Both JMD 50910/2727/2003 and law 4042/2012 describe the planning on waste management that is required by the authorities both in national and regional level. On national level, the national plan on waste management (ESDA / ΕΣΔΑ) is designed by the Ministry of Environment & Energy and is reviewed every 5 years. On regional level, each administrative authority sets up a regional plan on waste management (PESDA / ΠΕΣΔΑ) which should be in consistency with the national plan.

The more recent national plan on waste management (ESDA, June 2015)[19] follows the guidelines of the waste framework directive 2008/98/EC as adopted by the Greek state through law 4042/2012. The plan encourages the separate collection of different fractions of bio-wastes and more specifically UCO through networks of collection points managed by the producers, the local municipalities or private waste management companies. The target is to recover up to 75% of UCO produced by the year 2020.

Regarding the region of Attica, which is of interest for the present study, the recently publicized regional plan on waste management (PESDA, July 2015)[20] confirms the quantitative target of 75% recovery of UCO by 2020.

2.3 Current Situation

The current situation both in the EU and in Greece regarding UCO production by sector and UCO collection efficiency are analysed in this section.

2.3.1 UCO Production

The amount of collectable UCO in each country is difficult to be determined directly since there is lack of traceability, especially regarding the amounts that the households produce. Certain studies use indirect methods to estimate these amounts based on the consumption of edible oils and fats. According to the BioDieNet Project[21] (2007-2009)

it is estimated that the UCO annual production in the EU-27 is 3,55Mt/y (or 3,95Mm^3/y considering UCO density 0,9t/m^3) ranging between 6,3-8,0lt/capita or 5,6-7,2kg/capita.

The contribution of households in the EU is estimated to 1,748Mt/y[22-23] of UCO which corresponds to about 49% of the total UCO production. The remaining amounts are attributed mainly to the HORECA sector and less to the food industry.

Applying these estimates to Greece (population 10,8 million in 2011[24]) the annual UCO production should range between 61.200-77.800t/y. For comparison purposes, Portugal that has population of 10,6 millions and similar climate to Greece, produces on annual basis 96.000m^3/y UCO[21,25] or 86.400t/y. The contribution in UCO production of the household sector in Portugal is ~54,7%, of the catering facilities ~44,7% and of the food industry ~0,6%.

According to SELAS (a Greek UCO collector) the estimated production of UCO in Greece, based of edible oil consumption, is 83.000m^3/y[26] (or 74.700t/y) of which 30% derives from households. Although the estimated contribution of households is relatively small, the total production of UCO is in agreement with the BioDieNet project estimates.

However, according to the Greek Ministry of Environment & Energy, during the recent revision of the national plan on waste management (ESDA), the estimated production of UCO in 2015 is 55.200t/y based on a multiplier of about 5kg/capita[27]. The respective UCO production in the region of Attica is 19.400t/y. These figures seem somewhat conservative and may underestimate the required amount of UCO to be collected in order to meet the 75% recovery target by 2020.

2.3.2 UCO Collection & Utilization

It is estimated that in the EU almost 90% of the collected UCO is used for biodiesel production and the remaining is used by the oleochemical industry.[28]

Considering an average conversion of 1,07m^3 of biodiesel per tonne of UCO[16], up to 3,8Mm^3 of UCOME (Used Cooking Oil Methyl Ester, i.e. biodiesel originating from UCO) could be produced in the European Union. UCOME could replace up to 1,4-1,8%[21-23] of conventional diesel or up to 20-26% of biodiesel originating from virgin vegetable oils (considering 7%vol biodiesel in the diesel fuel). Taking into account the provision of the EU for double-counting the amount of biofuels originating from wastes,

UCO could provide to the member states an additional 1,4-1,8% contribution towards the target of 10% share from renewable energy in the transport sector.

In 2007-2009 the BioDieNet project[21] conducted a study in 10 European countries. In 8 of them (population 288,5 millions) for which adequate data has been collected, the estimated amount of produced UCO was 1,92Mm^3/y and the recovered amount was 0,77Mm^3/y, that is, average recovery efficiency of about 40%.

If we extrapolate the collected amount of UCO in the whole EU-28 of 502,2 millions in 2009[29], the estimated amount of collected UCO should be about 1,34Mm^3/y of which about 1,21Mm^3/y (i.e. 90%[28]) could have been used for biodiesel production. These figures match quite well with those included in the European Commission's report on agricultural markets prospects issued in December 2014[30]. The data is presented in Table-A1 (Appendix A) including suitable assumptions and transformations and also in Chart-1.

Following the introduction of the RED directive in 2009, that was gradually adopted by the Member States, the collection efficiencies of UCO in the EU were increased but so were the UCO imports from third countries such as the USA, China, Indonesia and Argentina[35]. The motive for this was the double-counting provision of the directive towards the Member States national target on renewable energy.

Concerning the situation in Greece, useful data on collection and utilization of UCO may be derived from the joint ministerial decisions that allocate the biodiesel production to producer according to the quota system. In these decisions is recorded the amount of Greek origin UCO purchased by the biodiesel producers, since this is an important parameter for the allocation of production according to the quota system. Any UCO imports are not recorded but these are assumed to be relatively small (<10%)[36]. The data is presented in Table-A2 including suitable assumptions and transformations and also in Chart-1.

Both in the EU-28 and in Greece the UCO collection efficiency improves from 2012 onward although in absolute terms the collection efficiency appears to be about 10%-20% lower in Greece compared to the EU average (Chart-2). In 2014 for instance, the UCO recovery efficiency in Greece is estimated to 31-43% (depending on the base production rate considered) versus about 51% in the EU-28.

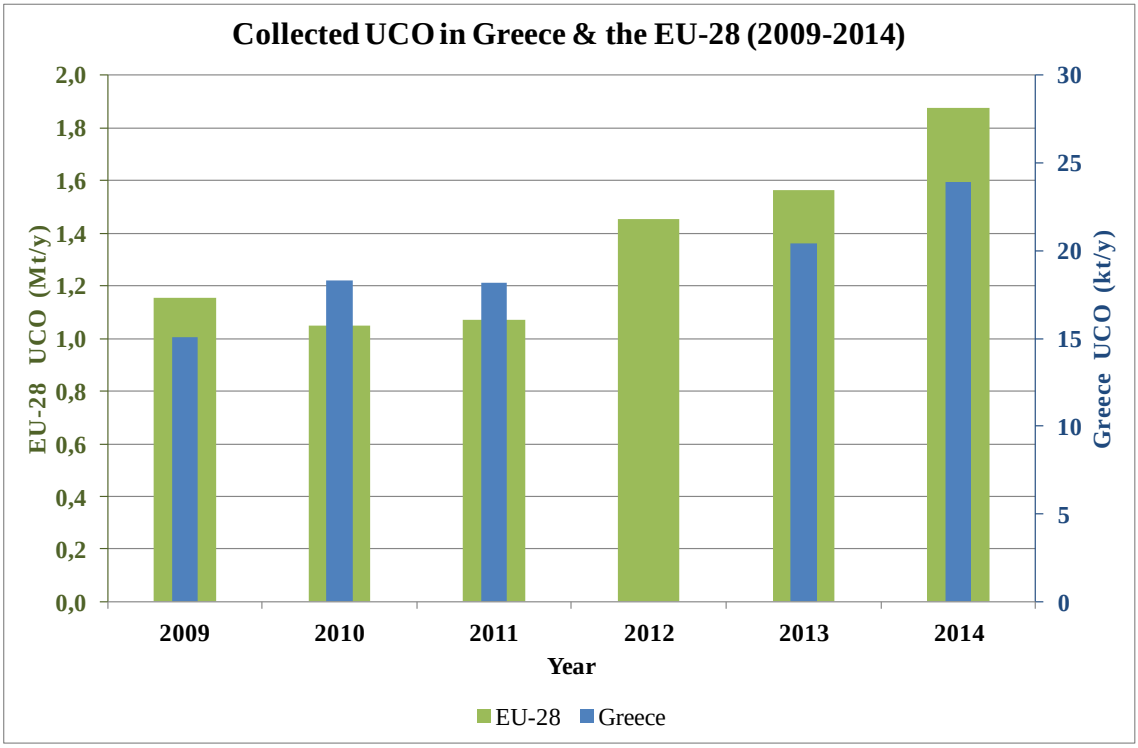

Chart-1: Collected UCO amounts in Greece and the EU-28 (based on Table-A1&2).

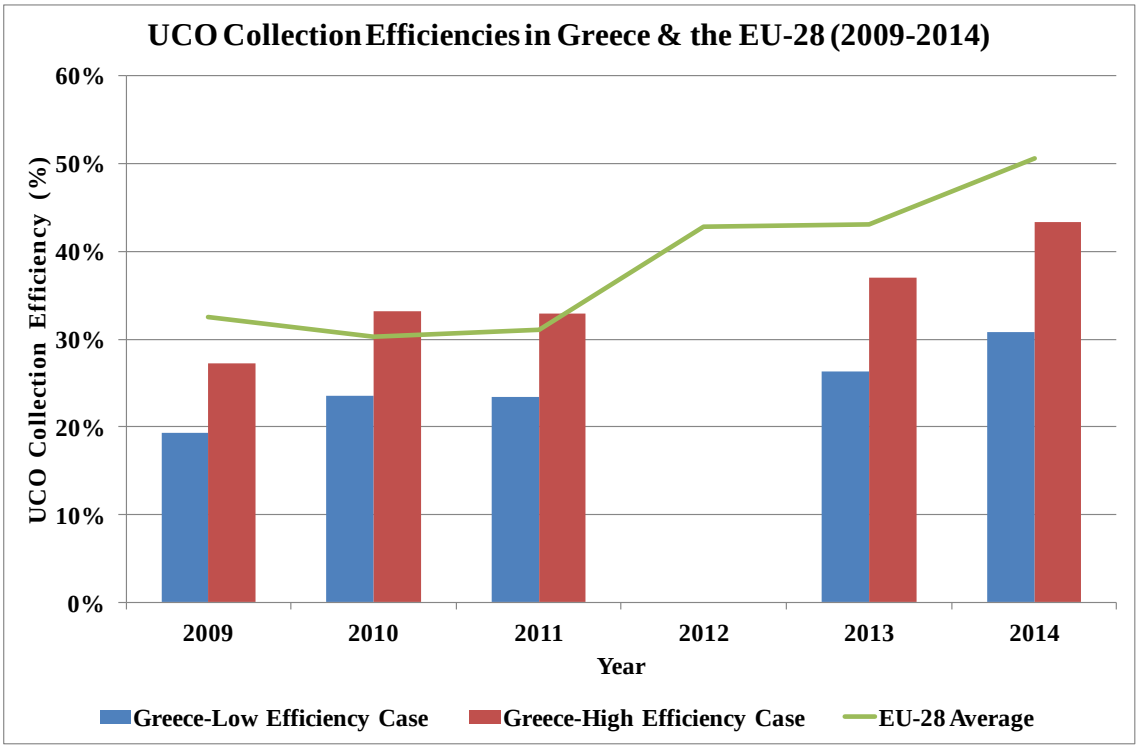

Chart-2: UCO estimated collection efficiencies in Greece & the EU-28 (based on Table-A1&2). The underline production of UCO is 7,2kg/capita in the EU-28 and for the Low Efficiency Case in Greece, and 5kg/capita for the High Efficiency Case in Greece.

2.4 UCO Market Outlook

In this section the UCO market outlook up to 2020 is provided based on official EU and Greek state estimates, along with price forecasts.

2.4.1 UCO Utilization

The market outlook is focused on UCO utilization as feedstock for biodiesel plants since this represents almost 90% of the market. This is a rapidly expanding market following the adoption of the RED directive by the EU member states that allows for double-counting of UCOME towards the national targets on renewable energy utilization.

According to the European Commission's report on agricultural markets prospects[30] the biodiesel consumption is expected to increase by 12% in aggregate between years 2015-2020 while the respective UCOME production is expected to increase by 32%. The contribution of the produced UCOME in the EU-28 is expected to reach almost 23% of biodiesel consumption, which is consistent with the estimated substitution of biodiesel from UCOME by 20-26% when UCO production is considered equivalent to 5,6-7,2kg/capita (see Sections 2.3.1 and 2.3.2). However, based on current market evidences, part of the UCO required may be covered by UCO imports. In addition almost 10% of biodiesel consumption is expected to be covered by direct imports of finished biodiesel product. The data is presented in Chart-3 and Chart-4.

Concerning the Greek market outlook some estimates may be derived by the submitted national plans on renewable energy and waste management. The Greek National Renewable Energy Action Plan[52], includes some estimates on biodiesel consumption. In addition the National Plan on Waste Management (ESDA)[19,27] contains some estimates on total UCO production and the declared national target for 75% recovery by 2020. These estimates after suitable transformations are presented Table-A3.

The estimated biodiesel consumption in Greece includes potential imports which are not expected to exceed 5%[52]. Furthermore, the calculated biodiesel substitution ~17% equals to 75% of the maximum expected (~23%) which is consistent with the 75% recovery rate of domestic UCO. Overall, a substantial increase in UCO collection is suggested in the coming years from 23,9kt/y to 41,6kt/y, equivalent to +75% by 2020 compared to the current situation in Greece.

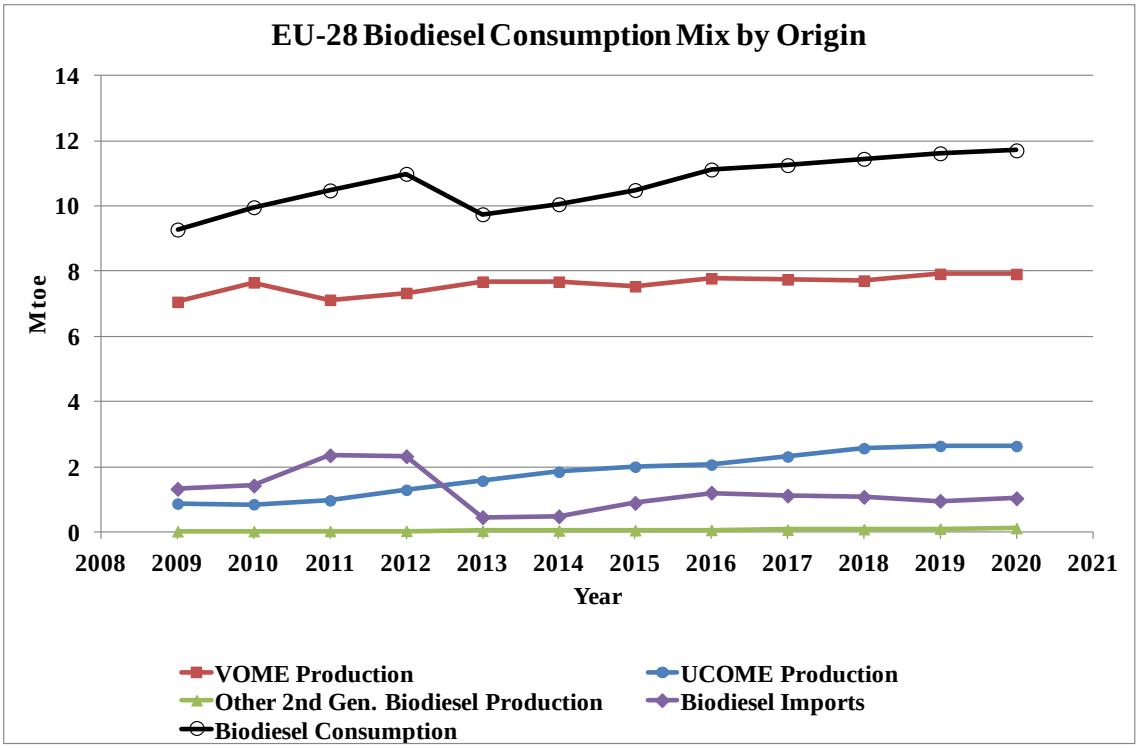

Chart-3: EU-28 Biodiesel consumption outlook by feedstock origin.[30]

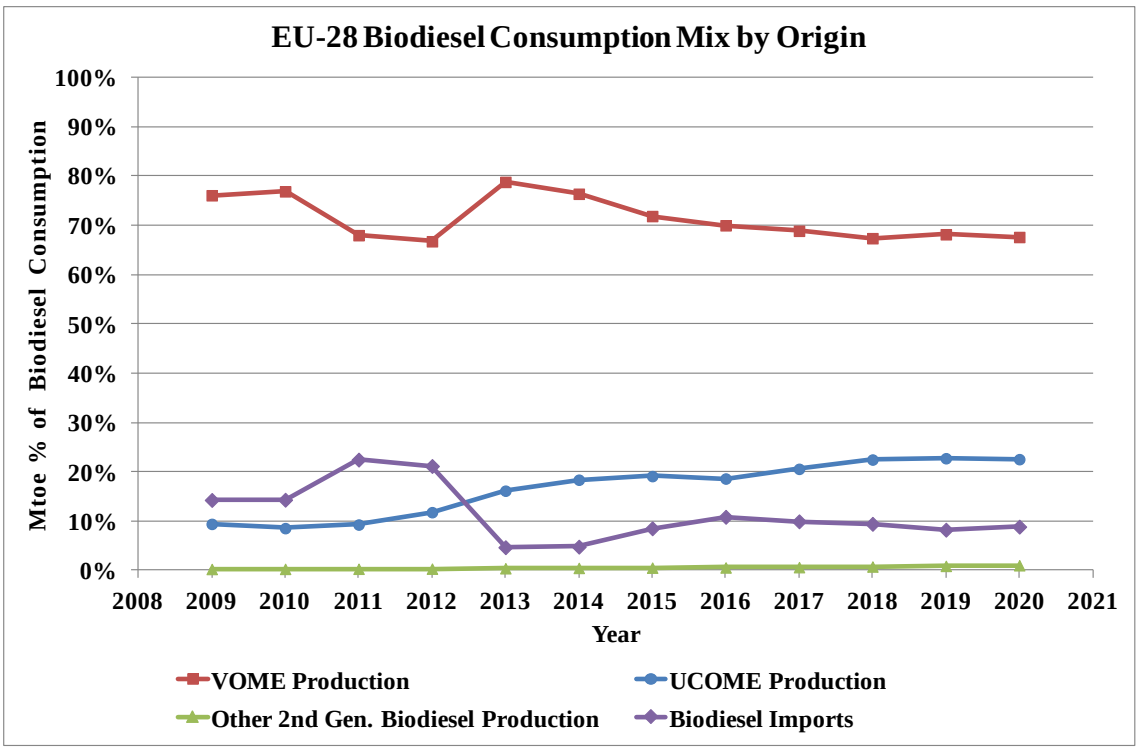

Chart-4: EU-28 Biodiesel composition outlook by feedstock origin.[30]

2.4.2 UCO Prices

UCO competes with other virgin vegetable oils as feedstock for the biodiesel plants. It appears that the UCO price is influenced by the virgin rapeseed oil and palm oil prices.[53]

In Chart-5 are presented historical data of UCO and palm oil prices along with price forecasts for palm oil. It appears that there is a strong correlation between the palm oil and the UCO prices.

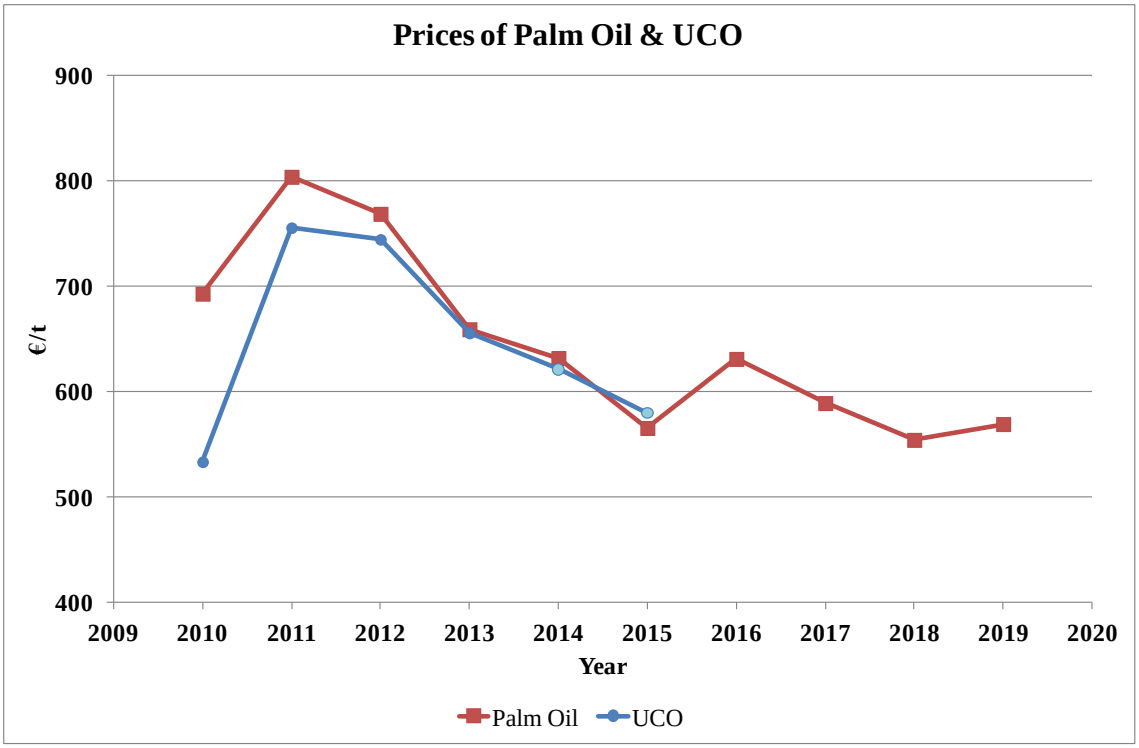

Chart-5: Palm oil and UCO prices based on Table-A4 (Appendix A) data, where the 2014 and 2015 UCO values are spot prices.

2.5 UCO Collection Industry Practices

In this section although reference will be made to the UCO collection systems in general the focus will be on UCO collection from the household sector. As discussed in Section 2.3.1 almost 49% of UCO produced originates from households and the remaining amount originates mainly from the HORECA sector and to a far smaller extent from the food industry.

In certain Mediterranean countries the contribution of the households is considered even higher, e.g. 54-62% in Portugal[21,59], 57% in Italy[59] or even up to 80% in Spain[60]. For

Greece no similar data has been located, however based on suggestions of some Greek UCO collectors regarding virgin oil consumption by sector, the households may contribute by 30-40% in the UCO production[26,61].

Based on this data the UCO recovery rates is difficult to be substantially improved unless the UCO collectors turn into the household sector as well. For instance the new Greek national plan on waste management (ESDA) suggests that the total UCO recovery should reach 75% by 2020[19].

Although is difficult to retrieve specific data on UCO recovery from households, several studies suggest that these rates are quite low. This is attributed to the increased collection cost of UCO from households. While on the one hand the private collection companies are prone to 'cherry-picking' strategies by selecting large point sources to service, the municipalities on the other hand do not have UCO collection as part of their traditional waste management activities.[21,28]

Two main collection schemes may be identified from the general literature (similar to those described in [23]) as shown in Table-1. The decentralized collection (or door-to-door collection) is applicable to large point sources e.g. restaurants, while the centralized system aggregates the UCO produced from many small producers e.g. households. Depending on the supply chain characteristics, the UCO collectors may deliver the collected UCO to other larger collectors or directly to the biodiesel plants (or other processing facilities).

Table-1: Main UCO collection schemes (based on the categorization described in [23]).

	Advantages	Disadvantages
Decentralized Collection (Door-to-Door)	- More applicable to large UCO producers. - Direct relationship between collector and producer allows educating producers on collection practices.	- High collection cost when applied to small producers. - Collection frequency depends on producer.
Centralized Collection (Public Collection Points)	- Low collection cost when applied to small producers. - Standardized collection frequency.	- Less control over the UCO quality and quantity. - Collection points exposed to criminal actions (theft, vandalism) - Approval of the collection points by the municipalities.

The European Commission in order to support UCO collection from households funded the Recoil Project (2012-2015) that analyzed several pilot programs on UCO collection. The scope was to identify key success factors and to provide a useful database for reference to companies or other entities interested in the development of UCO collection systems. In Table-A5 are listed the pilot programs considered successful by the Recoil Project. The Recoil Project did not provide any regression analysis in order to justify deviations in efficiency between the different pilot programs, such an analysis though will be provided by the present dissertation in Chapter-3 (Data Analysis).

Some qualitative results of the Recoil Project survey on pilot programs are summarized in the followings.[23,59,64-66]

Collection System:

Typically the collection system involves the partnership of public organizations (such as municipalities), non-profit organizations (NGOs) and private companies. In more than 85% of the cases a public organization or an NGO was involved in the program in order to provide promotion activities whereas the private companies were involved in the actual collection and transport process.

Collection Method:

The collection points are typically placed in public gathering places such as schools, supermarkets, parking lots, municipal buildings or directly on the streets. A few systems even applied door-to-door collection.

Delivery Method:

In the majority of the cases studied (60%), citizens were delivering UCO in bottles (or other containers) that were placed at the collection point. In 25% of the cases bulk containers were used as collection points where the citizens could pour the UCO. The remaining of the cases used both methods for UCO collection. With the first method better hygiene conditions can be achieved at the collection point since frequent pouring of UCO by the citizens is avoided. Bottles or small containers may be provided to the citizens by the implementing organization. Some examples of UCO containers are shown in Picture-1.

Means of Transport:

Tank-trucks or modified vans carrying tanks and pumps can be used to load the bulk oil and transport it (Picture-2). In cases where the UCO is delivered in bottles or small containers, these are directly collected.

Raising Public Awareness:

The most common communication channels were the local newspapers (77% of the cases) followed by TV programs and radio talk-shows. Other communication tools included leaflets, brochures, posters or the oil container itself. The communication campaigns often involved public presentations and schools workshops.

The campaigns were targeting on educating citizens about the benefits of UCO recycling. The campaign topics included the production of biodiesel from renewable resources and the problems that UCO causes to the waste water treatment plants when improperly disposed. In addition these campaigns were informing the citizens on how to collect the UCO and about the location of the collection points.

In certain cases, rewards were provided to the participating citizens, such as giving back to the citizens 1 litre of virgin oil for every 20 litres of UCO delivered.

Hygiene and Safety Issues:

In the majority of cases (67%) no special hygiene problems were reported at the collection points, however in some cases it was reported that the frequent pouring of oil into the bulk containers generated lots of dirt on the container itself and on the streets. In some rare cases was reported that dirty containers stained the cloths of people delivering UCO.

In addition 80% of the systems declared that the risk of UCO theft was average to high, which is attributed to the rising prices of UCO. Furthermore, acts of vandalism against the UCO collection equipments have been reported, including graffiti, physical damage/breaking or container overturning. Finally, in some cases was reported contamination of UCO with mineral oil or urban wastes.

Incidents such as those described above may reduce the willingness of citizens to participate in the program. To avoid such incidents the containers should be properly maintained and cleaned, while when possible to be placed in supervised areas and their internal compartments should be kept secured/locked.

(a)

(b)

(c)

(d)

(e)

(f)

Picture-1: Examples of UCO collection methods, (a-c) UCO is delivered in bottles, (d) UCO is poured into a bulk container, (e-f) bottles/containers provided by the implementing organization.[23,59,64,66]

Picture-2: Examples of transport means in cases where the UCO was collected in bulk containers.[59,64,66]

Citizens Preferences & Barriers:

The Recoil Project, apart from the analysis of the previously conducted pilot programs discussed above, interviewed 877 households in order to identify the social acceptance of the UCO recycling initiatives. About 26% of the households included in the survey, declared that they have participated in UCO recycling programs before. The results are summarized in Chart-6 and Chart-7.

In Chart-6 citizens provided more than one preference. One could suggest that the first choice 'Disposal Facilities (close to home & safe)' is relatively vague and overlaps with other choices as long as the disposal procedure is easy and safe. The second choice 'Door-to-Door Collection' although preferred by the citizens is relatively difficult to be implemented due to the scarcity of the collection points.

The remaining choices that refer to collection points located at public places, rank preferred locations in the following order: supermarkets, gas stations, schools, municipalities and restaurants. The common characteristic of these choices is that the collection points are located in controlled areas that are frequently visited by the citizens. It is interesting to note that the 'gas stations' is the second best choice of the citizens although it is a collection method that hasn't been used by any of the systems listed in Table-A5.

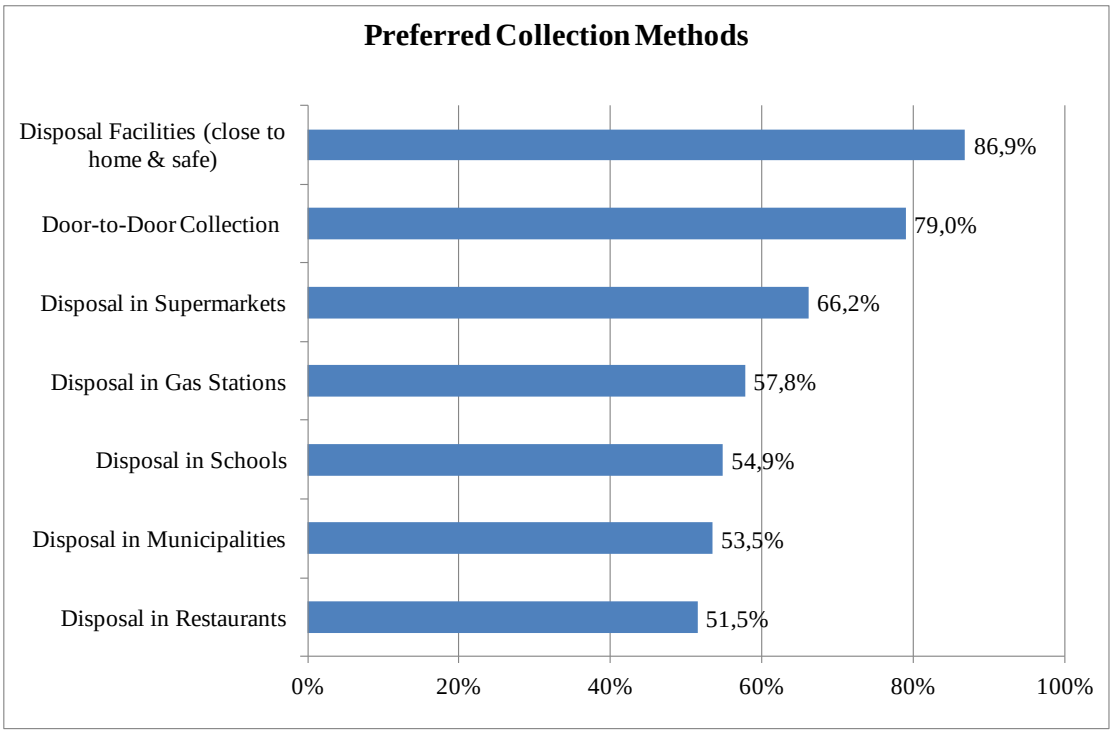

Chart-6: Preferred UCO collection methods by the citizens according to the Recoil Project.[59,65]

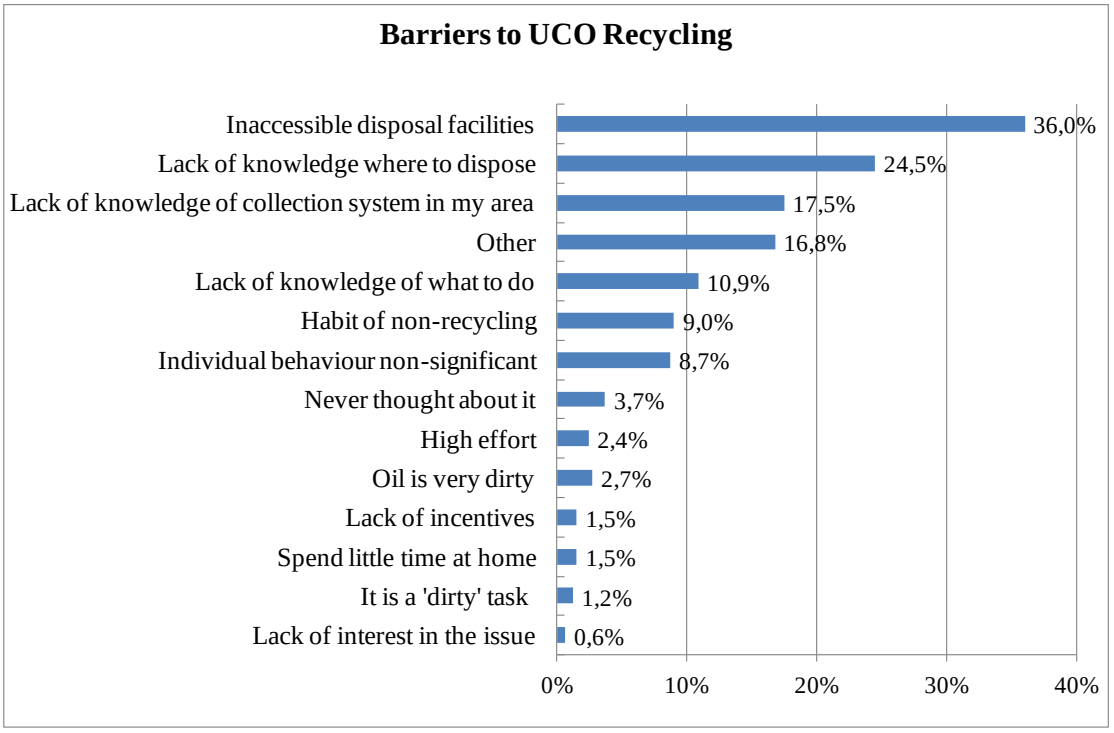

Chart-7: Barriers to citizens participation in UCO recycling according to the Recoil Project.[59,65]

In Chart-7 is provided a list of reasons that prevents citizens from participating to UCO recycling, according to their replies. Obviously the participants named more than one barrier. Also, it appears that there is a degree of overlap between several identified barriers. One could summarize the barriers as follows: inaccessible collection points, lack of knowledge regarding the collection system, lack of incentive/interest or even denial. The first two categories that have to do with collection points accessibility and awareness about the recycling system are the main ones.

The Recoil Project also reported that about 38% of the respondents would participate in a UCO recycling program only if it was easy and practical, while 33% would participate even if the collection procedure was complex.

2.5.1 UCO Collection in Gas Stations – The MOL Example

A special case in the UCO collection industry is the Hungarian oil company MOL. The company launched a new UCO recycling initiative in May 2011 in collaboration with Biofilter Kft. The latter collects and transports the UCO from MOL's gas stations to the Rossi Biofuel plant for conversion to biofuels.[67]

The initiative started with UCO collection points located at about 100 gas stations in Hungary[68] and by the end of 2014 had reached 230 collection points in three countries – Hungary, Romania, Slovakia.[69]

In 2014 only, MOL managed to collect 162 tonnes of UCO from the existing network of 230 gas stations[69], which on average corresponds to 704kg (or about 783lt) per collection point.

The majority of UCO collected (82%) originated from the 178 gas stations located in Hungary, while the remaining collection points are located in Slovakia and Romania[70-71]. The Hungarian population is about 10 millions and the estimated annual UCO production is 53.500t/y or about 5,3kg per capita. Of this amount, about 60% is estimated that derives from households.[72]

In order to support the initiative, MOL has launched several promotional campaigns that often provided some rewards to the participants. In 2013 the participants were receiving a coupon which they used to vote for their communities on the website. At the end of the contest MOL would organize a street festival at the centre of the winning community[67]. In 2014 the campaign was combined with a game in which entrants

could win a prize, resulting to 72% more registrants compared to 2013[71]. In addition, MOL provides to the participants a reusable flask with its logo printed on (Picture-3), that the citizens can use in order to collect, store and transport the oil to the gas stations.

Picture-3: MOL's reusable 'red flask' for UCO collection.[71]

MOL has also conducted an online survey in August 2013 regarding UCO recycling. About 1000 customers participated, the majority of which were ladies responsible for housekeeping at the age of 18-59. The survey concluded that more than 50% of the participants would rather pour UCO into the sinker or drop it into the garbage instead of recycling it.[73]

Furthermore, nearly 75% of the survey participants would be willing to participate in UCO recycling if there was a collection point in proximity to their residences. The remaining 25% declared that they wouldn't participate even if such a collection system was available, but they would have a more friendly stance towards the Door-to-Door collection method.[73]

MOL however suggests that there is ample room for changing this deep-rooted habit of not recycling UCO, based on the results of the successful initiative that the company has already undertaken in UCO collection.[73]

2.5.2 UCO Collection in Greece

In Greece around 50 companies are involved in UCO collection and transport[74]. About 1/3 of them have permission for the operation of temporary storage infrastructures. There is also one company, 'AGROIL ENERGY', which provides UCO refining at its plant in Thessaly[75]. However, applicable UCO pre-treatment steps are often integral parts of the biodiesel production process[23].

Since the temporary storage of wastes requires suitable infrastructures and approval of a special Environmental Impact Assessment Study[17], only large collectors are able to operate such facilities. Presumably, smaller collectors transfer the collected UCO to these temporary storage facilities operated by the larger collectors. In certain cases a UCO collector may be an affiliate or subsidiary of a company operating a biodiesel plant.

For instance, 'GF Energy' that runs a biodiesel plant in Corinth (Peloponnese Region) owns 45% of 'Revive' shareholders' capital, while the latter is the exclusive provider of UCO to the former[76-78].

'Revive' was established in 2006 and by 2010 had a network of 1.900 collection points all over Greece, mainly in the HORECA sector, and 3 temporary storage units. 'Revive' rewards the participating companies by providing them detergents or virgin oils. In 2010 the annually collected amount was 1.850t/y[76], which corresponds to about 1,0t/y per collection point. 'Revive' is the sole supplier of UCO in Greece to 'GF Energy' and, based on the declared amounts of UCO of the latter within the framework of the biodiesel allocation quota system and following a similar estimation procedure to that presented in Table-A2, we can assume that in 2014 the company recycled about 3.000t/y of UCO or almost 1,6t/y per collection point.

'Revive' has participated in two projects to collect UCO from households (see Table-A5). In one case, the project involved collection points at 22 municipalities, 16 schools and 80 supermarkets ('Atlantic'). However, given the closure of the supermarket chain 'Atlantic', this initiative may be inactive since mid 2011.[62-63,83]

The second initiative, involved the establishment of about 50-60 collection points at supermarkets 'AB Vasilopoulos' in several locations around Greece. This initiative is

still active since 2009. As part of the promotional campaign 'Revive' donates 0,03€ to the WWF for each litre of UCO collected.[62-63,84]

The oil company 'ELINOIL' that operates more that 580 gas stations in Greece has created, through its subsidiary 'ELIN Biofuels' that operates a biodiesel plant in the area of Volos (Thessaly Region), a UCO collection company under the trade name 'Prasino Ladi' (English trade name 'Sillogi'). The company 'Prasino Ladi' collects UCO by its own means or through other certified collectors. The UCO after temporary storage at company's facilities is directed to the Volos biodiesel plant of 'ELIN Biofuels'. A UCO pre-treatment/refining step takes place at the biodiesel plant facilities.[79-82,102]

Regarding 'Prasino Ladi' it appears that the company focuses its activities to the HORECA sector[79-80]. It is not known how many collection points the company services and their efficiency, but the company also receives UCO from other collaborating collectors. An indication could be the joint ministerial decisions that allocate the biodiesel production according to the quota system. Based on the 2013-2015 decisions[43-45], 'ELIN Biofuels' is the greater UCO recycler in Greece, converting to biodiesel about 8.000t of UCO annually.

'Prasino Ladi' has also participated into pilot projects within the framework of Recoil Project[23]. These projects started between 2013-2015 and involved municipalities and schools in the area of Athens and Marathon. Collection points have been placed at 50 schools and public buildings, while the public awareness campaign reached more than 100 schools.

Another interesting initiative is the consortium of 'JET ENERGY Ltd' and 'Michalelis Sons GP' established in 2012. The consortium intends to collaborate with UCO producers including local administrative authorities and in return for certain amount of UCO received will credit to the producers a proportional amount of heating oil supplied by a 'JETOIL' gas station.[85]

'JET ENERGY Ltd' is involved in the Renewable Energy sector since 2009 and is a 75% subsidiary of the oil company 'MAMIDOIL-JETOIL SA' that operates about 600 'JETOIL' gas stations in Greece. 'Michalelis Sons GP' on the other hand is a large UCO collector with activities all over Greece. The literature review cannot conclude

about the amounts of UCO that the latter collects today, but according to a previous study, in 2008 ‘Michalelis Sons GP’ was the main UCO collector in Greece reclaiming about 3.500t/y or almost 27% of the total UCO collected.[85-87]

Several other pilot projects have been launched lately focusing on UCO collection from households. The collection systems included local authorities, NGOs and private companies. The collection points were mainly located at schools and public buildings. The local authorities often were receiving some amount of heating oil in return for the UCO delivered.[23,88-89]

Overall, it appears that although today the main source of reclaimed UCO is the Greek HORECA sector, several public awareness campaigns and demonstration projects have paved the way for the adoption of UCO recycling practices by the general population.

3. Data Analysis

The data analysis chapter is dedicated to the most crucial parameter of any UCO collection system, which is its efficiency.

As discussed in Section 2.5, the Recoil Project has studied a number of previously implemented projects involving UCO collection systems targeting to the general public (Table-A5). The Recoil Project sorted these projects in categories such as Country, Population Density, UCO Production per Capita and Collection Points Density. A fifth category was also used, which was the Income per Capita, however due to several discrepancies between the two sources [62] and [63], it was omitted from our analysis.

The Recoil Project although provided a categorization of the initiatives and presented several findings regarding the applied methods and practices, it did not provide any generalized method for estimating the potential efficiency of future projects. The present study attempts to fill this gap by applying multivariable regression analysis in order to identify an empirical equation that provides the UCO collection efficiency as a function of the categories (variables) identified by the Recoil Project. The regression equation will then be used for estimating the expected efficiency for the Business Plan suggested in Chapter-4.

3.1 Data Transformation

The Recoil Project provides the collection efficiency (dependent variable) of the system in terms of *amount of UCO collected per collection point*. However, the suggested categories (explanatory variables) are related to characteristics linked to the target population. For the purpose of the regression analysis, all suggested explanatory variables should have some type of rational connection to the dependent variable. For this reason it would be considered more appropriate to express the collection system efficiency in terms of *amount of UCO collected per inhabitant*. In this way the efficiency of the collection system would be better related to the UCO collection potential, depending on the population characteristics.

However, the Recoil Project does not provide information about the number of inhabitants each system addressed to, but only the collection points density *category* (in terms of inhabitants per collection point).

In order to estimate the number of inhabitants each system addressed to, population data by region or municipality was retrieved from other sources. In few cases where such a task was not possible or was leading to contradictory results, the number of inhabitants was calculated based on the Recoil Project data (e.g. collection points density [middle of category] x number of collection points).

In Table-B1 (Appendix B) is presented the calculated efficiency for each pilot project, studied by the Recoil Project, in terms of amount of UCO collected per inhabitant. Certain pilot project cases, such as 'Revive', 'AB Vasilopoulos' and 'Region of Tuscany' were omitted since the target population couldn't be estimated and neither the Recoil Project provided any collection point density data.

3.2 Regression Variables

The regression variables identified are given in Table-B2. Apart from the dependent variable, which is the collection efficiency, all independent (explanatory) variables are of categorical type (Country, Population Density, UCO Production, Collection Points Density).

A suggested technique in order to deal with categorical variables is the introduction of some 'Dummy Variables'. One dummy variable is created for each category within a categorical variable. A dummy variable has possible values equal to 0 or 1. When a dummy variable equals to 1, this means that the observation falls within the specific category of the categorical variable.[93]

A small technical detail regarding the introduction of dummy variables, is that, for each categorical variable the number of dummy variables that is needed is *one fewer* than the number of categories.[93] (However, if this rule is not followed then the regression analysis will practically exclude one of the dummies by setting its regression coefficient equal to zero)

The dummy variables introduced in the analysis are given in Table-B3. The last category of each categorical variable is excluded. The categories excluded are Italy (Country), ≥1000 (Population Density), ≥10 (UCO Production) and >5k (Collection Points Density). These categories that are excluded from the introduction of a corresponding dummy variable, are not excluded from the analysis but serve as the reference category (for instance an observation that has Population Density ≥1000 will

be represented by setting the dummy variables corresponding to Population Density <200 and Population Density 200-1000 equal to zero).

3.3 Regression Analysis

Once the dummy variables have been introduced, the Recoil Project data (sample) may be modified as shown in Table-B4.

A generalized multiple linear regression equation for the sample would be:

$$Y = a + \sum_{i}\sum_{j} b_{ij} \cdot X_{ij} = a + \sum_{k=1}^{3} b_{1k} \cdot X_{1k} + \sum_{m=1}^{2} b_{2m} \cdot X_{2m} + \sum_{n=1}^{2} b_{3n} \cdot X_{3n} + \sum_{p=1}^{2} b_{4p} \cdot X_{4p} \quad \text{(eq.1)}$$

where,

Y : Collection Efficiency (dependent variable) in [lt/(hab·y)].

α : Multiple regression intercept in [lt/(hab·y)].

b_{ij} : Regression coefficients corresponding to variables X_{ij} in [lt/(hab·y)].

X_{ij} : Independent (dummy) variables having values 0 or 1.

i : Categorical variables identification (1 to 4), where 1: Country, 2: Population density, 3: UCO production, 4: Collection points density.

j : Corresponds to categories k, m, n, p.

k : Country categories, 1:Greece, 2:Spain, 3:Portugal.

m : Population density categories, 1:<200 hab/km^2, 2: 200-1000 hab/km^2.

n : UCO production categories, 1:<1 lt/(hab·y), 2: 1-10 lt/(hab·y).

p : Collection points density categories, 1:≤2k hab/cp, 2: 2-5k hab/cp.

The regression analysis identifies a line that minimizes the sum of squared residuals (residuals between regression line and sample points)[93]. This was implemented by using the Microsoft Excel add-in application 'Data Analysis'. The resulting coefficients and other statistical parameters are given in Table-B5 and Table-B6.

One of the regression coefficients (b_{31}) was calculated equal to zero, thus this coefficient can be dropped-out of the regression equation.

The resulting regression equation has a relatively good fit through the sample points and explains almost 66% (R-square) of the variation in UCO collection efficiency. However, there could be other important variables that affect the UCO collection

system efficiency. One could suggest factors such as the public awareness campaign or the previous experience of the participants (private/public operator, manager), however it is difficult to quantify such factors.

3.4 Confidence Intervals

A typical confidence interval of a point estimate is given by the following generic equation:[93]

$$Point\ Estimate \pm Multiple \cdot Standard Error \quad \text{(eq.2)}$$

where the 'Multiple' factor can be estimated from t-distribution tables depending on the desired confidence interval and 'Standard Error' is the standard error of prediction for the regression equation.

In case of multivariable regression the standard error of prediction is quite cumbersome to be estimated, since it requires calculations involving arrays[94]. The standard error of prediction is minimized around the sample mean and gradually increases as we move away from the mean. For point values reasonably close to the sample mean, the standard error of prediction can be estimated by the following equation[93-94]:

$$s_{ind} = s_e \cdot \sqrt{1 + \frac{1}{n}} = 0{,}114 \cdot \sqrt{1 + \frac{1}{15}} = 0{,}118 lt\ /(hab \cdot y) \quad \text{(eq.3)}$$

where,

s_{ind} : Standard error of prediction in [lt/(hab·y)]

s_e : Standard error of estimate (see Table-B6) in [lt/(hab·y)]

n : Sample size (see Table-B6)

The standard error of prediction is relatively large, and comparable to the sample mean which equals to 0,158lt/(hab·y). Thus, it would be impractical to require high confidence intervals, since the resulting range of the point estimate would be quite wide. Instead, given that the purpose of the analysis is to set-up a new business and the intrinsic uncertainty of such endeavours, it is considered appropriate to require a relatively low confidence interval such as 70%, which is equal to about one standard deviation (for normally distributed populations). A 70% confidence interval (two tails) corresponds to 85% confidence interval (one tail) regarding the low side estimate, which would be more critical for a business decision.

For 70% (two tail) confidence interval and 6 degrees of freedom (see Table-B6), the resulting t-multiple is 1,134.[95]

Substituting in eq.2, the expected range of a point estimate at 70% confidence interval is calculated:

$$Point\ Estimate \pm 0{,}134 lt\ /(hab \cdot y)$$

Although, it is impossible to draw a graph of the dependent variable against the explanatory variables in a multiple regression equation, we can plot the estimated dependent variable (estimated UCO collection efficiency) against the observed values (actual UCO collection efficiency). Such a plot is shown in Chart-8.

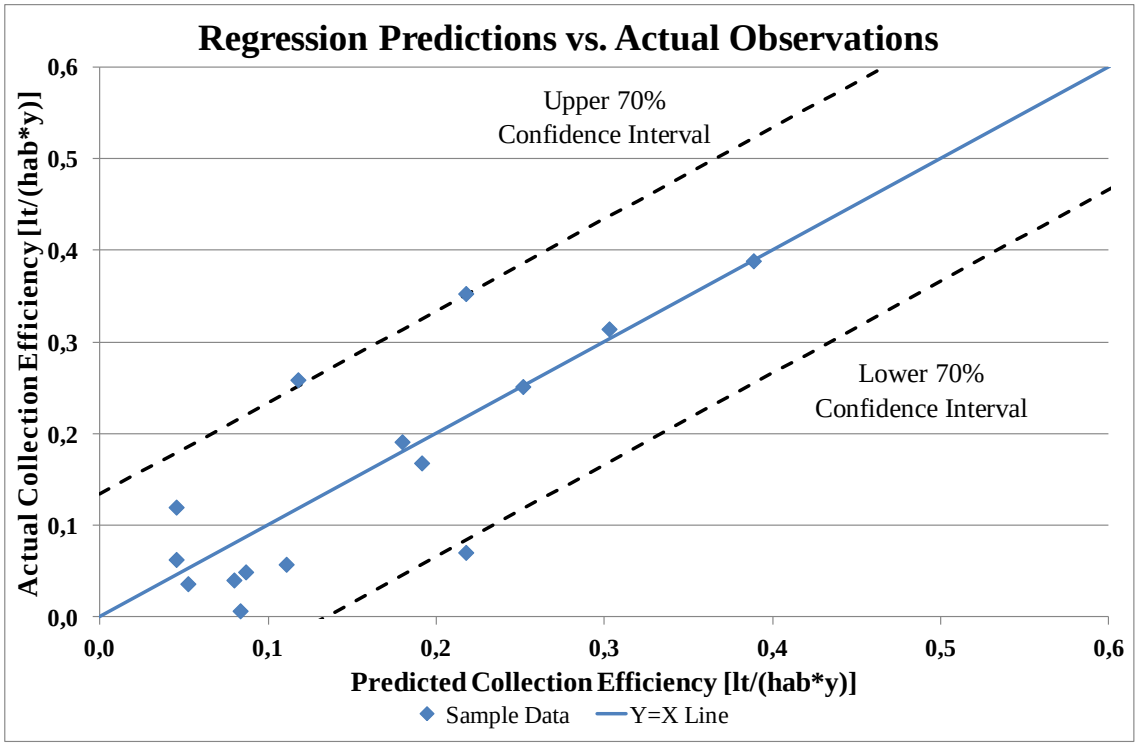

Chart-8: Actual UCO collection efficiencies versus the regression equation predictions.

In Chart-8, if the regression equation estimates were fully matching the observed collection efficiencies, then all sample points would be on the Y=X line. Furthermore, it is noted that, in Chart-8 all observations fall within or relatively close to the 70% confidence interval.

3.5 Application of the Regression Equation

The suggested business project will install collection points at gas stations. As will be discussed in Chapter-4 it is suggested to target the collection activities in the region of Attica.

In the region of Attica operate 1049 gas stations[96]. The region's population is 3.827.624 and the average population density is 1.005,13hab/km^2 [20]. The resulting gas station density is 3649hab/cp. Furthermore, the estimated UCO production in Greece falls within the 1-10lt/(hab·y) range (see Section 2.3.1). When replacing this data set into the regression equation the average estimated UCO collection potential efficiency in the area of Attica can be estimated. The calculation procedure is shown in Table-B7.

The resulting estimate of potential UCO collection efficiency is 0,251 lt/(hab·y). One could observe that the population density marginally falls in the ≥1000 hab/km^2 category and if it was lower so would be the estimated collection efficiency. However, the population density used was an average one, including not inhabited areas, while the urban areas have normally much higher population densities (often higher than 10.000 hab/km^2)[20]. Thus, the estimate is considered reasonably accurate.

When applying the 70% confidence interval, the expected collection efficiency ranges from about 0,12 to 0,39lt/(hab·y).

These estimates can be further converted on a per collection point basis, considering the average collection points density of 3649hab/cp. The resulting average collection efficiency is 917lt/(cp·y) and the 70% confidence interval range is 429 to 1406lt/(cp·y). For comparison, the collection efficiency reported by the Hungarian oil company MOL (see Section 2.5.1) was 783lt/(cp·y) which falls within the suggested range.

4. Business Plan

The present business plan deals with the incorporation of a company involved in the Used Cooking Oil (UCO) recycling industry which lies at the intersection of two very promising sectors of the economy, the biofuels/biodiesel industry and the waste management industry.

4.1 The Concept

The company will provide UCO collection services through a network of collection points located at the premises of collaborating gas stations and the collected UCO will be destined for biodiesel plants feedstock. The company will be incorporated in Greece and, at least during the early stage of its business expansion, will provide its services only within the region of Attica, which is the most highly populated area of Greece.

4.2 The Context

The background for the business opportunity is being set by a framework of regulatory interventions on behalf of the European Union (EU)[1-11] and the Greek state[12-20].

Four very important EU regulatory interventions constitute the base for the business opportunity in UCO reclamation and utilization as biodiesel feedstock:

- Following the recent dioxin crisis the EU introduced in 2002 the European Council regulation 1774/2002, which prohibits the incorporation of catering wastes (including UCO) into animal foods. UCO, other than that originating from the food industry, can only be incorporated into technical products solely for industrial use such as soaps, lubricants and biofuels.[7-9]
- According to directive 2008/98/EC, UCO is a biodegradable fraction of municipal wastes that should be separately collected.[10-11]
- The Renewable Energy Directive (RED) 2009/28/EC[4], introduced the concept of the Indirect Land Use Change (ILUC). Based on this concept, and regarding biofuels feedstock, biofuels should not compete with food crops and their production shouldn't encourage the destruction of biodiverse or agricultural land.
- The Renewable Energy Directive (RED) 2009/28/EC[4] and its amending directive 2015/1513[6] introduced a list of feedstocks which, when utilized for biofuels production, allow for double-counting the energy content of the

resulting biofuels towards the members states national targets on renewable energy utilization. This list of feedstocks includes wastes such as UCO.

The Greek regulatory framework is consistent with the EU mandates, and also provides some additional incentives for UCO reclamation:

- The biodiesel production in Greece is allocated to producers by the Greek state according to a quota system. One of the criteria, for the allocation of biodiesel production, is the existence of purchase invoices of *Greek origin UCO* (JMD 2497/2013)[16].
- The recent Greek National Plan on Waste Management (ESDA, June 2015)[19] and the Regional Plan on Waste Management of Attica (PESDA, July 2015)[20] set out the target of recycling up to 75% of the produced UCO by 2020.

4.3 The Market

The regulatory framework (especially the double-counting provision) provides considerable incentives for the UCO market development. It is estimated that in the EU almost 90% of the collected UCO is used for biodiesel production and the remaining is used by the oleochemical industry[28].

UCO is currently traded as a commodity and its price is strongly influenced by the prices of virgin vegetable oils such as the palm oil[53]. Forecasts of the palm oil prices suggest an average price of 586€/t for the five years period 2016-2020[54-56]. The same price is suggested as the basis for UCO within the framework of the present business plan (see Section 2.4.2).

Concerning the UCO demand by the biodiesel plants in Greece, this is strongly dictated by the production allocation criteria according to the quota system given the installed overcapacity. According to JMD 2497/2013[16] the existence of purchase invoices of *Greek origin UCO* has a 12,5% weighting factor. Also, the installed biodiesel capacity of the Greek biodiesel plants is ~780.000m^3/y (687.000t/y)[103] which is about 6 times the annually allocated biodiesel production during the last five years (on average ~130.000m^3/y)[39-45]. These figures suggest strong competition among the biodiesel companies in order to increase their production share through the purchase of feedstocks that the quota system promotes.

4.4 The UCO Supply Chain in Greece

According to official estimates in Greece are produced 55.200t of UCO annually and expected to remain at this level until 2020[27], although based on other studies[21], the estimated annual UCO production in Greece is 10-40% higher. Also, the officially estimated UCO production for the region of Attica is 19.400t/y.[27]

Some estimates about the recycled amounts of UCO in Greece can be derived from the joint ministerial decisions[37-51] that allocate the biodiesel production according to the quota system. The estimated amount of UCO incorporated into biodiesel in 2014 is 23.900t/y (Section 2.3.2 and Table-A2). The resulting collection efficiency of the UCO recycling industry is 43% considering the official UCO production estimates. These figures suggest that in order to achieve the 2020 national target, the recovered UCO should increase by +75% compared to the currently collected amounts. This corresponds to a required industry expansion of 8-12% on a year-over-year basis since 2014.

It is estimated that about 30-50% (see Section 2.5) of the produced UCO derives from households, of which negligible amount is recovered, and the remaining derives mainly from the HORECA sector.

Currently the private companies involved in the UCO industry are focused to large point sources, such as the HORECA sector, that improves logistics efficiency. On the other hand the public sector (municipalities) do not have UCO collection as part of their traditional waste management activities.[21,28]

In addition, it is required by the hygiene regulation (96967/2012)[104] that food & drink establishments should collect the UCO produced and recycle it through certified collectors. On the other hand, the amounts of UCO that derive from households are not regulated and its recovery is on voluntary basis through small scale pilot projects[23,62,63,88,89].

The EU principle '*the polluter should pay*'[97] is not actually enforced in the case of UCO recovery. The UCO collectors provide the services for free and they may even provide small incentives to the producer such as detergents, virgin oil or fuels in exchange for the UCO delivered. The whole supply chain is sustained by the price that

the biodiesel plants pay for the UCO feedstock rather that from the fees that the polluter pays for the recycling service.

In the region of Attica operate about 15-20 UCO collectors of which at least 5 operate temporary storage facilities in the region[74]. Collectors deliver the collected UCO either to large collectors that operate temporary storage facilities or directly to the biodiesel plants. Some UCO collectors are vertically integrated with biodiesel plants, such is the case of 'Prasino Ladi' and 'ELIN Biofuels'[79], or have exclusivity agreements with biodiesel plants, such is the case of 'Revive' and 'GF Energy'[78].

4.5 The Oil Industry

Concerning the structure of the oil industry in Greece, the retail sector is dominated by two large companies, Hellenic Petroleum and Motor Oil. The two companies which operate the 4 Greek refineries are vertically integrated and through their affiliates/subsidiaries control in aggregate about 50% of the retail sector. There are also about 15 smaller companies (plus a number of independent gas stations) that control the remaining market share (<10% each).[101]

In addition two oil companies, ELINOIL and JETOIL, are involved in the UCO industry. The first one through its subsidiaries 'Prasino Ladi' (UCO collector) and 'ELIN Biofuels' (biodiesel plant operator) collects UCO mainly from the HORECA sector and the food industry and, after temporary storage, the UCO is transferred to the company's biodiesel plant at Volos[79-82]. The second one through its subsidiary 'JET Energy' has established a consortium with a large UCO collector. The consortium intends to collaborate with UCO producers including local administrative authorities and in return for certain amount of UCO received will credit to the producers a proportional amount of heating oil supplied by a 'JETOIL' gas station.[85]

4.6 Strategy Outline

Based on the data presented in the previous sections, it appears almost impossible for Greece to achieve the UCO recovery national target unless the UCO industry is expanded into the household sector, since the HORECA sector is reaching saturation regarding UCO recovery efficiencies. The present business model suggests the incorporation of a company collecting UCO from the household sector. The household

sector is considered a market niche with substantial development potential since the UCO recovery rate from households is almost negligible.

The company will manage a network of UCO collection points located at the premises of collaborating gas stations. The company's business model will need to be combined with the Social Responsibility Programs (SRPs) of big oil companies.

The company will own and manage a network of collection points located at gas stations in the region of Attica. The company will collect the UCO by means of a private fleet of vehicles and will transport it to large UCO collectors that operate temporary storage facilities located also in the same region. The company will need to receive a special permit for 'Collection & Transport' of UCO by the administrative authority of the region of Attica[17,98].

The company will not operate its own temporary storage facilities in order to reduce the business risk related to additional investments, at least at the initial phase. Furthermore, the operation of such installations requires additional permits by the local authorities[17,98].

Given that there are no biodiesel plants in the region of Attica (the closest being the 'GF Energy' plant in Corinth – region of Peloponnese)[45,87], it is not considered a cost effective solution to transport small quantities of UCO directly to the biodiesel plants. Furthermore, transporting UCO to different regions requires additional permits by the local authorities where the biodiesel plants are located and the UCO is finally delivered (although permits are not required for the transit of UCO through intermediate regions)[17,98].

The UCO recovery service from households is not a service provided to customers in order to meet a basic need, but is rather based to a large extent on the voluntarism of the participants in order to achieve some higher goal such as the protection of the environment and public health. This results from the fact that the EU principle '*the polluter should pay*'[97] is not actually enforced in this case.

The collection efficiency of similar UCO collection initiatives in Greece and the EU has been studied[62-63] and analyzed (in Chapter-3). The analysis suggests that if such a system was applied in the region of Attica the expected recovery rate would be on average 0,251 lt per inhabitant or about 917lt per collection point on an annual basis.

Considering UCO density of about 0,9kg/lt[21], these figure are translated to 0,226kg/(hab·y) and 826kg/(cp·y) respectively.

Since under the current business plan it is suggested that the collected UCO will not be delivered directly to the biodiesel plants, but to some large UCO collectors for temporary storage, some deduction in the UCO price is required in order to take into account the 'wholesaler' gross profit margin. It has been considered a gross profit margin equal to 15% which is the minimum suggested[99], given the strong market demand for UCO. In this case, the large UCO collector is expected to buy the collected UCO at the price of 498€/t.

Some estimates about the size of the business can be provided at this point, given that in the region of Attica operate 1049 gas stations (February 2015 records)[96]. In Chart-9 are given the expected revenues as a function of the number of the collaborating gas station (collection points). According to Chart-9 the business initiative falls in the category of 'microenterprises' or SME according to the EU categorisation[100]. It appears that is required the establishment of about 600-700 collection points in order to marginally sustain a small company of up to 10 employees.

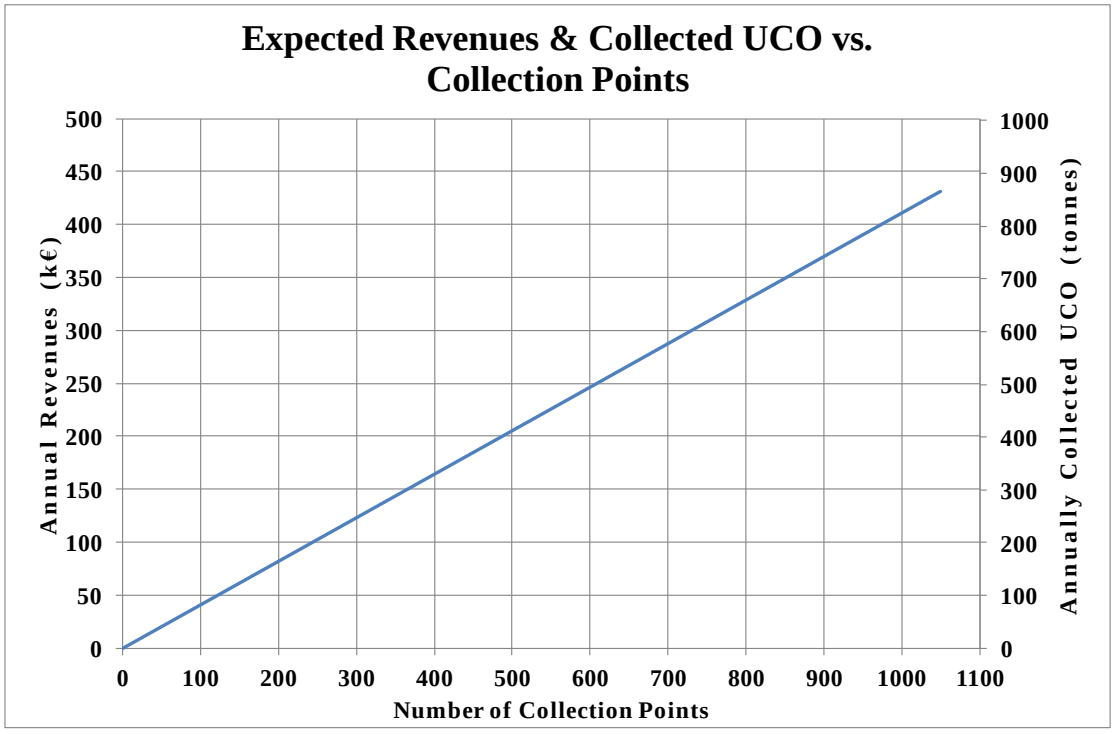

Chart-9: Expected revenues and collected UCO versus the number of collaborating gas station (collection points).

4.6.1 Strategy Analysis

In the region of Attica are annually produced 19.400t of UCO of which about 9.200t are recovered[27]. Considering that about 17 collectors are involved in this region, the average market share for each one corresponds to about 540t/y.

Under the basic scenario the company should install about 650 collection points and will reclaim about 537t on an annual basis (Chart-9). Thus, the suggested market share will be similar to the industry average.

The suggested strategy outlined in the previous section is further analyzed by applying the Porter's Five-Forces Model[105]. The application of the model aims to analyze in a systematic (though qualitative) manner the competition in the UCO industry, to identify aspects of the suggested strategy that are considered critical and finally to refine the suggested strategy.

Rivalry Among Competing Firms:

Number of competitors: The number of competitors is quite high and for most of them the profit margins should be very limited when considering an average share of 540t/y. (High Threat)

Product differentiation: The collected UCO is traded to a large extent as a commodity, thus there are minimal opportunities for differentiation. (High Threat)

Market Growth: The market is forecasted to expand by almost 75% in the next five years. (Low Threat)

Product Prices: Product prices are expected to remain almost stable within the next five years. (Low Threat)

Exit Barriers: Most collectors, which do not operate temporary storage facilities, are expected having limited investments in tangible assets (such as vehicles, buildings or equipments). These are not considered specialized equipment and could be liquefied relatively easily. (Low Threat)

Suggestions on strategy: The rivalry among competing firms is considered moderate, since although this is a marginal business the market is expanding. It is suggested to pursuit domination of the target industry niche (gas stations) through exclusivity agreements in order to avoid retaliatory countermoves by competitors.

Entry Barriers for New Competitors:

Legal Barriers: It is required a permit in order to conduct the collection and transport activities. In addition new enterprises need to be registered as legal entities in the General Electronic Commercial Registry (G.E.MI./Γ.Ε.ΜΗ.). (Medium Threat)

Technology Barriers: Technology barriers are not considered important in this industry regarding the product characteristics and the required equipments. (Low Threat)

Economies of Scale & Access to Resources: UCO collection points may be located at public areas, after approval by the local authorities, or at the premises of private companies. Private companies, such as restaurants, may be bound with contracts from switching between collectors while for other companies, such as gas stations, there is no legal requirement for installing UCO collection points. In addition, the proposed business model suggests expansion of the collection points to at least 60% of the gas stations operating in the region of Attica, requiring at minimum the participation of 3-4 different oil companies. Furthermore, two oil companies are already involved in the UCO industry through collaborating collectors. (High Threat)

Suggestions on strategy: The entry barriers are considered high, mainly due to accessibility to resources barriers in combination with the required economies of scale in order to achieve business sustainability. It is suggested providing incentives to the gas station operators in combination with contractual agreements before launching the business initiative.

Bargaining Power of Suppliers:

Availability of Resources: The '*polluter should pay*' principle is not applied. The producers from the HORECA sector may bargain for additional pay back in goods given the competition between UCO collectors. The UCO collection from households on the other hand is conducted on a voluntary basis. (High Threat)

Suggestions on strategy: The bargaining power of suppliers (households) is considered high, since UCO delivery is conducted on a voluntary basis. It is suggested providing incentives to the participating households in order to achieve long term loyalty to the UCO recycling initiative.

Bargaining Power of Customers:

Number of Customers: There are at least 5 operators of temporary storage facilities that may purchase UCO in the region of Attica. (Low Threat)

Product Demand: The UCO demand is considered that exceeds supply, given the incentives provided to the biodiesel plants through the quota system. (Low Threat) Perishable Products/Inventory: Collectors that do not operate temporary storage facilities cannot retain inventory. (High Threat)

Backward Integration: Biodiesel plants and operators of temporary storage facilities are often backward integrated and are involved in UCO collection activities. (Moderate Threat)

Suggestions on strategy: The bargaining power of customers is considered on average moderate. It is suggested to enter into contractual agreements with UCO buyers (this is also required in order to retain the permit issued by the local authorities).

Product Substitution (from other industries):

Vegetable Oil (feedstock substitution): The existing legal framework promotes the utilization of wastes over edible oils for biofuels production. Furthermore, after 2020, governments will financially support only biofuels produced from materials that do not compete with food crops, such as wastes, algae etc[106]. In addition UCO prices closely match palm oil prices. (Low Threat)

Biodiesel Utilization (product substitution): According to forecasts in the EU and in Greece (Chart-3, Table-A3) the biodiesel consumption will keep on increasing until 2020. (Low Threat)

Advanced Biofuels (product substitution): The utilization of UCO through advanced processes, such as Hydrotreated Vegetable Oil (HVO), that may substitute conventional biodiesel is considered to be under way[107]. HVO is produced through drop-in processes in existing refineries. Hellenic Petroleum S.A. has already participated in research programs related to the utilization of UCO through similar processes[108]. (Low Threat)

Suggestions on strategy: Currently the substitution threat is considered low. It is suggested to be kept informed about regulatory and technological developments in order to be better prepared for potential business threats or opportunities. Participation in

research programs organized by research institutes may also be an option, provided that small allocation of resources is required.

Overall, it appears that the main barriers to the development of the suggested business initiative are the accessibility to resources (through the installation of collection points at the gas stations) and the availability of resources provided by the households. In order to better align the interests of the oil companies and their customers with the proposed business initiative, appropriate incentives are required. To a certain extent, these incentives could be combined so that, a) the loyalty of oil companies' customers is enhanced through the loyalty of the participants to the suggested recycling program b) the program success is combined with promotional activities pursued by the oil companies. Some examples are provided below and will be further discussed in the Marketing section:

- ✓ Introduce a lottery game for the participants to the program, who will receive a number of lottery tickets proportional to the amount of UCO they recycle. The winners will receive a voucher which will be able to redeem through the gas stations in order to buy fuels or shop products. The price will be payable by the UCO collector. A similar initiative that has been introduced by MOL was reported as very successful[71].
- ✓ The trade names of participating companies will be included in all promotional activities undertaken by the UCO collector (e.g. printed material).
- ✓ The UCO collector will be required to purchase, on an annual basis and from each participating oil company, a certain amount of fuels at market prices for its fleet of vehicles. The amount will be proportional to the collection points installed.
- ✓ The UCO collector will be required to provide for free, to each oil company, a certain amount of crude UCO samples for research purposes related to the promotion of UCO utilization in biofuels.
- ✓ The UCO collector will compile statistical data related to the program efficiency, regarding each participating company. This data will be available to the respective oil company and will be granted permission for public release through the oil company's annual SRP report.

4.7 The Operations

In this section details are provided about the company's operating activities and the related equipments, such as collection containers and vehicles.

4.7.1 Collection Method

The suggested collection method is the UCO to be delivered by citizens in bottles which will be placed directly into the collection container. The citizens will not pour the oil into the bulk container.

This is the most common collection method of the pilot programs studied under the Recoil Project (see Section 2.5). This method is considered more convenient for the citizens and allows for better hygiene conditions at the collection point.

Furthermore, under JMD 114218/1997[109] that sets the technical specification on solid waste management, it is required washing the collection containers once per week and the wastes to be collected every 3-5 days, unless it is required otherwise by the local authorities. The suggested collection method avoids the contact of UCO with the container and thus the need for washing or replacing the container. Furthermore, a plastic liner (bag) may be placed inside the container in order to avoid accidental spills. It is assumed at this point that the local authorities will allow collection intervals of up to 7 days, due to the intrinsically better hygiene conditions that the specific collection method provides.

The collected bottles in turn will be placed in a pallet box inside the collection vehicle. Each collection vehicle will service on a daily basis about 26 collection points, considering that about 15 minutes are required to service each collection point plus additional time to deliver the collected UCO to the temporary storage facilities.

The collected UCO will be decanted into bulk containers provided at the temporary storage facilities and the empty bottles will be disposed off in special recycling bins ('blue' bins)[111] located in specific areas (e.g. at company's premises) after agreement with the local authorities.

Under the basic scenario, up to 650 collection points will be serviced. The required collection shifts are 5 on a daily basis (i.e. 5 shifts per day x 5 days per week x 26 CP per shift = 650 CP per week). It is assumed that in total 5+1=6 collection shifts are needed for smooth operation of the collection system (e.g. personnel holidays,

contingencies etc.). The required personnel excess by JMD 114218/1997[109] is 15% which is satisfied under the suggested scheme.

4.7.2 Collection Containers

The containers located at the collection points will be similar to those used for municipal waste disposal (Picture-4). Some additional features are:

- The container should be suitable for outdoor installation and in accordance to standard ΕΛΟΤ EN-840[109].
- The preferred container size is 80lt (smaller EN-840 approved size), since the estimated collected amount per collection point (considering 7 days collection interval) is ~17,5lt.
- Low height containers are preferred in order to avoid damaging the plastic bottles when thrown into the container.
- The container will have a modified lid with circular perforation in order to accept plastic bottles of sizes 0,5-2,0lt.
- The container lid will be locked and keys will be held by the UCO collector and the gas station operator.
- A plastic bag will be attached inside the container which will be replaced when found torn or spilled.
- The suggested colour of the container is yellow, since this colour is commonly used for UCO recycling.
- The container should be wheeled in order to be easily transferred in the gas station's warehouse when the gas station is closed.
- On the container will be attached labels promoting the recycling program and instructions about the recycling procedure (e.g. the bottle cap should be tight and the bottle should be placed in the container and not decanted). The instructions should be illustrated with pictures and not only text.

Regarding the containers placed inside the vehicles, the use of pallet boxes is considered the most versatile solution (Picture-4). One pallet box will be placed in each vehicle of suitable dimensions in order to fit into the vehicle's cargo space. A minimum of 500lt capacity is required for the pallet box, considering that the collected UCO volume on a daily trip will be about 455lt (i.e. 26cp x 17,5lt/cp).

Picture-4: Indicative types of a) UCO container located at the collection points (left), b) Pallet box placed inside each collection vehicle (right). (Acquired from [112-113]. Any container prices indicated in subsequent sections do not necessarily match the prices of the illustrated specimens.)

4.7.3 Collection Vehicles

According to circular A12/14983/1642/20-04-2011[126] the collector of non-hazardous wastes may use for the waste transport small vehicles (<4 tonnes). Based on relevant commercial examples from the literature review, and for the UCO collection method suggested in the previous, a typical small van type vehicle is applicable. According to circular 129043/4345[98] approval of the vehicles for the specific service is required by the Ministry of Infrastructure, Transport and Networks.

As a minimum it is considered that the vehicle shall carry appropriate firefighting equipment. In addition the vehicle should have enough cargo space to carry cleaning equipments (such as buckets, detergents, mops etc.).[110]

The vehicle should also have enough cargo space to load the pallet box and at least one spare collection point container. It is suggested that the cargo space of the van should be 2-3m^3.

Some additional requirements about the collection vehicles are:[109-110]

- The collected wastes should not remain in the vehicle for more than 24h.
- The loads in the cargo space should be secured against displacement.
- The vehicles should be of new 'anti-pollution' technology.
- The vehicles should be equipped with communication systems.
- The company's trade name and the registration number for the collection activities should be printed on both sides of the vehicle.

4.7.4 Activities at the Collection & Delivery Points

The vehicle driver will collect the UCO from the collection points which will deliver at the temporary storage facilities and will fill-in the required documents for transportation. More specifically the driver will:

- Record at the collection point the number of tickets provided to the program participants and confirm these against the collected amount.
- Fill-in a consignment note (3 copies), which will be signed by himself and the gas station operator, recording the type of waste (i.e. UCO) and the collected amount. This procedure is required by the circular 129043/4345[98].
- Fill-in the 'incoming products' form per ISCC certification system (see Section 4.7.6) and attach it to the consignment note. The ISCC form will be pre-printed and only the collection point name (gas station), the date, the consignment note serial number and the amount of UCO collected will be added by the driver.
- Inspect the collection point conditions and report any issues to the company (e.g. damages, spills etc.). In addition he will provide maintenance to the collection point if required (e.g. changing bags, replacing container, cleaning etc.).
- Deliver the collected UCO at the temporary storage facilities where the consignment notes are signed by the facilities operator. One copy of the consignment notes will be retained by the temporary storage facilities operator, a second copy will be retained by the driver and a third copy will be returned to the gas stations during the next visit.
- Issue an invoice for the amount of UCO delivered, signed by the temporary storage facilities operator.
- Fill-in the 'outgoing products' form per ISCC certification system (see Section 4.7.6) and attach it to the consignment note. The ISCC form will be pre-printed and only the delivery point name (temporary storage facilities), the date, the

consignment notes serial numbers and the amount of UCO delivered will be added by the driver.

4.7.5 Required Activities by the Gas Station Operator

Some minimum collaboration is required by the gas station operator in order to ensure smooth operation of the recycling initiative. Considering that the expected collection efficiency is 17,5lt/cp per week, about 2-3 customers are expected to deliver UCO on a daily basis. The required activities by the gas station operator are:

- Will receive the UCO bottles by the gas station's customers and will provide them a number of lottery tickets proportional to the amount delivered.
- Will keep a record of the participants (date, amount, name, address) along with the serial numbers of the provided tickets. A tag will be attached on the bottles including the tickets' serial numbers. This procedure will allow record keeping of the participants to the lottery game and better traceability of the UCO.
- Will visually inspect the bottles and may not accept receiving them in cases where the presence of lubricating oil is suspected (e.g. black oil) or the bottle contains excessive amount of water. These precautions are needed in order to avoid system abuse and it is not expected to be required on a regular basis.
- Will take reasonable measures for the safety of the UCO collection equipments (e.g. the collection point will be located in a supervised area and the collection container will be locked in the warehouse when the gas station is closed).
- Will sign the consignment note for UCO collection and will maintain a record file.

4.7.6 Certification Scheme

The probably most commonly used certification scheme for the UCO supply chain is the International Sustainability & Carbon Certification (ISCC) voluntary scheme. Several Greek companies participating in the UCO industry are certified under the ISCC scheme[114]. The ISCC scheme is based on the requirements of RED 2009/28/EC. The scheme sets certain guidelines for the traceability of UCO given the eligibility of UCOME for double–counting towards the national targets on renewable biofuels.

Under system's document ISCC 201/WR for wastes and residues[114], and regarding the supply chain up to the UCO collector as applied in our case, only the UCO collector needs to be certified under the ISCC system.

There is no certification or self-declaration requirement for the households. Also, regarding the gas stations these can be considered as 'depended collection points', since they conduct no UCO trading and the collected UCO at their premises is considered as collector's property. The depended collection points require no ISCC certification but some of them may be audited once per year by the certification body.

4.8 The Company

In this section suggestions are provided about the company's legal form, its organizational structure and its human capital.

4.8.1 Legal Form

As discussed in the previous, the expected company size is small and thus a flexible management scheme is considered more appropriate, such as that of a general/limited partnership (Greek terms OE or EE) or a limited/private company (Greek terms ΕΠΕ or IKE). Moreover the second type of companies has some important advantages over partnerships regarding the liability of the partners and the taxation rates (relevant references are tax law 4172/2013[115] and circular 1113/2015[116]).

The Limited Company (LTD/ΕΠΕ) and the Private Company (PC/IKE) are similar forms of legal entities. The second one is a recently introduced type of legal entity according to law 4072/2012[117] and has certain advantages over the first one mainly regarding the registration cost, the partners contribution and the flexibility in the decisions process[118]. Thus, the preferred type of legal entity is that of a Private Company (PC). Some of the features of a Private Company are[117]:

- Minimum share capital equal to 1€.
- For the company's incorporation a shareholders agreement may be adequate followed by registration at the General Electronic Commercial Registry (GEMI) that acts as a public notary.
- The partners may contribute in capital, assets or provision of services.
- One or more physical or legal entities may become partners.
- The company is governed by the shareholders' general assembly which may appoint a representative manager.
- The general assembly takes place at least once per year but decisions may be taken without the need of a general assembly if all shareholders agree.

- The liability of the partners is limited up to their capital share.
- The share capital may change or be transferred.
- The company follows double-entry accounting methods.
- The income tax rate is 29% (law 4334/2015).[119]
- Distributed profits are taxed at a 10% rate[115] and an additional 1/20 is retained as statutory reserve.
- The partners may provide services to the company as employees and the respective labour cost is included in the company's expenditures, and thus it's tax deductable.[116]

Finally, it should be noted that the UCO collected and being sold for biodiesel production is not exempted from VAT according to circular 1157/2014[120] and thus a 23%VAT[119] is applied. This provision allows for VAT refund against company's expenditures.

4.8.2 Organizational Structure

As discussed in the previous the expected company size is ~10 employees. A suggested organizational structure is given in Chart-10. The responsibilities and tasks of each business unit are discussed in the followings.

Shareholders' General Assembly: Will be responsible for major decisions regarding the company's structure and form, the distribution of dividends and significant strategic decisions.

General Manager: Will supervise the company's operations, will act as the company's representative before the authorities, will supervise the accountant & procurement officer and will supervise the company's marketing activities.

Logistics Supervisor: Will be responsible for the day-to-day supervision of company's logistics, will need to organize and optimize the company's logistics and will be responsible for the implementation of the certification system.

Accountant & Procurement Officer: Will hold the company's books in compliance with the double-entry accounting method, will manage the records of related pay-back benefits to the recycling program participants and will be responsible for managing the company's procurements.

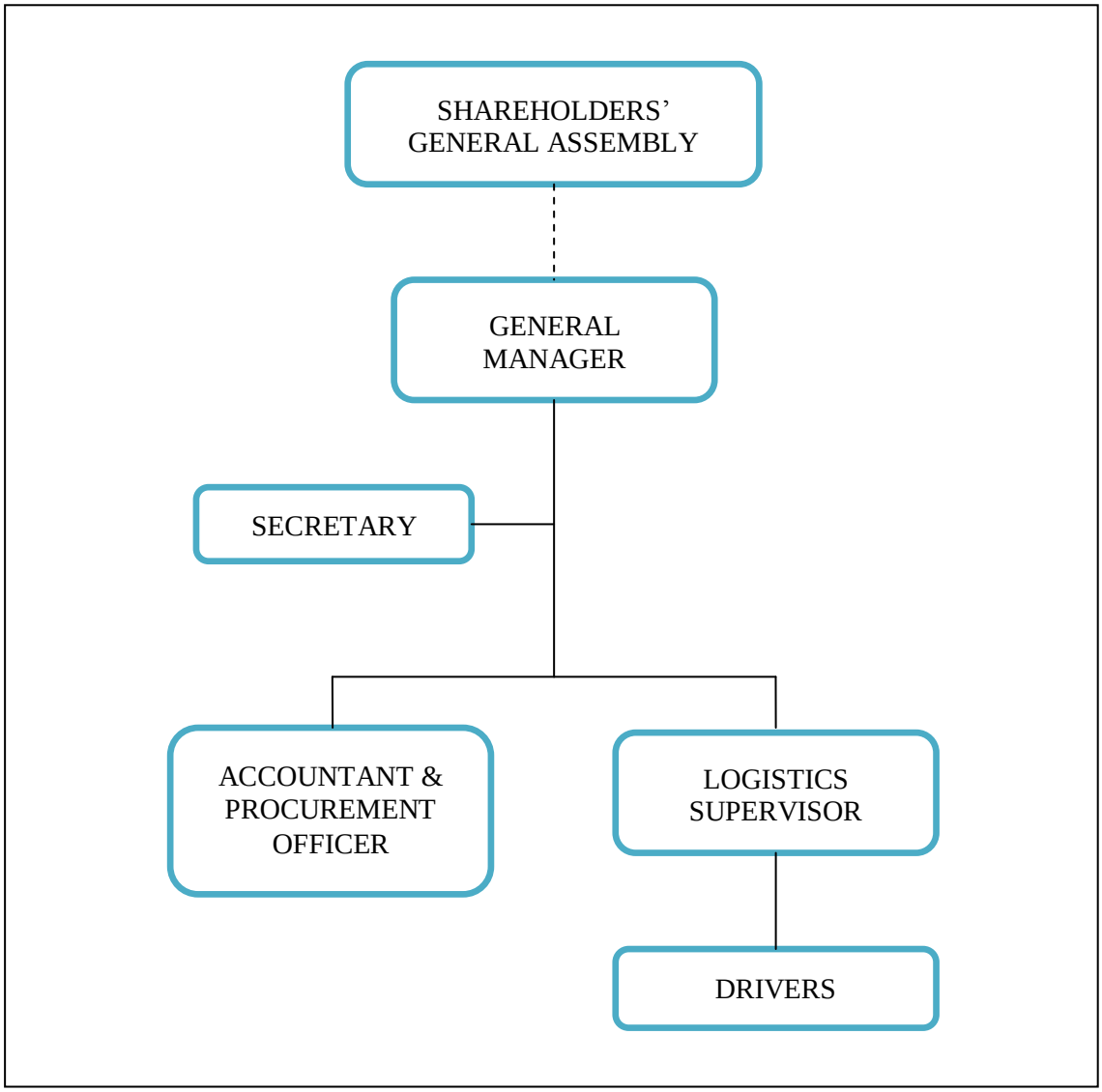

Chart-10: Suggested organizational structure.

Secretary: Will provide secretarial support to all officers mentioned above and will manage the company's call centre.

Drivers: Will collect, transport and deliver the UCO, compile the required paperwork for transportation and will be responsible for the daily maintenance of the company's vehicles.

It is also suggested that the company will outsource the marketing activities and the company's legal support.

4.8.3 Human Resources

In this section are discussed the required qualifications of the company's employees.

General Manager: A business administration degree or even a chemical/environmental engineer first degree along with an MBA masters degree is suggested as the typical qualification of the general manager. A minimum of 10 years experience in the fuels, edible oils or waste management industry is suggested along with previous experience in managerial positions.

Logistics Supervisor: A first degree in supply chain management is suggested for this position. A previous experience in managing logistics and developing supply chains of up to 5-10 years is suggested for this position.

Accountant & Procurement Officer: A first degree in accounting along with 5 years experience in similar position and especially in the double-entry accounting system is required (minimum 3 years experience for ATEI graduates according to law 4152/2013[127]).

Secretary: Previous experience of 5 years in administrative/secretarial positions is suggested for this position. Previous participation in relevant seminars is recommended. The employee should be computer literate and should speak English fluently.

Drivers: The drivers should hold a B category (not professional) driving licence (<3.500kg vehicle)[121] and have a minimum of 5 years since the acquisition of the driving licence. The employees should be computer literate and should speak English at basic level.

4.8.4 Recruitment & Training

The two most critical positions in the organization are considered those of the General Manager and the Logistics Supervisor. Given the size of the company, the related labour cost for the recruitment of experienced personnel and the required long term commitment in these positions, it would be preferable if the company's founders have the appropriate qualification to cover these positions themselves. In this way the pay-back time of the investment could be reduced as well, by applying moderate compensation rates.

On the other hand the positions of the Secretary and Drivers are considered less critical. The company should investigate the possibility of recruiting unemployed candidates

that cover the qualification criteria, but are also eligible for salary subsidy by the state[122].

The Accountant position is considered of moderate criticality, and thus could be covered by eligible candidates by the market through appropriate evaluation procedures.

The company should invest in long term employment with its employees. Regarding employees training, the following suggestions are provided: The General Manager should be kept informed about developments in the industry (technological, mergers, market trends etc.), the Logistics Supervisor should receive additional training on the product certification system, the Accountant should be kept informed about developments in the regulatory framework regarding taxation and accounting standards and the Drivers may also receive (internal) training regarding the documentation required by the regulatory framework and the certification scheme and training on emergency procedures e.g. spills, accidents or even fires.

4.8.5 Trade Name & Corporate Philosophy

A suggested trade name for the company is "Greek Company for UCO Collection" («Ελληνική Εταιρεία Συλλογής Τηγανελαίων», ΕΕΣΤ/EEST). It appears that the specific trade name is not currently occupied at the GEMI registry[123].

The suggested company's mission statement is "To Promote UCO Recycling for a Sustainable Development". The mission statement should be backed by appropriate practices within the company regarding recycling in general. All employees should be encouraged to participate in the UCO recycling program. The company should also try to demonstrate environmental responsibility in all sectors of its activities by following recycling programs for wastes derived from its premises e.g. containers recycling (blue bins), batteries recycling etc.

4.9 The Marketing Strategy

In a supply chain the suppliers and customers are identified by following the flow of products or money, which normally move in the opposite direction. In this respect the citizens that participate in the recycling program are company's suppliers and the UCO wholesalers are company's customers.

Although it may seem counterintuitive in the specific case the main core of marketing and promotion activities need to be focused to the program participants which supply

the UCO. This is due to the fact that the recycling initiative is based mainly to the voluntarism of the participants. Since '*the polluter should pay*' principle is not actually applied, the company that provides the recycling services needs to pay in order to collect the UCO.

Regarding the actual customers, which are the UCO wholesalers, the suggested strategy is to arrive to contract agreements regarding the UCO prices while the product origin will be certified under a commonly accepted certification scheme (such as ISCC). No additional marketing or promotional activities are required in this respect, given the fact that UCO is traded as a commodity and its demand as biodiesel feedstock exceeds supply.

In the followings, the marketing strategy regarding the citizens participating to the recycling initiative is discussed. Initially a market analysis is provided, by summarizing findings discussed in previous sections, and a market segmentation and positioning is suggested followed by a proposed marketing mix based on generalized marketing processes[105,124-125].

4.9.1 Market Analysis

Context: The legal framework promotes the utilization of UCO. Future developments in the technological and legal context are expected to further support the utilization of UCO as an alternative feedstock for biofuels production. Previous initiatives in UCO recycling in several Greek geographical areas, including the region of Attica, have to some degree educated citizens and paved the way for better acceptance of a similar initiative on a business scale.

Collaborators: Upstream in the supply chain, the gas stations are critical collaborators for launching and sustaining the new business. Appropriate motivation is required for their collaboration. The new recycling initiative should not harm their business image but rather enhance it and the same should apply regarding their customers' loyalty. Downstream in the supply chain, the role of wholesalers is also important. Setting up appropriate contract agreements and standardized transaction practices is required.

Competition: The competition in the UCO collection industry is considerable but is mainly concentrated in the HORECA segment. In the households segment the competition is limited and the market is not developed. The largest in scale initiative

that recycles UCO from households is considered that of 'AB Vasilopoulos' & 'Revive' which has placed collection points in selected supermarkets around Greece.

Customers (Households): The customer needs that the suggested business initiative intends to cover are the need of contribution for a better environment and the need of supporting the local economy within the financial crisis through voluntarism.

Company: The company is dedicated to provide sustainable solutions for UCO recycling from households in a professional approach. This will be the core business activity of the company and not a side activity simply for demonstration or publicity purposes.

4.9.2 Market Segmentation & Positioning

Initially a geographic segmentation was applied in order to identify any 'hot spots' regarding UCO production. Clearly the region of Attica represents a geographical segment of highly concentrated UCO production. The region produces 19.400t/y of UCO which is equivalent to 35% of the Greek UCO production[27], while the region occupies only 2,9% of the country's land area[20].

The market may also be segmented by UCO source i.e. industrial or households. Considering that 30-50% of UCO derives from households, the size of the household segment in the region of Attica is 5.800-9.700t/y.

Finally, regarding behavioural segmentation and user status, the Recoil Project identified and quantified three levels of users loyalty[59,65]. More specifically, 38% of the people would be willing participating in a UCO recycling program as long it is convenient, 33% would be willing participating even if the collection process is complex and the remaining 29% is not willing to participate.

The suggested target segments are those of occasional and frequent participants within the households segment in the geographical region of Attica. The two segments could be approached separately by different strategies concerning the provided incentives such as the refunds provided or the convenience/size of the collection network (the latter being the most critical). By selecting the dual segment approach the marketing strategy is mainly driven by the occasional users segment, mainly due to the size of the required collection network.

Some reasons for selecting the dual sector approach are: a) The collection efficiency estimates of Chapter-3 are based on data that don't differentiate among the type of users but are referring to the general population, b) By reducing the collection points density, and in order to achieve economies of scale, may be required to arrive to agreement with an even larger number of oil companies that operate gas stations.

Under the base case scenario of 650 collection points out of 1049 gas stations (i.e. 62%), the dual segment size effectively approached is 62%x(38%+33%)=44% of the households segment in the region of Attica, which is equivalent to about 2.550-4.270t/y and is almost 5-8 times the company's targeted capacity of ~540t/y.

Regarding company's positioning the intended image is that of a customer friendly and professional recycling company that provides personal rewards to the participating environmentally conscious households. The identified point of parity with other UCO recycling initiatives that target the household sector (see Section 2.5.2) is that it provides a centralized collection system, with collection points located in public areas. The identified points of difference are: a) The collection points are located at gas stations, b) The collection network exceeds in size any other existing UCO collection network located in public areas and targeting to households, c) The system provides personal rewards to the participants and not to an NGO or a municipality, d) The system provides additional convenience due to the collection method (i.e. placing bottles in a bulk container) which is not always applied by other recycling initiatives.

4.9.3 Marketing Mix

The marketing mix is analyzed through four basic dimensions, the product itself, the place, the promotion and the pricing.

The provided product is the UCO recycling service that will be provided to the participants through an extensive collection network and through a convenient collection method (i.e. placing bottles in a bulk container). The collection points' image is also considered part of the service provided and will need to be maintained clean and in good mechanical condition.

The place term, includes the marketing channels through which the company contacts the customers. The main marketing channel will be indirect, through the services provided at the gas stations. Guidelines on the collection procedure will be provided to

the participants by the gas station operators but printed instructions will be also attached on the collection point. The company will also maintain a customer phone line and a web page to provide information about the locations of the collection points and the collection procedure but also to receive feedback regarding customers complains. Finally, the company will contact by mail the customers eligible to receive a discount voucher.

The promotion activities will include mainly take-away printed material located at the collection points. These will include information about the company's contact details and the web page address, the company's mission and the environmental impact of its activities, the UCO destination, instructions about the UCO collection procedure, the names of the collaborating oil companies and the incentives provided to the program participants. Similar information will be also provided through the company's web page.

The price dimension in the specific business plan is related to the rewards provided to the program participants. The reward provided to both the occasional participants and the frequent participants will be a lottery game. For each 0,5lt of UCO delivered the participants will receive a lottery ticket. Every month a lottery draw will take place and 50 winners will receive a 10€ voucher for buying fuels or shop products from the gas stations network of the participating oil companies. The more UCO the participants deliver the more tickets they can collect and the more chances they will have to win. The voucher along with a congratulating covering letter will be posted to the winners by mail at the address they declared during the UCO delivery. The serial numbers of the winning tickets will be announced through the company's web page. The related cost is 6.000€ annually.

It should be noted that loyalty based rewards programs are not considered very effective in this case. For instance if the company was to return to the customers 0,03€ for each litre delivered, the customers would need to deliver more than 30lt of UCO in order to receive a 1€ voucher. On the other hand the cost for the company would be disproportionately high (could be up to ~7% of revenues).

4.10 Finance

In order to estimate the funding requirements for the suggested business initiative a more detailed estimation of the expected cash inflows/outflows is required. A five years projection is provided in Table-C1 through C13 of the Appendix-C.

The following funding sources have been considered:

1) Equity capital provided by the company's partners of up to 150.000€ in cash.

2) A five years bank loan of 100.000€ to cover working capital requirements.

3) National/European development programs. The new ESPA 2014-2020[150] has not been activated yet, hence not considered under the specific business plan, however a government funding opportunity may be available in the coming period for start-up companies. It has been considered however that the company will be eligible for a 2 year 80% discount in the social security expenses of non-critical personnel, such as the secretary and the drivers, by participation in special employment programs[122] subsidized by the Greek state.

The suggested funding will cover start-up investments/expenses and any working capital requirements or cash flow deficits during the initial phase of operation.

The estimated start-up investment in company's assets is ~80.000€ (Table-C1) plus additional start-up expenses of ~10.000€ (Table-C5). It is suggested that the company should not purchase high value tangibles assets such as office/warehouse and vehicles in order to reduce the funding requirements. It is assumed that the company will need to rent a small office of about 80m^2 plus a warehouse of 50m^2 for storing spare equipments (e.g. spare containers etc.) in the area of western Attica. The company will also lease 6 small vans for its operations and will rent respective parking places.

Regarding turnover projection (Table-C2), it was assumed that the company will go through a 3-year consolidation period until it reaches (in the third year) the collection efficiency of 537t/y (see Section 4.6.1). It is assumed that during the first 3 years the collection efficiencies will be 50%, 75% and 100% of the expected efficiency respectively. This is similar to the consolidation time required and the respective efficiency growth estimated under the MOL initiative, which collects UCO through a network of gas stations[69]. For the 4th and 5th years it is assumed an 8% annual growth

in collection efficiencies which is equivalent to the most conservative expected market growth up to 2020 (see Section 4.4).

Under the suggested turnover projection, it is estimated that during the first two years the suggested initiative will record losses, and only after the third year will generate profits and positive cash flows (Table-C10&C12). It is estimated that the cash available will reach a minimum of ~10.000€ at the end of the second year, thus the suggested funding requirements are the minimum recommended.

5. Conclusions

In this chapter a timeline of events for the company incorporation is provided along with some suggestions for its development. The chapter ends with concluding remarks regarding the feasibility of the proposed business initiative.

5.1 Suggested Timeline

A suggested timeline for the major start-up activities is provided in Table-C14. The total start-up time is estimated to 7-8 months. The start-up activities may be split into two phases, the initial phase that does not entail any major cash flows and the final phase where all substantial cash flows are taking place.

It is suggested that the initial phase, which has duration of at least 5 months, should be completed before the start of the 1st fiscal year. This phase includes:

- Company incorporation with minimum required share capital
- Reaching tentative agreements with UCO wholesalers
- Reaching tentative agreements with oil companies

It is considered that this phase is revocable and, unless a substantial number of oil companies have signed tentative agreements, the business initiative may be cancelled.

Once the initial phase has been successfully completed, the final phase may start. The latter should be completed the soonest the possible within the 1st fiscal year. A preliminary estimation of the final phase duration is 2,5 months, after which the operations may start. This phase includes:

- Increase share capital
- Rent offices/warehouse
- Purchase equipments
- Leasing vehicles
- Hire personnel
- Licensing UCO collection activities & vehicles
- Sign contract agreements with UCO wholesalers & oil companies
- Start-up operations

Of the final phase activities, the one that the company has less control of and falls into the *critical path* of the timeline is the licensing procedure. Good preparation is required

prior to the application submission in order to avoid any pitfalls in the licensing procedure.

Other activities included in the start-up timeline, which are not critical for the initiation of the operations, are the working capital funding through bank loans and the activities certification. The first one is not considered critical at this stage, given that, the company will still have adequate cash available to fund its operations through the share capital allowance. The second one doesn't prohibit the initiation of operations but, depending on the contract agreement details with the wholesalers, may entail some UCO price discount (up to 25-30%[53]) for the first month of operations when, however, the collection efficiencies are expected to be at minimum.

Once the business is in full operation it is expected to go through a consolidation period which, as suggested in Section 4.10, could be up to 3 years. During this period the collection efficiencies are expected to be below the projections of the regression model provided in Chapter-3. The second year of operation is quite critical regarding the cash flows, since the cash availability is expected to reach a minimum. During the third year of operation, the sustainability of the business initiative needs to be proved and positive cash flows to be generated, since substantial time will have elapsed for the establishment of public awareness and for the optimization of company's operations. During the fourth and fifth years of operation, the collection efficiencies are expected to grow at market rate. This growth period is quite important in order to cover the income losses recorded during the consolidation period.

By the end of the fifth year, important decisions about the future of the company will need to be taken. Also, in 2020 the European policy regarding biofuels is expected to be revised. At that time the business opportunities will need to be re-evaluated in the light of the new regulatory framework. Some indicative options are given below:

- Investigate the opportunities for expansion into new market segments (e.g. geographical expansion).
- Investigate the opportunities for vertical integration (e.g. built temporary storage facilities).
- Investigate the opportunities for mergers with other market factors (e.g. UCO wholesalers, biodiesel plants, oil companies etc).

5.2 Concluding Remarks

The present business plan investigates the economic sustainability of a company being involved in the Used Cooking Oil (UCO) collection activities. The main innovation in this business plan is the collection method. The UCO will be recovered through an extended collection network located at the premises of existing gas stations and the participants will be the households in the region of Attica. Furthermore, the business initiative attempts to approach the UCO collection from households in a professional manner aiming to long term commitment towards the program participants, in contrast to several short-term pilot scale initiatives that have been launched in the previous years.

The suggested legal form is that of a Private Company (Greek term 'IKE') that provides flexibility in decision taking procedure and limits the partners' liability regarding their personal wealth. The company will receive a licence for the 'Collection & Transport' of UCO but will not operate its own temporary storage facilities. The collected UCO will be sold to UCO wholesalers operating temporary storage facilities in the region of Attica.

The company will be incorporated by two business partners who will provide the seed capital of 150.000€ in cash and will also be employed by the company in order to perform managerial and supervision services. The company will also need to receive a 100.000€ bank loan in order to cover working capital requirements during the initial phase of the business. Given the low value of the company's tangible assets (about 50.000€ when any guarantee deposits are excluded) this bank loan may need to be secured against partners' personal property.

The size of the company falls into the microenterprise category. It will employ up to 10 employees (including the company's partners) and the expected annual revenues at the end of the third year of operation will be about 270.000€.

The estimated payback time of the investment is 5-6 years, but it may be even shorter regarding the business partners when considering the after tax compensation they receive for the management and supervision services.

The company's assets turnover ratio (AT=Revenues÷Total Assets) lies in the range of 1,1-3,1 with an average of 2,2 for the five years period analyzed. This ratio is indicative

of the size of the revenues generated against the capital invested. It is less subject to managerial discretion or funding options and could be used at this initial stage as a benchmark indicator. Indicative AT ratios for 'Prasino Ladi' and 'Revive', based on published financial statements[151-152], are in the range of 1,1-3,8. Thus, it appears that, the company's AT ratios fall within the range of other similar companies in the industry.

The suggested business plan is based on the target UCO recovery of ~540t/y which is the estimated industry average. Under the normal collection efficiency rate of ~0,25lt per inhabitant per year (see Chapter-3) the required number of collection points is 650. The estimated break-even point, below which the business initiative is not considered economically feasible, is the establishment of ~500 collection points (Chart-11).

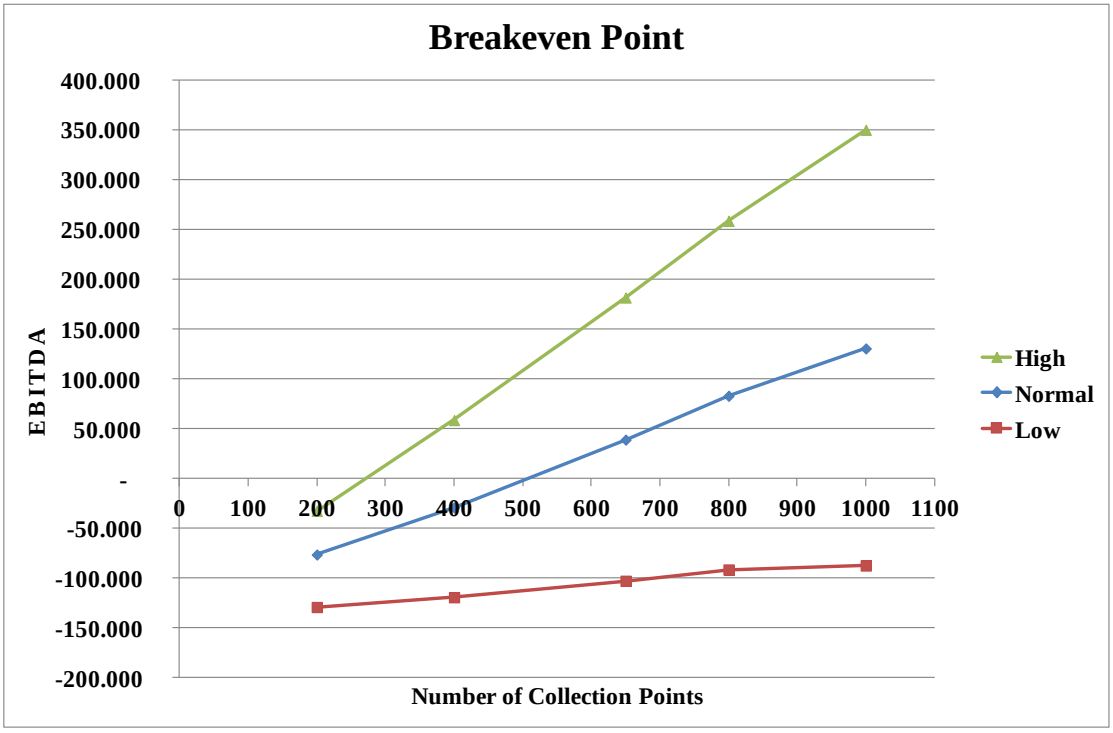

Chart-11: Expected EBITDA versus the number of collection points. Three collection efficiency scenarios are illustrated according to Chapter-3. The high efficiency case corresponds to 0,39lt/(hab·y), the normal efficiency case corresponds to 0,25lt/(hab·y) and the low efficiency case corresponds to 0,12lt/(hab·y).

As discussed in Chapter-3 there is a 70% confidence interval that the collection efficiency will fall in the range of 0,12-0,39lt/(hab·y). The low efficiency scenario corresponds to collection efficiency of 0,12lt/(hab·y). In this case the expected EBITDA

is always negative for the entire range of collection points available in the region of Attica. Under the high efficiency scenario, that corresponds to collection efficiency of 0,39lt/(hab·y), the break-even point is reached for a number of collection points of just 250-300. Furthermore, under the high efficiency scenario, the business economics become similar to these of the base case scenario when a number of 350-400 collection points is reached.

A weak side of the business initiative is the consensus requirement by a substantial number of oil companies, in order to install UCO collection points at their premises. The oil companies may be reluctant accepting the additional burden to their operations, given the absence of relevant regulatory requirement. It is considered however that, by providing the appropriate incentives to the oil companies, the suggested business initiative could be realized. A strong incentive could be the enhancement of their corporate responsibility profile regarding the protection of the environment and the promotion of sustainable 'green' fuels. Furthermore, the UCO is already emerging as part of the biodiesel and the automotive diesel oil supply chain, of which the oil companies are also an integral part. Thus, the UCO recovery activities have a certain degree of affinity to the conventional activities of the oil companies.

In conclusion, the purpose of UCO reclamation is the protection of the environment and the support of the local economy, which the local authorities may not be able to provide especially within the financial crisis. The oil companies, through their extended network of gas stations, could fill this gap by supporting the suggested business initiative, which to some extent helps reducing the dependence of the Greek economy from imported fossil fuels.

References

1. European Commission (2015a), Energy Strategy, *European Commission*, [Online]. Available: https://ec.europa.eu/energy/en/topics/energy-strategy [Accessed: 22 October 2015].
2. European Commission (2015b), 2020 Energy Strategy, *European Commission*, [Online]. Available: https://ec.europa.eu/energy/en/topics/energy-strategy/2020-energy-strategy [Accessed: 22 October 2015].
3. European Commission (2015c), 2030 Energy Strategy, *European Commission*, [Online]. Available: https://ec.europa.eu/energy/en/topics/energy-strategy/2030-energy-strategy [Accessed: 22 October 2015].
4. European Parliament and EU Council (2009a), Directive 2009/28/EC, *Official Journal of the European Union*, Vol.52, L 140/5.6.2009, pp. 16-62.
5. European Parliament and EU Council (2009b), Directive 2009/30/EC, *Official Journal of the European Union*, Vol.52, L 140/5.6.2009, pp. 88-113.
6. European Parliament and EU Council (2015), Directive (EU) 2015/1513, *Official Journal of the European Union*, Vol.58, L 239/15.9.2015, pp. 1-29.
7. European Parliament and EU Council (2002), Regulation (EC) No 1774/2002, *Official Journal of the European Communities*, Vol.45, L 273/10.10.2002, pp. 1-95.
8. European Commission (2015d), EU Rules on Animal By-Products (ABPs), *European Commission*, [Online]. Available: http://ec.europa.eu/food/food/biosafety/animalbyproducts/index_en.htm [Accessed: 24 October 2015]
9. European Commission (2004), Guidance on applying the new Animal By-Products Regulation (EC) No 1774/2002, *European Commission* [Online]. Available: http://ec.europa.eu/food/food/biosafety/animalbyproducts/guidance_faq_en.pdf [Accessed: 08 September 2015].
10. European Parliament and EU Council (2008), Directive 2008/98/EC, *Official Journal of the European Union*, Vol.51, L 312/22.11.2008, pp. 3-30.

11. European Commission (2014a), Commission Decision 2014/955/EU, *Official Journal of the European Union*, Vol.57, L 370/30.12.2014, pp. 44-86.

12. Greek Government (2010a), Law 3851 [Greek Language], *Government Gazette of the Greek Republic*, Vol. A, FEK 85/04.06.2010, pp. 1753-1780.

13. Greek Government (2012a), Law 4062 [Greek Language], *Government Gazette of the Greek Republic*, Vol. A, FEK 70/30.03.2012, pp. 1885-1944.

14. Greek Government (2009a), Law 3769 [Greek Language], *Government Gazette of the Greek Republic*, Vol. A, FEK 105/01.07.2009, pp. 5279-5382.

15. Greek Government (2010b), JMD 460/2009 [Greek Language], *Government Gazette of the Greek Republic*, Vol. B, FEK 67/28.01.2010, p. 726.

16. Greek Government (2013a), JMD Δ1/Α/οικ.2497 [Greek Language], *Government Gazette of the Greek Republic*, Vol. B, FEK 253/08.02.2013, pp. 4529-4548.

17. Greek Government (2003), JMD Η.Π. 50910/2727 [Greek Language], *Government Gazette of the Greek Republic*, Vol. B, FEK 1909/22.12.2003, pp. 26073- 26107.

18. Greek Government (2012b), Law 4042 [Greek Language], *Government Gazette of the Greek Republic*, Vol. A, FEK 24/13.02.2012, pp. 231-271.

19. Ministry of Environment & Energy (2015a), National Plan on Waste Management [Greek Language], *Ministry of Environment & Energy*, [Online]. Available: http://www.ypeka.gr/LinkClick.aspx?fileticket=egY6pHPEQ8g%3d&tabid=238&language=el-GR [Accessed: 26 October 2015].

20. Region of Attica (2015), 2nd Revision of the Regional Plan on Waste Management in Attica [Greek Language], *Region of Attica*, [Online]. Available: http://www.patt.gov.gr/site/index.php?option=com_content&view=article&id=16036&Itemid=693 [Accessed: 26 October 2015].

21. BioDieNet (N.D.), EL LIBRO / The Handbook for: Local Initiatives for Biodiesel from Recycled Oil, *SEC – Sofia Energy Centre Ltd*, [Online]. Available: http://www.sec.bg/userfiles/file/BioDieNet/EL%20LIBRO.pdf [Accessed: 04 November 2015].

22. EUBIA-European Biomass Industry Association (2015), Transformation of Used Cooking Oil into biodiesel: From waste to resource, *EUBREN*, [Online]. Available:

http://www.eubren.com/UCO_to_Biodiesel_2030_01.pdf [Accessed: 04 November 2015].

23. Paraiba, O. et al. (2015), UCO to Biodiesel – Practical Guide, *Recoil*, [Online]. Available:http://www.researchgate.net/publication/281347879_RecOil_Used_Cooking_Oil_to_Biodiesel_Guide [Accessed: 05 November 2015].
24. Hellenic Statistical Authority (2015), 2011 Population - Housing Census, *Hellenic Statistical Authority*, [Online]. Available: http://www.statistics.gr/en/2011-census-pop-hous [Accessed: 05 November 2015].
25. Anderssen, I.H. et al. (2007), Localised production and supply of biodiesel from used cooking oils – State of the Art in Europe, *BioDieNet*, [Online]. Available: http://www.vestforsk.no/filearchive/rapport12-07-biodienet_wp2_rpt_v12.pdf [Accessed: 05 November 2015].
26. Mpikos, S. (2010), Fried-Oils Collection [Greek Language], *Presented at the conference on: Prospects of UCO Recycling for Biofuels Production* [Translated from Greek], October 2010, EKETA, Thessaloniki, Greece, [Online]. Available: http://biofuels2g.gr [Accessed: 05 November 2015].
27. Ministry of Environment & Energy (2014), Revision of the National Plan on Waste Management [Greek Language], *Ministry of Environment & Energy*, [Online]. Available:http://www.ypeka.gr/LinkClick.aspx?fileticket=7LiOc0J1iFk%3D&tabid=232&language=el-GR [Accessed: 05 November 2015].
28. Toop, G. et al. (2013), Trends in the UCO market, *ECOFYS*, [Online]. Available: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/266089/ecofys-trends-in-the-uco-market-v1.2.pdf [Accessed: 05 November 2015].
29. Eurostat (2015a), Population and population change statistics, *Eurostat*, [Online]. Available: http://ec.europa.eu/eurostat/statistics-explained/index.php/Population_and_population_change_statistics#Further_Eurostat_information [Accessed: 07 November 2015].
30. European Commission (2014b), Medium-term prospects for EU agricultural markets and income 2014-2024, *European Commission*, [Online]. Available: http://ec.europa.eu/agriculture/markets-and-prices/medium-term-outlook/index_en.htm [Accessed: 07 November 2015].

31. Eurostat (2015b), Glossary: Tonnes of Oil Equivalent (toe), *Eurostat*, [Online]. Available: http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Tonnes_of_oil_equivalent_%28toe%29 [Accessed: 07 November 2015].

32. Swisher, K. (2014), Tallow Market Overview, *National Renderers Association and American Fats and Oils Association*, 2014 Annual Meeting, [Online]. Available: https://fatsandoils.org/wp-content/uploads/2014/10/Kent-Swisher.pdf [Accessed: 07 November 2015].

33. PLATTS (2013), Weekly Biodiesel Market Report, *McGraw Hill Financial*, May 8, [Online]. Available: https://www.platts.com/IM.Platts.Content/ProductsServices/Products/BiodieselMarketReport.pdf [Accessed: 07 November 2015].

34. SCB (2015), SCB Biofuels Weekly Report 25 Mar 2015, *Starsupply Commodity Brokers (SCB)*, [Online]. Available: http://www.starsupply.ch/research/15-03-25/SCB_Biofuels_Weekly_Report_25_Mar_2015.aspx [Accessed: 07 November 2015].

35. Spottle, M. et al. (2013), Low ILUC potential of wastes and residues for biofuels, *ECOFYS*, [Online]. Available: http://www.ecofys.com/files/files/ecofys-2013-low-iluc-potential-of-wastes-and-residues.pdf [Accessed: 07 November 2015].

36. Tsoutsos, T., Tournaki, S. and Georgatou, C. (2014), Assessment of best practices in UCO processing and biodiesel distribution: D4.1 - Biodiesel Stakeholders' input on existing practices in processing UCO to biodiesel and in biodiesel distribution, *Recoil*, [Online]. Available: http://www.recoilproject.eu/index.php/el/best-practices-in-processing-and-distribution-gr [Accessed: 08 November 2015].

37. Greek Government (2009b), JMD Δ1/Α/25573 [Greek Language], *Government Gazette of the Greek Republic*, Vol. B, FEK 2499/18.12.2009, pp. 30485-30496.

38. Greek Government (2010c), JMD ΥΠΕΚΑ/Δ1/Α/12725 [Greek Language], *Government Gazette of the Greek Republic*, Vol. B, FEK 963/30.06.2010, pp. 13805-13809.

39. Greek Government (2010d), JMD ΥΠΕΚΑ/Δ1/Α/15555 [Greek Language], *Government Gazette of the Greek Republic*, Vol. B, FEK 1174/04.08.2010, pp. 16283-16294.

40. Greek Government (2011a), JMD Δ1/Α/17970 [Greek Language], *Government Gazette of the Greek Republic*, Vol. B, FEK 1700/29.07.2011, pp. 23367-23382.

41. Greek Government (2011b), JMD Δ1/Α/23603 [Greek Language], *Government Gazette of the Greek Republic*, Vol. B, FEK 2432/02.11.2011, pp. 34611-34630.

42. Greek Government (2012c), JMD Δ1/Α/οικ.18571 [Greek Language], *Government Gazette of the Greek Republic*, Vol. B, FEK 2590/25.09.2012, pp. 41125-41140.

43. Greek Government (2013b), JMD Δ1/Α/οικ.11750 [Greek Language], *Government Gazette of the Greek Republic*, Vol. B, FEK 1452/14.06.2013, pp. 22007-22022.

44. Greek Government (2014a), JMD Δ1/Α/οικ.13316 [Greek Language], *Government Gazette of the Greek Republic*, Vol. B, FEK 2220/13.08.2014, pp. 27659-27670.

45. Greek Government (2015a), JMD οικ.176374 [Greek Language], *Government Gazette of the Greek Republic*, Vol. B, FEK 911/19.05.2015, pp. 9991-10002.

46. Greek Government (2009c), JMD Δ1/Α/16936 [Greek Language], *Government Gazette of the Greek Republic*, Vol. B, FEK 1683/17.08.2009, pp. 21379-21384.

47. Greek Government (2010e), JMD ΥΠΕΚΑ/Δ1/Α/10085 [Greek Language], *Government Gazette of the Greek Republic*, Vol. B, FEK 750/31.05.2010, pp. 9421-9428.

48. Greek Government (2011c), JMD ΥΠΕΚΑ/Δ1/Α/13972 [Greek Language], *Government Gazette of the Greek Republic*, Vol. B, FEK 1307/16.06.2011, pp. 18283-18290.

49. Greek Government (2013c), MD Δ1/Α/οικ.3008 [Greek Language], *Government Gazette of the Greek Republic*, Vol. B, FEK 335/18.02.2013, pp. 6787-6790.

50. Greek Government (2014b), MD Δ1/Α/οικ.6769 [Greek Language], *Government Gazette of the Greek Republic*, Vol. B, FEK 937/15.04.2014, pp. 14078-14082.

51. Greek Government (2014c), MD οικ.23327 [Greek Language], *Government Gazette of the Greek Republic*, Vol. B, FEK 3549/30.12.2014, pp. 40887-40889.

52. Ministry of Environment, Energy & Climatic Change (2012), Greece - National Renewable Energy Action Plan in the Scope of Directive 2009/28/EC, *European Commission*, [Online]. Available: https://ec.europa.eu/energy/en/topics/renewable-energy/national-action-plans [Accessed: 11 November 2015].

53. Pelkmans, L. et al. (2014), Impact of promotion mechanisms for advanced and low-iLUC biofuels on markets: Used cooking oil and animal fats for biodiesel, *IEA Bioenergy*, [Online]. Available: http://www.bioenergytrade.org/downloads/t40-low-iluc-UCO-august-2014.pdf [Accessed: 11 November 2015].

54. Knoema (2015), Commodity Prices, Forecast 2015-2019, *Knoema*, [Online]. Available: http://knoema.com/wxgcxde/commodity-prices-forecast-2015-2019-charts-and-tables?variable=US%24%3A%E2%82%AC%2C%20Exchange%20rates%20%28av%29 [Accessed: 12 November 2015].

55. World Bank (2015a), Commodity Markets–Publications and Data/Annual Data, *The World Bank*, [Online]. Available: http://www.worldbank.org/en/research/commodity-markets [Accessed: 14 January 2016].

56. World Bank (2015b), Commodity Markets Outlook – Understanding El Nino, *The World Bank*, Quarterly Report, October 2015, Washington, USA. [Online]. Available:http://pubdocs.worldbank.org/pubdocs/publicdoc/2015/10/22401445260948491/CMO-October-2015-Full-Report.pdf [Accessed: 12 November 2015].

57. Square Commodities (2014), Biodiesel Market Report, *Square Commodities*, Issue No. 71, 21 August, [Online]. Available: http://www.squarecommodities.com/sites/default/files/SC_BMR_71_210814.pdf [Accessed: 12 November 2015].

58. Square Commodities (2015), Biodiesel Market Report, *Square Commodities*, Issue No. 91, 22 January, [Online]. Available: http://www.kraftstoffe-der-zukunft.com/fileadmin/img/rueckblick/2015/square_com.pdf [Accessed: 12 November 2015].

59. Recoil Project (2013a), Energy for Sustainability 2013, *Recoil*, [Online]. Available: http://www.recoilproject.eu/index.php/en/publications/category/4-presentations [Accessed: 16 November 2015].

60. SUM Project (N.D.), Regional Study of Sustainable Mobility, *Sustainable Urban Mobility*, [Online]. Available: http://www.sumproject.eu/sites/default/files/studies/LP_REGIONAL%20_STUDY_BIOFUELS%20_3.pdf [Accessed: 16 November 2015].

61. Andrianos, H. (2010), Biodiesel Production from UCO in Greece [Greek Language], *Presented at the conference on: Prospects of UCO Recycling for Biofuels Production* [Translated from Greek], October 2010, EKETA, Thessaloniki, Greece, [Online]. Available: http://biofuels2g.gr [Accessed: 16 November 2015].

62. Recoil Project (2013b), Deliverable D2.2: Compilation of UCO collection promotional campaigns and respective results, *Recoil*, [Online]. Available: http://www.recoilproject.eu/index.php/en/good-promotion-and-collection-practices [Accessed: 17 November 2015].

63. Recoil Project (2015), Recoil Online Guide, *Recoil*, [Online]. Available: http://temp.assec.pt/recoil/?cix=740&id=735&ixf=seccao&lang=4 [Accessed: 17 November 2015].

64. Recoil Project (2013c), Deliverable D2.3: Guidelines for UCO collection, transport and promotion campaigns based on previous experiences, *Recoil*, [Online]. Available:http://www.recoilproject.eu/index.php/en/good-promotion-and-collection-practices [Accessed: 23 November 2015].

65. Paraiba, O. et al. (2013), Strategies for Optimization of the Domestic Used Cooking Oil to Biodiesel Chain – The European Project Recoil, *Paper presented at conference: Energy for Sustainability 2013 – Sustainable Cities: Designing for People and the Planet*, 8-10 September 2013, Coimbra, Portugal.

66. Recoil Project (2012), Deliverable D2.1: Analysis of previous experiences in UCO collection transport and recycling, *Recoil*, [Online]. Available: http://www.recoilproject.eu/index.php/en/good-promotion-and-collection-practices [Accessed: 24 November 2015].

67. MOL Group (2013a), MOL is after more used cooking oil, *MOL Group*, Press Releases, 14-08-2013 [Online]. Available: http://molgroup.info/en/media-

centre/press-releases?keyWord=keyword&start=90#346-mol-is-after-more-used-cooking-oil [Accessed: 26 November 2015].

68. HATC (2011), Hungary's MOL to Make Fuel from Used Cooking Oil, *XpatLOOP*, [Online]. Available: http://www.xpatloop.com/news/hungarys_mol_to_make_fuel_from_used_cooking_oil [Accessed: 26 November 2015].
69. MOL Group (2014a), 2014 Annual Report, *MOL Group*, [Online]. Available: http://molgroup.info/images/molgroup/pdf/investor_relations/financial_results_and_reporting/annual_reports/Integrated_Annual_Report_2014.pdf [Accessed: 26 November 2015].
70. PetrolWorld (2014), Hungary: MOL Recycling Drive Hits 280 Tonnes, *PetrolWorld*, [Online]. Available: http://www.petrolworld.com/europe/item/21125-hungary-mol-recycling-drive-hits-280-tonnes [Accessed: 26 November 2015].
71. MOL Group (2014b), Sustainability Case Study, *MOL Group*, [Online]. Available: http://molgroup.info/images/molgroup/pdf/sustainability/reports_and_data/case_studies/Used%20cooking%20oil%20campaign_case%20study.pdf [Accessed: 26 November 2015].
72. Istvan, Z (2011), Analyses of the state of art, main barriers and market potential of UCOs, *Oileco Project*, Task 2.1, October 2011.
73. MOL Group (2013b), People Rather Throw Out than Collect and Deliver the Used Cooking Oil, *MOL Group*, Press Releases, 26-08-2013 [Online]. Available: http://molgroup.info/en/media-centre/press-releases/345-people-rather-throw-out-than-collect-and-deliver-the-used-cooking-oil [Accessed: 27 November 2015].
74. Ministry of Environment & Energy (2015b), Registry of Companies Involved in Management of Non-Dangerous Wastes [Greek Language], *Ministry of Environment & Energy*, [Online]. Available: http://www.ypeka.gr/LinkClick.aspx?fileticket=wi7Yb4XHmU8%3D&tabid=438&language=el-GR [Accessed: 28 November 2015].
75. AGROIL ENERGY (2015), Refining Services, *AGROIL ENERGY*, [Online]. Available: http://www.agroil-energy.gr/index.php?id=57 [Accessed: 28 November 2015].

76. MOKEP (2011), Case Study on Green Entrepreneurship 'Revive S.A.' [Greek Language], *University of Piraeus*, [Online]. Available: http://mokep.unipi.gr/article_elements/meletes_periptoseon/melethperiptoshs_REVIVE.pdf [Accessed: 28 November 2015].

77. GF Energy (2015), Our Company, *GF Energy*, [Online]. Available: http://www.gfenergy.gr/our-company/ [Accessed: 28 November 2015].

78. Revive (2015), Synergies [Greek Language], *Revive*, [Online]. Available: http://www.revive.gr/ [Accessed: 28 November 2015].

79. ELIN Biofuels (2015a), Recycle [Greek Language], *ELIN Biofuels*, [Online]. Available: http://elinbio.gr/greenoil [Accessed: 28 November 2015].

80. ELINOIL (2015a), Sillogi, *ELINOIL*, [Online]. Available: http://www.elin.gr/en/prasinoladi.html [Accessed: 28 November 2015].

81. ELIN Biofuels (2015b), Activities of ELIN Biofuels [Greek Language], *ELIN Biofuels*, [Online]. Available: http://elinbio.gr/activities#biodiesel [Accessed: 28 November 2015].

82. ELINOIL (2015b), ELLIN Biofuels, *ELINOIL*, [Online]. Available: http://www.elin.gr/en/elin-biofuels.html [Accessed: 28 November 2015].

83. IMERISIA (2011), Atlantic: Officially in bankruptcy [Greek Language], *IMERISIA On Line*, 03 August 2011 [Online]. Available: http://www.imerisia.gr/article.asp?catid=12647&subid=2&pubid=111767319 [Accessed: 28 November 2015].

84. AB Vasilopoulos (2015), Cooking Oil Recycling [Greek Language], *AB Vasilopoulos*, [Online]. Available: http://www.ab.gr/responsible/environment/recycling/cooking-oil?language=en [Accessed: 28 November 2015].

85. JET ENERGY (2015), About Us / Projects [Greek Language], *JET ENERGY*, [Online]. Available: http://www.jetenergy.gr/index.html [Accessed: 28 November 2015].

86. JETOIL (2015), Petrol Stations, *JETOIL*, [Online]. Available: http://www.jetoil.gr/en/stations [Accessed: 28 November 2015].

87. Papageorgiou P. (2009), *Energy Crops and Waste Cooking Oil for Biodiesel Production: Case Study of Greece*, Master of Science Degree Project, Royal Institute of Technology (KTH), Stockholm, Sweden [Online]. Available: http://rymd.lwr.kth.se/Publikationer/PDF_Files/LWR_EX_09_11.pdf [Accessed: 28 November 2015].

88. Biofuels.gr (2015), Frying Oils [Greek Language], *Biofuels.gr*, [Online]. Available: http://www.biofuels.gr/category/fryingoil/ [Accessed: 29 November 2015].

89. AGROENERGY (2015), Recycling Municipal Organic Wastes [Greek Language], *AGROENERGY*, [Online]. Available: http://www.agroenergy.gr/ [Accessed: 29 November 2015].

90. INE Spain (2015), Resident population by date, sex and generation, *Instituto Nacional de Estadistica (INE)*, [Online]. Available: http://www.ine.es/jaxiT3/Tabla.htm?t=9688&L=1 [Accessed: 03 December 2015].

91. Kallikratis (2014), Results of 2011 Census [Greek Language], *Kallikratis*, [Online]. Available:http://www.kallikratis.eu/apotelesmata-tis-apografis-plithismou-katikion-2011-dimotes/ [Accessed: 03 December 2015].

92. INE Portugal (2015), Censos 2011, *Instituto Nacional de Estatistica (INE)*, [Online]. Available: http://mapas.ine.pt/map.phtml [Accessed: 03 December 2015].

93. Albright, S.C., Zappe, C.J. and Winston, W.L. (2011), *Data Analysis, Optimization, and Simulation Modeling*. International Edition. South-Western Cengage Learning.

94. DeSalvo, J.S. (1970), Standard Error of Forecast in Multiple Regression: Proof of a Useful Result, *Rand Corporation*, [Online]. Available: http://www.rand.org/content/dam/rand/pubs/papers/2008/P4365.pdf [Accessed: 04 December 2015].

95. SJSU (2015), t-Table, *San Jose State University*, [Online]. Available: http://www.sjsu.edu/faculty/gerstman/StatPrimer/t-table.pdf [Accessed: 04 December 2015].

96. GSIS (2015), Fuels Inflows-Outflows System – Gas Station in Compliance (02/02/2015) [Greek Language], *General Secretariat of Information Systems*, [Online].

Available:http://www.gsis.gr/gsis/info/gsis_site/Services/Epixeiriseis/eisroes_ekroes.html [Accessed: 04 December 2015].

97. European Union (2012), Consolidated Version of the Treaty on the Functioning of the European Union – Title XX, Environment, Article 191, *Official Journal of the European Union*, Vol.55, C 326/26.10.2012, pp. 132-133.

98. Ministry of Environment, Energy & Climatic Change (2011), Implementation of Legislation on Non-Hazardous Waste Management / Circular 129043/4345 [Greek Language], *Ministry of Environment, Energy & Climatic Change* [Online]. Available:http://www.elinyae.gr/el/lib_file_upload/egg%20129043_11.1363958252281.pdf [Accessed: 06 December 2015].

99. Hummel, C. (2015), The Average Profit Margin for Wholesale, *Chron*, [Online]. Available:http://smallbusiness.chron.com/average-profit-margin-wholesale-12941.html [Accessed: 06 December 2015].

100. European Commission (2015e), What is an SME?, *European Commission* [Online]. Available:http://ec.europa.eu/growth/smes/business-friendly-environment/sme-definition/index_en.htm [Accessed: 06 December 2015].

101. Lois, E. (2015), The Greek Policy on Natural Gas and Petroleum Products [Greek Language], *National Technical University of Athens*, [Online]. Available: http://www.chemeng.ntua.gr/courses/pngtech/?page=material [Accessed: 06 December 2015].

102. ELINOIL (2015c), Petrol Stations, *ELINOIL*, [Online]. Available: http://www.elin.gr/en/stations.html [Accessed: 08 December 2015].

103. Folias, S. (2013), Biodiesel: Development, Decentralization and Sustainability [Greek Language], *Presented at 1st Annual Conference 'Biofuels: Looking Towards 2020'* [Translated from Greek], March 2013, SBIBE, Athens. [Online]. Available: http://www.sbibe.gr/sviveconference/documents/PRESENTATIONS/Folias%20final.pdf [Accessed: 09 December 2015].

104. Greek Government (2012d), MD Υ1γ/Γ.Π/οικ.96967 [Greek Language], *Government Gazette of the Greek Republic*, Vol. B, FEK 2718/08.10.2012, pp. 42347-42366.

105. Fred, R.D. and Forest, R.D. (2015), *Strategic Management*, Global Edition, Fifteenth Edition. Pearson Education Ltd, Harlow, England.

106. European Commission (2015f), ENERGY – Land Use Change, *European Commission*, [Online]. Available: https://ec.europa.eu/energy/en/topics/renewable-energy/biofuels/land-use-change [Accessed: 11 December 2015].

107. EBTP (2015), HVO/HEFA, *European Biofuels Technology Platform*. [Online]. Available: http://biofuelstp.eu/hvo.html [Accessed: 11 December 2015].

108. Sustain Diesel (2015), Home Page [Greek Language], *Sustain Diesel*. [Online]. Available: http://www.sustaindiesel.gr/ [Accessed: 11 December 2015].

109. Greek Government (1997), JMD οικ.114218 [Greek Language], *Government Gazette of the Greek Republic*, Vol. B, FEK 1016/17.11.1997, pp. 12917-12981.

110. Diavgeia (2013), ΑΔΑ: ΒΕΖ0ΟΡ1Κ-ΠΥΑ [Greek Language], *Diavgeia*, [Online]. Available: https://diavgeia.gov.gr/doc/ΒΕΖ0ΟΡ1Κ-ΠΥΑ [Accessed: 12 December 2015].

111. EEAA (2015), Frequently Asked Questions [Greek Language], *Hellenic Recovery Recycling Corporation*, [Online]. Available: http://www.herrco.gr/default.asp?siteID=1&pageID=30&langID=2 [Accessed: 12 December 2015].

112. HELESI (2015a), Design your own MGB Pro 2-wheel Bin, *Hellenic Environmental Systems Industry*, [Online]. Available: http://www.helesi.com/english/2-wheel_pro_flash.html [Accessed: 12 December 2015].

113. HELESI (2015b), Helesi Pallet Box, *Hellenic Environmental Systems Industry*, [Online]. Available: http://www.helesi.com/download/Palletboxes.pdf [Accessed: 12 December 2015].

114. ISCC (2015), Home, *International Sustainability & Carbon Certification*, Available: http://www.iscc-system.org/en/ [Accessed: 14 December 2015].

115. Greek Government (2013d), Law 4172 [Greek Language], *Government Gazette of the Greek Republic*, Vol. A, FEK 167/23.07.2013, pp. 2457-2516.

116. GSPR (2015a), Notification on requirements of Articles 22, 22A and 23 of Law 4172/2013 (FEK 167A') / Circular ΠΟΛ.1113/2.6.2015 [Greek Language],

General Secretariat for Public Revenue, [Online]. Available: http://www.publicrevenue.gr/kpi/public/blog/attach/files/rss/pol1113_2_6_15.pdf [Accessed: 15 December 2015].

117. Greek Government (2012e), Law 4072 [Greek Language], *Government Gazette of the Greek Republic*, Vol. A, FEK 86/11.04.2012, pp. 2311-2562.

118. Farsarotas, I.D. and Spatoulas, E.T. (2015), "Starting your own business" All Legal Forms of Enterprises [Greek Language], *SupportBusiness.gr*, [Online]. Available: http://supportbusiness.gr/financial/companies-legalforms/118-ksekinwntas-th-dikh-sou-epixeirhsh-oles-oi-nomikes-morfes-epixeirhsewn [Accessed: 15 December 2015].

119. Greek Government (2015b), Law 4334 [Greek Language], *Government Gazette of the Greek Republic*, Vol. A, FEK 80/16.07.2015, pp. 745-768.

120. Yperdiavgeia (2014), Implementation of VAT regulations on purchase and sale of used cooking oils / Circular ΠΟΛ.1157/3.6.2014 [Greek Language], *Yperdiavgeia*, [Online]. Available: https://yperdiavgeia.gr/decisions/downloadPdf/11514225 [Accessed: 15 December 2015].

121. Greek Government (2012f), Presidential Decree 51 [Greek Language], *Government Gazette of the Greek Republic*, Vol. A, FEK 101/27.04.2012, pp. 2789-2888.

122. OAED (2015), Employment Programmes for Enterprises – Employers (Eligible Claimants) and Unemployed People / Workers (Beneficiaries) [Greek Language], *Manpower Employment Organization*, [Online]. Available: http://www.oaed.gr/index.php?option=com_content&view=article&id=1176:2012-02-08-17-45-18&catid=28:2011-11-21-08-34-19&Itemid=152&lang=en [Accessed: 18 December 2015].

123. GEMI (2015), GEMI Database [Greek Language], *General Electronic Commercial Registry*, [Online]. Available: http://www.businessportal.gr/search_name.php [Accessed: 19 December 2015].

124. Kotler, P. et al. (2012), *Marketing Management*, Second Edition. Pearson Education Ltd, Harlow, England.

125. Dolan, R.J. (2000), Note on Marketing Strategy, *Harvard Business School*, No. 9-598-061, November 2000, pp.1-17.

126. YME (2011), Licensing trucks of less than 4 tonnes to licensed waste management companies for collection and transport of non-hazardous recyclable wastes / Circular A12/14983/1642/20-04-2011 [Greek Language], *Ministry of Infrastructure, Transport and Networks*, [Online]. Available: http://www.yme.gr/?getwhat=1&oid=449&id=&tid=449 [Accessed: 23 December 2015].

127. Greek Government (2013e), Law 4152 [Greek Language], *Government Gazette of the Greek Republic*, Vol. A, FEK 107/09.05.2013, pp. 1571-1622.

128. Supercleaner (2015), http://www.supercleaner.gr/catalogues_GR.asp [Accessed: 27 December 2015].

129. Ebay (2015), http://www.ebay.co.uk/bhp/leaflet-dispenser [Accessed: 27 December 2015].

130. Masterdom (2015), http://www.masterdom.gr [Accessed: 27 December 2015].

131. Dromeas (2015), http://eshop.dromeas.gr/el [Accessed: 27 December 2015].

132. Plaisio (2015), http://www.plaisio.gr/ [Accessed: 27 December 2015].

133. Autogram (2015), http://www.autogram.gr/index.php/products-gr/κατασκευές/επιγραφές/επιγραφές-αυτοκινήτων [Accessed: 27 December 2015].

134. Delevegko, D. (2014), Non-residential buildings leading price appreciation [Greek Language], *Capital.gr*, 04 May 2014 [Online]. Available: http://www.capital.gr/story/2006110 [Accessed: 27 December 2015].

135. Hertz (2015), https://www.hertz.gr/VanOffers [Accessed: 27 December 2015].

136. Greek Government (2012g), Law 4093 [Greek Language], *Government Gazette of the Greek Republic*, Vol. A, FEK 222/12.11.2012, pp. 5525-5648.

137. IKA (2015), Social Security Guide for Employers [Greek Language], *IKA*, April 2015, Athens [Online]. Available: https://www.ika.gr/gr/infopages/ergo/20150529_odhgos_ergodoth.pdf [Accessed: 27 December 2015].

138. Ministry of Development & Competitiveness (2015), Liquid Fuel Prices Monitoring Centre [Greek Language], *Ministry of Development & Competitiveness*, [Online]. Available: http://www.fuelprices.gr/deltia.view [Accessed: 27 December 2015].

139. iEfimerida (2014), The salaries per profession according to IKA data [Greek Language], *iEfimerida*, 25 August 2014 [Online]. Available: http://www.iefimerida.gr/news/167749/αυτοί-είναι-οι-μισθοί-των-εργαζομένων-στην-ελλάδα-από-τους-εργάτες-μέχρι-τους-διευθυντές [Accessed: 27 December 2015].

140. Greek Government (2009d), JMD 100692 [Greek Language], *Government Gazette of the Greek Republic*, Vol. B, FEK 1487/23.07.2009, pp. 18991-18992.

141. Aldigron (2015), http://aldigron.gr/products/promotional/leaflets/ [Accessed: 29 December 2015].

142. Stasy (2015), http://www.stasy.gr/?id=47 [Accessed: 29 December 2015].

143. Greek Government (2010f), Law 3850 [Greek Language], *Government Gazette of the Greek Republic*, Vol. A, FEK 84/02.06.2010, pp. 1721-1752.

144. Texnikosasfaleias (2015), http://www.texnikosasfaleias.gr/default.asp?ypd=222 [Accessed: 29 December 2015].

145. Georgoulopoulou, M. and Kanellos, P. (2015), Private Company – Registration Procedure and Taxation [Greek Language], *Power-Tax*, [Online]. Available: http://www.power-tax.gr/el/normal/193/600/ViewArticle.aspx [Accessed: 29 December 2015].

146. EEA (2015), Members Subscription Fees [Greek Language], *Athens Chamber of Tradesmen*, [Online]. Available: http://www.eea.gr/gr/el/content/syndromes-teli-melon [Accessed: 29 December 2015].

147. Greek Government (1996), Presidential Decree 17 [Greek Language], *Government Gazette of the Greek Republic*, Vol. A, FEK 11/18.01.1996, pp. 93-102.

148. GSPR (2015b), Notification and interpretation of tax regulations on assets depreciation for enterprises according to Article 24 of Law 4172/2013 / Circular ΠΟΛ.1073/31.3.2015 [Greek Language], *Taxheaven*, [Online]. Available:

http://www.taxheaven.gr/laws/circular/view/id/20625 [Accessed: 30 December 2015].

149. NBG (2016), https://www.nbg.gr/greek/pricing-of-products-and-services/Documents/Επιτόκια και Τιμολόγιο Προϊόντων[1]/Δάνεια[2]/web_portal_elliniko_epitokia-timologio_daneiwn.pdf [Accessed: 01 January 2016].

150. ESPA (2016), Programs for Enterprises [Greek Language], *ESPA 2014-2020*, [Online]. Available: https://www.espa.gr/el/Pages/stprocsimsea.aspx [Accessed: 02 January 2016].

151. Prasino Ladi (2013-15), *Company Financial Statements 2012-14* [Greek Language]. Kifisia, Greece.

152. Revive (2008-12), *Company Financial Statements 2007-11* [Greek Language]. Athens, Greece.

APPENDIX - A

Table-A1: Overview of biodiesel and UCO market in the EU-28.

		2009	2010	2011	2012	2013	2014	Source/Note
Biodiesel Consumption	Mtoe	9,3	10,0	10,5	11,0	9,7	10,0	[30]
Biodiesel Production	Mtoe	8,0	8,5	8,1	8,7	9,3	9,6	[30]
from vegetable oils	Mtoe	7,1	7,7	7,1	7,3	7,7	7,7	[30]
from waste oils	Mtoe	0,9	0,9	1,0	1,3	1,6	1,8	[30]
from other 2nd gen.	Mtoe	0,0	0,0	0,0	0,0	0,0	0,0	[30]
Biodiesel Production from waste oils	Mt	1,0	1,0	1,1	1,5	1,8	2,1	(a)
	Mm^3	1,2	1,1	1,3	1,7	2,1	2,4	(b)
UCO Feedstock for Biodiesel Production	Mt	1,1	1,1	1,2	1,6	1,9	2,3	(c)
	Mm^3	1,2	1,2	1,3	1,8	2,2	2,5	(d)
UCO Imports	Mt	0,04[(e)]	0,12[(e)]	0,25[33]	0,26[33]	0,50[34]	0,53[34]	
	Mm^3	0,05	0,13	0,27	0,29	0,56	0,58	(d)
Total UCO collected	Mt	1,15	1,05	1,07	1,45	1,56	1,87	(f)
	Mm^3	1,28	1,17	1,19	1,61	1,73	2,08	(f)
Total Vegetable Oil Consumption	Mt	22,4	21,9	21,7	21,4	22,9	23,4	[30]
Total UCO production	Mt	3,55[21]	3,47	3,44	3,39	3,63	3,71	(g)
	Mm^3	3,94	3,86	3,83	3,77	4,03	4,12	(d)
UCO Collection Efficiency	%	32%	30%	31%	43%	43%	51%	(h)
Biodiesel substitution by UCOME	%	9,4%	8,5%	9,3%	11,8%	16,1%	18,4%	(i)

Notes: (a) Considering 0,86toe/t [31]. (b) Considering 0,88t/m^3 [16]. (c) Considering 1,07m^3 of biodiesel per tonne of UCO[16], (d) Considering 0,90t/m^3 [21]. (e) Considering imports from USA only[32]. (f) UCO biodiesel feedstock, minus imports, plus 10% of base year 2009 for non-fuel uses. (g) Changes in UCO production calculated based on changes in vegetable oil consumption following the base year 2009 (h) UCO collection over production. (i) Substitution of biodiesel consumption by UCOME from all source (collected + imports) on Mtoe basis.

Table-A2: Overview of biodiesel and UCO market in Greece.

		2009	2010	2011	2012[(a)]	2013	2014	2015	Source/Note
Biodiesel Allocation Period		01/07/09-30/06/10	01/07/10-30/06/11	01/07/11-30/06/12	01/07/12-31/12/12	01/01/13-31/12/13	01/01/14-31/12/14	01/01/15-31/12/15	[37-45]
Biodiesel Allocated	k m^3	155	164	132	-	92	133	140	[37-45]
UCO Purchase Invoices Period		01/09/08-14/08/09	01/09/09-10/06/10	01/09/10-01/07/11	-	01/07/11-08/03/13	09/03/13-09/05/14	10/05/14-21/01/15	[46-51], (b)
UCO Purchases	kt	13,0	13,7	15,9	-	29,2	24,6	17,9	[37-45]
UCOME Allocated	k m^3	12,3	13,0	15,1	-	31,2	26,4	19,1	[37-45]
Biodiesel substitution by UCOME	%	8,0%	7,9%	11,4%		33,9%	19,8%	13,6%	
-Data Transformation-									
UCO Collected	kt	15,1	18,3	18,2		20,4	23,9		(c)
	k m^3	16,7	20,3	20,2		22,7	26,6		(d)
UCO Collection Efficiency	%	19%	24%	23%		26%	31%		Low Case[(e)]
	%	27%	33%	33%		37%	43%		High Case[(f)]

Notes: (a) The 2011 biodiesel allocation was extended until the 31/12/12[42]. (b) In cases when the start or the end period was not specified it was assumed to start at the end of the previous ITB period or to end on the last day of the present ITB. (c) UCO purchases were suitably transformed and extrapolated to annual basis in order to match the appropriate calendar period. It is further assumed that imports match any alternative UCO uses and that the collected UCO is used solely for biodiesel production. (d) Considering 0,90t/m^3 [21]. (e) Assuming UCO production of 7,2kg/capita[21]. (f) Assuming UCO production of 5,0kg/capita[27].

Table-A3: Biodiesel consumption and UCO collection / utilization rates outlook in Greece.

		2014	2015	2016	2017	2018	2019	2020	Source/Note
Expected Biodiesel Consumption	ktoe	113	130	146	161	175	190	203	[52]
UCO Production	kt	55,20	55,20[27]	55,26	55,32	55,38	55,44	55,50[27]	(a)
UCO Collection Efficiency	%	43%	49%	54%	59%	64%	70%	75%[19]	(b)
UCO Collected	kt	23,9	26,8	29,8	32,7	35,7	38,7	41,6	(c)
UCOME Production	ktoe	19,4	21,7	24,1	26,5	28,9	31,3	33,7	(d)
Biodiesel substitution by UCOME	%	17%	17%	17%	16%	17%	16%	17%	(e)

Notes: (a) The 2016-2019 values were estimated by linear interpolation based on 2015 and 2020 estimates. The 2014 value was set equal to 2015. (b) The 2014 value derives from Table-A2, while the 2015-2019 values were calculated by linear interpolation based on 2014 and 2020 estimates. (c) Derived from UCO production times collection efficiency. (d) Based on UCOME production of 1,07m^3 per tonne of UCO[16], UCOME density 0,88t/m^3 [16] and energy content of 0,86toe/t [31]. (e) Calculated on ktoe basis and considering that any imports cover any alternative UCO uses.

Table-A4: Palm oil and UCO prices.

		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Source/ Note
EUR/USD		1,3	1,4	1,3	1,3	1,3	1,1	1,0	1,1	1,2	1,2		[54]
Palm Oil	$/t	901	1125	999	857	821	622	631	648	665	683	701	[55-56]
Palm Oil	€/t	693	804	769	659	632	565	631	589	554	569		
UCO	€/t	533	756	744	656	621	580						(a),(b)

Notes: (a) UCO prices 2010-2013 were retrieved from chart.[53] (b) UCO prices for 2014 and 2015 are spot prices on 21/08/2014 and 22/01/2015 respectively.[57-58]

Table-A5: Examples of pilot programs involved in UCO collection from households. Data retrieved from Recoil Project.[62-63]

	Country	UCO Collected	Collection Points Number	Collection Points Efficiency	Population Density	UCO Production	Collection Points Density
		lt/y	cp	lt/(cp·y)	hab/km^2	lt/(hab·y)	hab/cp
Madre Coraje / Western Andalucia	Spain	494.000	400	1.235	<200	≥10	2-5k
Region of Murcia	Spain	100.100	417	240	<200	≥10	2-5k
Municipality of Cadiz	Spain	44.000	250	176	≥1000	≥10	≤ 2k
Municipality of Sykies	Greece	4.400	5	880	≥1000	1-10	2-5k
Revive	Greece	42.525	118	360	<200	1-10	
AB Vasilopoulos	Greece	40.000	50	800	<200	1-10	
Municipality of Savona	Italy	544	2	272	<200	<1	≤ 2k
Olly / Region of Tuscany	Italy	285.000	65	4.385	<200	1-10	
EMAC / Municipality of Cascais	Portugal	10.168	30	339	≥1000	1-10	> 5k
ENA / Municipality of Setubal	Portugal	7.611	24	317	200-1000	<1	> 5k
Municipality of Oliveira	Portugal	467	25	19	200-1000	1-10	2-5k
Municipality of S. Joao	Portugal	3.650	22	166	≥1000	1-10	≤ 2k
Municipality of Sesimbra	Portugal	5.935	7	848	200-1000	<1	> 5k
Municipality of Sintra	Portugal	21.740	80	272	≥1000	<1	2-5k
Municipality of Coimbra	Portugal	5.215	23	227	200-1000	1-10	> 5k
Municipality of Oeiras	Portugal	6.956	30	232	≥1000	<1	> 5k
Rasitejo / District of Santarem	Portugal	40.000	132	303	<200	1-10	≤ 2k
Municipality of Moita	Portugal	17.088	30	570	≥1000	1-10	2-5k

APPENDIX - B

Table-B1: Pilot programs for UCO collection from households (Recoil Project[62-63]), including calculated collection efficiencies per inhabitant.

	Country	UCO Collected	Collection Points Number	Population Density	UCO Production	Collection Points Density	Number of Inhabitants	Collection Efficiency
		lt/y	cp	hab/km^2	lt/(hab·y)	hab/cp	hab	lt/(hab·y)
Madre Coraje / Western Andalucia	Spain	494.000	400	<200	≥10	2-5k	1.400.000[(a)]	0,35
Region of Murcia	Spain	100.100	417	<200	≥10	2-5k	1.419.567[(b)]	0,07
Municipality of Cadiz	Spain	44.000	250	≥1000	≥10	≤ 2k	140.000[(c)]	0,31
Municipality of Sykies	Greece	4.400	5	≥1000	1-10	2-5k	17.500[(d)]	0,25
Municipality of Savona	Italy	544	2	<200	<1	≤ 2k	1.400[(e)]	0,39
EMAC / Municipality of Cascais	Portugal	10.168	30	≥1000	1-10	> 5k	206.479[(f)]	0,05
ENA / Municipality of Setubal	Portugal	7.611	24	200-1000	<1	> 5k	121.185[(f)]	0,06
Municipality of Oliveira	Portugal	467	25	200-1000	1-10	2-5k	68.611[(f)]	0,01
Municipality of Sao Joao	Portugal	3.650	22	≥1000	1-10	≤ 2k	21.713[(f)]	0,17
Municipality of Sesimbra	Portugal	5.935	7	200-1000	<1	> 5k	49.500[(f)]	0,12
Municipality of Sintra	Portugal	21.740	80	≥1000	<1	2-5k	377.835[(f)]	0,06
Municipality of Coimbra	Portugal	5.215	23	200-1000	1-10	> 5k	143.396[(f)]	0,04
Municipality of Oeiras	Portugal	6.956	30	≥1000	<1	> 5k	172.120[(f)]	0,04
Rasitejo / District of Santarem	Portugal	40.000	132	<200	1-10	≤ 2k	209.250[(g)]	0,19
Municipality of Moita	Portugal	17.088	30	≥1000	1-10	2-5k	66.029[(f)]	0,26

Notes: a) Western Andalucia (Cadiz, Cordova, Huelva, Seville) population 4,5 millions[90]. Estimated collection points density 11k is outside the suggested range 2-5k. Selected value at 50% of range 2-5k, i.e. 3,5k times the collection points number. b) Region of Murcia 2008 population[90]. c) Provided by Recoil Project[63]. d) Municipality of Sykies 2011 census[91] population 30.015. Estimated collection points density 6k is outside the suggested range 2-5k. Selected value at 50% of range 2-5k, i.e. 3,5k times the collection points number. e) Calculated value is 0,7k times the collection points number (0,7k is half an order of magnitude lower than the 2-5k category average). f) Municipalities of Cascais, Setubal, Oliveira de Azeméis, Sao Joao da Madeira, Sesimbra, Sintra, Coimbra, Oeiras and Moita population according to 2011 census[92]. g) The program was implemented in selected municipalities of the Santarem district. Municipalities of Alcanena, Chamusca, Constância, Entroncamento, Ferreira do Zêzere, Golegã, Santarém, Tomar, Torres Novas and Vila Nova da Barquinha population according to 2011 census[92].

Table-B2: Regression variables.

Variable	Type	Range
Collection Efficiency [lt/(hab·y]	Dependent	Continuous
Country	Independent	Categorical: Greece Spain Portugal Italy
Population Density [hab/km^2]	Independent	Categorical: <200 200-1000 ≥1000
UCO Production [lt/(hab·y]	Independent	Categorical: <1 1-10 ≥10
Collection Points Density [hab/cp]	Independent	Categorical: ≤2k 2-5k >5k

Table-B3: Regression variables including dummy variables.

Original Variables	New Variables	New Variables Range
Collection Efficiency [lt/(hab·y]	Collection Efficiency [lt/(hab·y]	Continuous
Country	Greece Spain Portugal	0 or 1 0 or 1 0 or 1
Population Density [hab/km^2]	<200 200-1000	0 or 1 0 or 1
UCO Production [lt/(hab·y]	<1 1-10	0 or 1 0 or 1
Collection Points Density [hab/cp]	≤2k 2-5k	0 or 1 0 or 1

Table-B4: Pilot programs for UCO collection from households (Recoil Project[62-63]), including regression data.

	Original Data[62-63]				Regression Data									
	Country	Population Density	UCO Production	Collection Points Density	Collection Efficiency	Country			Population Density		UCO Production		Collection Points Density	
		hab/km^2	lt/(hab·y)	hab/cp	lt/(hab·y)	Greece	Spain	Portugal	<200	200-1000	<1	1-10	≤2k	2-5k
Madre Coraje/Western Andalucia	Spain	<200	≥10	2-5k	0,35	0	1	0	1	0	0	0	0	1
Region of Murcia	Spain	<200	≥10	2-5k	0,07	0	1	0	1	0	0	0	0	1
Municipality of Cadiz	Spain	≥1000	≥10	≤ 2k	0,31	0	1	0	0	0	0	0	1	0
Municipality of Sykies	Greece	≥1000	1-10	2-5k	0,25	1	0	0	0	0	0	1	0	1
Municipality of Savona	Italy	<200	<1	≤ 2k	0,39	0	0	0	1	0	1	0	1	0
EMAC / Municipality of Cascais	Portugal	≥1000	1-10	> 5k	0,05	0	0	1	0	0	0	1	0	0
ENA / Municipality of Setubal	Portugal	200-1000	<1	> 5k	0,06	0	0	1	0	1	1	0	0	0
Municipality of Oliveira	Portugal	200-1000	1-10	2-5k	0,01	0	0	1	0	1	0	1	0	1
Municipality of Sao Joao	Portugal	≥1000	1-10	≤ 2k	0,17	0	0	1	0	0	0	1	1	0
Municipality of Sesimbra	Portugal	200-1000	<1	> 5k	0,12	0	0	1	0	1	1	0	0	0
Municipality of Sintra	Portugal	≥1000	<1	2-5k	0,06	0	0	1	0	0	1	0	0	1
Municipality of Coimbra	Portugal	200-1000	1-10	> 5k	0,04	0	0	1	0	1	0	1	0	0
Municipality of Oeiras	Portugal	≥1000	<1	> 5k	0,04	0	0	1	0	0	1	0	0	0
Rasitejo / District of Santarem	Portugal	<200	1-10	≤ 2k	0,19	0	0	1	1	0	0	1	1	0
Municipality of Moita	Portugal	≥1000	1-10	2-5k	0,26	0	0	1	0	0	0	1	0	1

Table-B5: Estimates of the regression coefficients.

Coefficient	Description	Coefficient Value [lt/(hab·y)]
α	Intercept	0,296
b_{11}	Slope coefficient (Country=Greece)	-0,082
b_{12}	Slope coefficient (Country=Spain)	-0,098
b_{13}	Slope coefficient (Country=Portugal)	-0,216
b_{21}	Slope coefficient (Population Density=<200)	-0,012
b_{22}	Slope coefficient (Population Density=200-1000)	-0,034
b_{31}	Slope coefficient (UCO Production=<1)	0
b_{32}	Slope coefficient (UCO Production=1-10)	0,007
b_{41}	Slope coefficient (Collection Points Density=≤2k)	0,105
b_{42}	Slope coefficient (Collection Points Density=2-5k)	0,031

Table-B6: Regression analysis parameters.

Parameter	Value
R-square	0,655
Standard Error of Estimate (s_e) [lt/(hab·y)]	0,114
Sample Mean [lt/(hab·y)]	0,158
Sample Size	15
Degrees of Freedom	6

Table-B7: Estimation of the average potential UCO collection efficiency in the region of Attica. (Discrepancies may appear due to rounding)

Coefficient	Description	Coefficient Value [lt/(hab·y)]	Dummy Variable Value	Coefficient x Variable [lt/(hab·y)]
α	Intercept	0,296	-	0,296
b_{11}	Slope coefficient (Country=Greece)	-0,082	1	-0,082
b_{12}	Slope coefficient (Country=Spain)	-0,098	0	0
b_{13}	Slope coefficient (Country=Portugal)	-0,216	0	0
b_{21}	Slope coefficient (Pop. Density=<200)	-0,012	0	0
b_{22}	Slope coefficient (Pop. Density=200-1000)	-0,034	0	0
b_{31}	Slope coefficient (UCO Production=<1)	0	0	0
b_{32}	Slope coefficient (UCO Production=1-10)	0,007	1	0,007
b_{41}	Slope coefficient (CP Density=≤2k)	0,105	0	0
b_{42}	Slope coefficient (CP Density=2-5k)	0,031	1	0,031
			SUM	**0,251**

APPENDIX - C

Table-C1: Start-up investment requirements.

Description	Number of Units	Cost per Unit (€)	Total Cost (€)	VAT Rate [119]	Total Cost (€) (excl. VAT)
CP Containers	650	60(a)	39.000	23%	31.707
Leaflets Stands	650	6(b)	3.900	23%	3.171
Box Pallets	6	300(c)	1.800	23%	1.463
Spare CP Containers	30(d)	60(a)	1.800	23%	1.463
Spare Leaflets Stands	30(d)	6(b)	180	23%	146
Spare Box Pallets	1(d)	300(c)	300	23%	244
Office Furniture	5(e)	600(f)	3.000	23%	2.439
PCs & Peripherals	5(e)	500(g)	2.500	23%	2.033
Vehicles Communication Equipments	6	200(g)	1.200	23%	976
Uncertainties Allowance (I)	20%	53.680(h)	10.736	23%	8.728
Office Rent - Guarantee Deposit	1	1.040(i)	1.040	-	1.040
Vehicles Leasing – Guarantee Deposit	6	4.000(k)	24.000	-	24.000
			Total Investment Requirements		**77.411**

Notes: Calculations discrepancies may appear due to rounding. a) Indicative price[128]. b) Indicative price[129]. c) Assumed 5 times the CP containers cost. d) Assumed ~5% spare. e) Four offices and one meeting room. f) Indicative price[131]. g) Indicative price[132]. h) Includes the sum of all costs above. i) Assuming guarantee deposit equal to one month rent at a rate of 8€/m^2 [134] for 130m^2 installations (80m^2 offices+50m^2 warehouse) at western Attica. k) Indicative guarantee deposit[135].

Table-C2: Projected revenues.

Description	Units[(a)]					Price/Unit[(b)]					Total (€)				
	Year					Year					Year				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Revenues	269	403	537	580	626	498	498	498	498	498	**133.713**	**200.570**	**267.426**	**288.820**	**311.926**

Notes: Calculations discrepancies may appear due to rounding. a) Amount of UCO sold in tonnes(t). b) UCO price in €/t.

Table-C3: Cost of goods sold.

Description	Units					Price/Unit					Total (€)				
	Year					Year					Year				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Labour Cost (Drivers)[(a)]	6	6	6	6	6	9.026	9.026	9.026	9.846	9.846	54.154	54.154	54.154	59.077	59.077
Labour Force Social Security[(b)]	6	6	6	6	6	443	443	2.217	2.418	2.418	2.660	2.660	13.300	14.509	14.509
Vehicles Operating Leasing[(c)]	6	6	6	6	6	2.640	2.640	2.640	2.640	2.640	15.840	15.840	15.840	15.840	15.840
Transport Fuel Consumption[(d)]	156	156	156	156	156	44,75	44,75	44,75	44,75	44,75	6.981	6.981	6.981	6.981	6.981
Uncertainties Allowance (II) [(e)]	20%	20%	20%	20%	20%	22.821	22.821	22.821	22.821	22.821	4.564	4.564	4.564	4.564	4.564
										Cost of Goods Sold	**84.199**	**84.199**	**94.839**	**100.971**	**100.971**

Notes: Calculations discrepancies may appear due to rounding. a)Labour cost calculated based on the minimum salaries provided by the National General Collective Labour Agreement[136]. For the first 3 years the monthly compensation is 644,69€ (x14) considering 3 years previous working experience. For the 4th and 5th year the monthly compensation is 703,30€ (x14) considering 6 years previous working experience. b)The employer's social security contribution is 24,56% of employee's salary[137]. It is further assumed that both the employer and the employees are eligible for an 80% discount in the social security cost for the first two years[122]. c) Indicative vehicles operating leasing cost[135]. The leasing cost includes cost of services, insurance and fees. d) Assumed that 100km distance is covered per vehicle on a daily basis or 156 thousands km in aggregate for all 6 vehicles per year (5days x 52 weeks per year). The assumed fuel consumption is 4,3lt/100km[135]. The assumed fuel (diesel) price is 1,28€/lt (2013-2015 average price in Attica)[138] discounted by 23%VAT. The resulting cost is 44,75€/1000km. e) Allowance includes the non-labour costs, since the labour cost is considered relatively accurate.

Table-C4: Administrative expenses.

Description	Units					Price/Unit					Total (€)				
	Year					Year					Year				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
General Manager[(a)]	1	1	1	1	1	30.800	30.800	30.800	30.800	30.800	30.800	30.800	30.800	30.800	30.800
Logistics Supervisor[(b)]	1	1	1	1	1	28.000	28.000	28.000	28.000	28.000	28.000	28.000	28.000	28.000	28.000
Accountant/ Procurement Officer[(c)]	1	1	1	1	1	20.636	20.636	20.636	22.700	22.700	20.636	20.636	20.636	22.700	22.700
Secretary[(d)]	1	1	1	1	1	9.846	9.846	9.846	10.667	10.667	9.846	9.846	9.846	10.667	10.667
Labour Force Social Security[(e)]	1	1	1	1	1	5.552	5.552	7.486	8.195	8.195	5.552	5.552	7.486	8.195	8.195
									Administrative Expenses		**94.834**	**94.834**	**96.769**	**100.361**	**100.361**

Notes: Calculations discrepancies may appear due to rounding. a) General Manager's salary is set 10% higher than the Logistics Supervisor salary. b) Logistics Supervisor salary is set at 2.000€ per month (x14) according to IKA survey[139] for average market salaries regarding SME's supervisors. c) Accountant/Procurement officer salary is set at 1.474€ per month (x14) according to IKA survey[139] for average market salaries regarding administrative personnel. A 10% salary increase is provided in the fourth year (almost equivalent to that provided by the National General Collective Labour Agreement after the completion of 3 years of working experience). d) Labour cost calculated based on the minimum salaries provided by the National General Collective Labour Agreement[136]. For the first 3 years the monthly compensation is 703,30€ (x14) considering 6 years previous working experience. For the 4th and 5th year the monthly compensation is 761,90€ (x14) considering 9 years previous working experience. e) The employer's social security contribution is 24,56% of employee's salary[137], regarding the Accountant/Procurement Officer and the Secretary position. It is further assumed that both the employer and the employee in the secretary position (only) are eligible for an 80% discount in the social security cost for the first two years[122]. The General Manager and the Logistics Supervisor (being the company's partners) are considered independently insured and there is no contribution by the company.

Table-C5: Overhead expenses.

Description	Units					Price/Unit					Total (€)				
	Year					Year					Year				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Promotion Vouchers[(a)]	600	600	600	600	600	10	10	10	10	10	6.000	6.000	6.000	6.000	6.000
Lottery Notary[(b)]	12	12	12	12	12	45	45	45	45	45	540	540	540	540	540
Promotion Leaflets[(c)]	24	24	24	24	24	120	120	120	120	120	2.880	2.880	2.880	2.880	2.880
Vehicles Parking[(d)]	6	6	6	6	6	585	585	585	585	585	3.512	3.512	3.512	3.512	3.512
Office/Warehouse Rent[(e)]	130	130	130	130	130	96	96	96	96	96	12.480	12.480	12.480	12.480	12.480
Electricity/Heating[(f)]	12	12	12	12	12	150	150	150	150	150	1.800	1.800	1.800	1.800	1.800
Telecommunications[(g)]	7	7	7	7	7	300	300	300	300	300	2.100	2.100	2.100	2.100	2.100
Safety Engineer[(h)]	1	1	1	1	1	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Certification Scheme Fees[(i)]	1	1	1	1	1	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200
Start-up Expenses (Registration)[(j)]	1	-	-	-	-	5.000	-	-	-	-	5.000	-	-	-	-
Start-up Expenses (Non-assets)[(k)]	1	-	-	-	-	4.634	-	-	-	-	4.634	-	-	-	-
Uncertainties Allowance (III) [(m)]	20%	20%	20%	20%	20%	35.146	25.512	25.512	25.512	25.512	7.029	5.102	5.102	5.102	5.102
										Overhead Expenses	**48.176**	**36.615**	**36.615**	**36.615**	**36.615**

Notes: Calculations discrepancies may appear due to rounding. a)50 vouchers per month, 10€ each. b) One raffle per month. Notary cost 40€ + 1%x500€[140]. c) For 650 gas stations the assumed population coverage is 650/1049=62% of total population in the region of Attica which is equivalent to ~2,4 millions. It is assumed that the required amount of leaflets is 10% of this population annually or 240.000 leaflets per year. The indicative cost is 120€ per 10.000 copies[141]. d) One parking space is required for each vehicle[109-110]. It is assumed that the parking spaces are rented at an indicative rate[142] of 60€ per month per vehicle or 48,78€ (excl.VAT). e) Assuming monthly rent at a rate of 8€/m^2 [134] for 130m^2 installations (80m^2 offices+50m^2 warehouse) at western Attica. f) Assumed electricity/heating cost of 150€/month. g) Assumed telecommunication cost of 25€ per month for the vehicles and the office. h) According to legislation requirements law 3850/2010[143] an indicative cost is provided[144]. i) Licence fee per certificate (annual) 200€ (ISCC fees)[114] plus assumed compensation of 1.000€ for the local cooperating Certification Body conducting the annual conformity inspection. j) Start-up expenses include the company registration expenses (1.700€ indicative cost[145-146]), safety study according to Presidential Decree 17/1996[147] (2.000€ indicative cost[144]), optional lawyer or notary cost and allowances. k) Includes improvements in third parties property, that don't qualify as assets per circular ΠΟΛ.1073/2015[148]. Includes office/warehouse revamp (4.500€ incl.VAT indicative cost[130]) and two-sided logo print on vehicles (6x200€ incl.VAT indicative cost[133]). m) The uncertainty allowance refers to all costs above except of the promotion vouchers.

Table-C6: Assets depreciation schedule.

Description	Depreciation Rate [115]	Total Assets (€)					
		Year					
		0[(a)]	1	2	3	4	5
CP Containers	10%	31.707	28.537	25.366	22.195	19.024	15.854
Leaflets Stands	10%	3.171	2.854	2.537	2.220	1.902	1.585
Box Pallets	10%	1.463	1.317	1.171	1.024	878	732
Spare CP Containers	10%	1.463	1.317	1.171	1.024	878	732
Spare Leaflets Stands	10%	146	132	117	102	88	73
Spare Box Pallets	10%	244	220	195	171	146	122
Office Furniture	10%	2.439	2.195	1.951	1.707	1.463	1.220
PCs & Peripherals	20%	2.033	1.626	1.220	813	407	-
Vehicles Communication Equipments	20%	976	780	585	390	195	-
Uncertainties Allowance (I)	10%	8.728	7.856	6.983	6.110	5.237	4.364
Office Rent – Guarantee Deposit	-	1.040	1.040	1.040	1.040	1.040	1.040
Vehicles Leasing – Guarantee Deposit	-	24.000	24.000	24.000	24.000	24.000	24.000
Total Assets		**77.411**	**71.873**	**66.335**	**60.797**	**55.259**	**49.721**
Annual Depreciation		-	**5.538**	**5.538**	**5.538**	**5.538**	**5.538**

Notes: Calculations discrepancies may appear due to rounding. The residual value of the assets above is considered negligible and is ignored. a) Start-up investments, according to Table-C1.

Table-C7: Estimated VAT inflows/outflows per year.

Description	VAT Rate [119]	VAT (€)				
		Year				
		1	2	3	4	5
Revenues	23%[120]	30.754	46.131	61.508	66.429	71.743
VAT Inflows	**[α]**	**30.754**	**46.131**	**61.508**	**66.249**	**71.743**
Vehicles Operating Leasing	23%	3.643	3.643	3.643	3.643	3.643
Transport Fuel Consumption	23%	1.606	1.606	1.606	1.606	1.606
General Manager	23%(a)	7.084	7.084	7.084	7.084	7.084
Logistics Supervisor	23%(a)	6.440	6.440	6.440	6.440	6.440
Lottery Notary	23%	124	124	124	124	124
Promotion Leaflets	23%	662	662	662	662	662
Vehicles Parking	23%	808	808	808	808	808
Electricity/Heating	13%(b)	187	187	187	187	187
Telecommunications	23%	483	483	483	483	483
Safety Engineer	23%	230	230	230	230	230
Certification Scheme Fees	23%	276	276	276	276	276
Start-up Expenses (Registration)	23%(c)	575	-	-	-	-
Start-up Expenses (Non-assets)	23%	1.066	-	-	-	-
CP Containers	23%	7.293	-	-	-	-
Leaflets Stands	23%	729	-	-	-	-
Box Pallets	23%	337	-	-	-	-
Spare CP Containers	23%	337	-	-	-	-
Spare Leaflets Stands	23%	34	-	-	-	-
Spare Box Pallets	23%	56	-	-	-	-
Office Furniture	23%	561	-	-	-	-
PCs & Peripherals	23%	467	-	-	-	-
Vehicles Communication Equipments	23%	224	-	-	-	-
Uncertainties Allowance (I)	23%(d)	2.008	-	-	-	-
Uncertainties Allowance (II)	23%(d)	1.050	1.050	1.050	1.050	1.050
Uncertainties Allowance (III)	23%(d)	1.617	1.174	1.174	1.174	1.174
VAT Outflows	**[β]**	**37.896**	**23.767**	**23.767**	**23.767**	**23.767**
VAT Net Outflows(e) [β-α]		**7.142**	-	-	-	-

Notes: Calculations discrepancies may appear due to rounding. Original taxable amounts (net of VAT) acquired from Tables-C1 through C5. a) Supervision services provided by company's founders (professionals) are bearing VAT. b) VAT is considered applicable to the 80% of the electricity expenses (the rest being municipal taxes and fees). c) VAT is considered applicable to the 50% of the registration expenses. d) All Uncertainties Allowances are considered bearing VAT 23% (conservative approach). e) VAT outflows not covered by respective inflows.

Table-C8: Loan repayment breakdown.

Description	Year					
	0	1	2	3	4	5
Total Principal	100.000	82.506	63.839	43.923	22.673	-
Annual Principal Repayment	-	17.494	18.666	19.916	21.250	22.673
Annual Interest Expenses	-	5.985	4.813	3.563	2.229	806

Notes: Calculations discrepancies may appear due to rounding. Loan repayment in fixed monthly instalments. Assumed annual interest rate of 6,5% (indicative interest rate[149]).

Table-C9: Income taxes.

Description	Year				
	1	2	3	4	5
Period Taxes	-32.526	-7.374	8.730	12.501	19.614
Deferred Taxes	-	-32.526	-39.901	-31.171	-18.670
Net Taxes	-	-	-	-	**944**

Notes: Calculations discrepancies may appear due to rounding. According to law 4172/2013[115] losses may be brought forward, for up to 5 years, and may be offset against income profits. According to law 4334/2015[119] the corporate tax rate for companies maintaining double-entry books is 29%.

Table-C10: Income Statement (five years projection).

Description	Year				
	1	2	3	4	5
Revenues	133.713	200.570	267.426	288.820	311.926
Cost of Goods Sold	-84.199	-84.199	-94.839	-100.971	-100.971
Gross Profit	**49.514**	**116.371**	**172.587**	**187.849**	**210.954**
VAT Net Outflows	-7.142	-	-	-	-
Administrative Expenses	-94.834	-94.834	-96.769	-100.361	-100.361
Overhead Expenses	-48.176	-36.615	-36.615	-36.615	-36.615
EBITDA	**-100.637**	**-15.078**	**39.204**	**50.873**	**73.979**
Interest Expenses	-5.985	-4.813	-3.563	-2.229	-806
Depreciation	-5.538	-5.538	-5.538	-5.538	-5.538
Total Earnings Before Taxes	**-112.160**	**-25.429**	**30.103**	**43.106**	**67.635**
Net Taxes	-	-	-	-	-944
Net Income	**-112.160**	**-25.429**	**30.103**	**43.106**	**66.691**

Notes: Calculations discrepancies may appear due to rounding.

Table-C11: Shareholders' Equity Statement (five years projection).

Description	Year				
	1	2	3	4	5
Start of Period					
Share Capital	150.000	37.840	12.411	42.513	85.619
Statutory Reserves	-	-	-	-	-
Total Equity	**150.000**	**37.840**	**12.411**	**42.513**	**85.619**
Period Outcome					
Net Income	-112.160	-25.429	30.103	43.106	66.691
Dividends Distributed	-	-	-	-	-
Total Retained Earnings	**-112.160**	**-25.429**	**30.103**	**43.106**	**66.691**
End of Period					
Share Capital	37.840	12.411	42.513	85.619	152.310
Statutory Reserves	-	-	-	-	-
Total Equity	**37.840**	**12.411**	**42.513**	**85.619**	**152.310**

Notes: Calculations discrepancies may appear due to rounding.

Table-C12: Cash Flow Statement (five years projection).

Description		Year				
		1	2	3	4	5
Cash Flows from Operations						
EBITDA		-100.637	-15.078	39.204	50.873	73.979
Tax Paid		-	-	-	-	-944
Net Cash Flows from Operations	**[a]**	**-100.637**	**-15.078**	**39.204**	**50.873**	**73.035**
Cash Flows from Investing Activities						
Purchase of Assets		-77.411	-	-	-	-
Net Cash Flows from Investing Activities	**[b]**	**-77.411**	**-**	**-**	**-**	**-**
Cash Flows from Financing Activities						
Proceeds from Borrowings		100.000	-	-	-	-
Loans Repayment		-17.494	-18.666	-19.916	-21.250	-22.673
Interest Expenses		-5.985	-4.813	-3.563	-2.229	-806
Net Cash Flows from Financing Activities	**[c]**	**76.521**	**-23.479**	**-23.479**	**-23.479**	**-23.479**
Net Change in Cash & Equivalents	**[a]+[b]+[c]**	**-101.528**	**-38.557**	**15.724**	**27.394**	**49.556**
Cash & Equivalents at the Start of Period		150.000	48.472	9.915	25.639	53.033
Cash & Equivalents at the End of Period		**48.472**	**9.915**	**25.639**	**53.033**	**102.589**

Notes: Calculations discrepancies may appear due to rounding.

Table-C13: Financial Position Statement (five years projection).

Description		Year				
		1	2	3	4	5
Tangible Assets		71.873	66.335	60.797	55.259	49.721
Total Non-Current Assets	**[a]**	**71.873**	**66.335**	**60.797**	**55.259**	**49.721**
Cash & Equivalents		48.472	9.915	25.639	53.033	102.589
Total Current Assets	**[b]**	**48.472**	**9.915**	**25.639**	**53.033**	**102.589**
TOTAL ASSETS	**[a]+[b]**	**120.345**	**76.250**	**86.436**	**108.292**	**152.310**
Share Capital		37.840	12.411	42.513	85.619	152.310
Statutory Reserves		-	-	-	-	-
Total Equity	**[c]**	**37.840**	**12.411**	**42.513**	**85.619**	**152.310**
Short-Term Liabilities		18.666	19.916	21.250	22.673	-
Long-Term Liabilities		63.839	43.923	22.673	-	-
Total Liabilities	**[d]**	**82.506**	**63.839**	**43.923**	**22.673**	**-**
TOTAL EQUITY & LIABILITIES	**[c]+[d]**	**120.345**	**76.250**	**86.436**	**108.292**	**152.310**

Notes: Calculations discrepancies may appear due to rounding.

Table-C14: Start-up activities timeline. The activities duration is given in working days (five working days per week, although official holidays were not considered).

	Activity Description	Duration	Start	Finish	Predecessors	Phase	Critical Path
1	**UCO Collection Start-Up**	**187 days**	**4/8/2016**	**21/4/2017**			
2	Company Incorporation						
3	Sign Incorporation Agreement	7 days	4/8/2016	12/8/2016		Initial	*
4	GEMI Registration	10 days	15/8/2016	26/8/2016	3	Initial	*
5	Increase Share Capital	2 days	3/1/2017	4/1/2017	30	Final	*
6	Rent Offices/Warehouse						
7	Investigate Market	30 days	29/8/2016	7/10/2016	4	Initial	
8	Rent Offices/Warehouse	1 day	5/1/2017	5/1/2017	5;7	Final	*
9	Revamp Offices/Warehouse	15 days	6/1/2017	26/1/2017	8	Final	
10	Purchase Equipment						
11	Investigate Market	10 days	3/1/2017	16/1/2017	30	Final	
12	Purchase Equipment	30 days	17/1/2017	27/2/2017	11	Final	
13	Lease Vehicles						
14	Investigate Market	7 days	3/1/2017	11/1/2017	30	Final	
15	Lease Vehicles	7 days	12/1/2017	20/1/2017	14	Final	
16	Collection Activities Licensing						
17	Investigate Eligibility Criteria	30 days	29/8/2016	7/10/2016	4	Initial	
18	Activities Licensing	20 days	6/1/2017	2/2/2017	8;17	Final	*
19	Vehicles Licensing	20 days	3/2/2017	2/3/2017	15;18	Final	*
20	Contractual Agreement-UCO Wholesalers						
21	Investigate Eligible Collaborators	30 days	29/8/2016	7/10/2016	4	Initial	
22	Sign a Tentative Agreement	10 days	10/10/2016	21/10/2016	21	Initial	
23	Sign a Contract Agreement	5 days	3/2/2017	9/2/2017	18;22	Final	
24	Contractual Agreement-Oil Companies						
25	Investigate Eligible Collaborators	60 days	29/8/2016	18/11/2016	4	Initial	*
26	Sign a Tentative Agreement	30 days	21/11/2016	30/12/2016	25	Initial	*
27	Sign a Contract Agreement	10 days	3/2/2017	16/2/2017	18;26	Final	
28	Hire Personnel						
29	Investigate Eligible Employees	30 days	29/8/2016	7/10/2016	4	Initial	
30	Hire Accountant	1 day	2/1/2017	2/1/2017	22;26;29	Final	*
31	Hire Secretary	1 day	27/1/2017	27/1/2017	9;29	Final	
32	Hire Drivers	1 day	21/2/2017	21/2/2017	19FS-8 days;29	Final	
33	Train Drivers	7 days	22/2/2017	2/3/2017	32	Final	
34	Start-Up Operations						
35	Deploy Collection Point Containers	5 days	3/3/2017	9/3/2017	12;18;19;23;27;33	Final	*
36	Start Operations	1 day	10/3/2017	10/3/2017	35	Final	*
37	Bank Loan						
38	Investigate Eligibility Criteria	10 days	5/1/2017	18/1/2017	5	Final	
39	Loan Application & Approval	30 days	19/1/2017	1/3/2017	38	Final	
40	Activities Certification						
41	Investigate Eligibility Criteria	30 days	29/8/2016	7/10/2016	4	Initial	
42	Select Certification Body	5 days	6/3/2017	10/3/2017	36FS-5 days;41	Final	
43	Activities Certification	30 days	13/3/2017	21/4/2017	42	Final	(*)

Notes: The timeline was created with *ProjectLibre*.