

Thinking outside the plastic bag

How Greece can reduce the plastic bag consumption

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Thesis for the fulfilment of the
Master of Science in Environmental Management and Policy
Lund, Sweden, September 2016



THE INTERNATIONAL INSTITUTE FOR
INDUSTRIAL ENVIRONMENTAL ECONOMICS

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Published in 2016 by IIIIEE, Lund University, P.O. Box 196, S-221 00 LUND, Sweden,
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ISSN 1401-9191

Acknowledgements

... and this is it! This is the end of two years full of new experiences, knowledge, fun but also challenging moments where I tried to find myself and my steps in a new field. Coming from an engineering background I had learnt to face a problem with a more “square way”, but EMP master program and especially this thesis taught me that the answer “it depends” suits better to the real world where the conditions are changing all the time.

I would like to thank everyone in IIIIEE, professors, stuff and my classmates, for this amazing year!

A special “thank you” to my supervisors, Thomas Lindhqvist and Leonidas Milios, for their support, guidance and all the comments that sent to me tirelessly the last months.

I am very grateful to WWF Greece and especially Achilleas Plitharas that trusted me and helped me understand better the Greek context during my thesis trip.

My gratitude to all the interviewees that shared with me their experience and perspectives and added an extra validity to the outcome of my thesis with their participation.

Finally, I would like to thank some people that helped me find the right path in the beginning of my effort, Mrs. Stavroula Kordella, Professor Kostas Bithas and Mr. Andreas Sotiropoulos from LIFE DEBAG project that were kind enough to share their experience from LIFE DEBAG and give me determinant directions for the designing phase, Professor Helen Briassoulis and Professor Dimitris Briassoulis for an evening full of wisdom and information on bio-based products and Mr. Dimitris Mandis from the association of the Greek manufacturers of packaging and materials for the valuable material on the new generation of plastics.

Last but not least, I would like to thank my family and friends that were very supportive and patient all this period.

Sofia Peppas

Abstract

In 2015 the EU introduced Directive 2015/720 on the reduction of the consumption of lightweight plastic carrier bags creating the first transnational agreement on plastic bag issue in the world. This Directive sets the scope within which Member States will design their own policies in order to reach a significant reduction in the plastic bag consumption over the following years. Greece is one of the countries that have to cover a long way towards the desired outcome, since every Greek consumes on average 363 plastic carrier bags per year, whereas the European average number is 175 plastic bags.

The aim of this thesis is to examine whether or not there are both environmentally sound and efficient measures for the reduction in the consumption of plastic bags in Greece within the scope of the Directive, having in mind though that it is an extra advantage if these measures give incentives for improvements beyond the targets of the Directive. This thesis is based on an ex-ante policy evaluation framework that compares alternative policy options taking into account the requirements of the Directive, the priorities of Greece regarding the waste management in the next years and external factors such as market signals and technological development. The collection of data was done through a desktop literature review and interviews with affected stakeholders.

The policy evaluation is a partly subjective process, since the final outcome depends on how the collected information is interpreted. For that reason, this thesis does not propose the best policy option among the examined measures but presents risks, costs, benefits and stakeholders' positions per measure in an organized and easy-to-follow way in order for the policy makers to take advantage of this information and make the final political decision. It is worth mentioning though that according to the conducted evaluation there are policy measures that can be both environmentally sound and cost-effective on the condition that the possible risks are minimised. As a result, which of these options will bring the best results depends on how the affected stakeholders will respond to them (political acceptability and equity).

Keywords: plastic bags, Greece, policy evaluation, Directive 2015/720

Executive Summary

Plastic bags have been accused of being one of the main causes of marine littering in the last decades. It is not a coincidence that more and more countries are implementing measures for the reduction in the consumption of plastic carrier bags recognizing their association with a series of environmental and other problems. However, there is no international agreement that attempts to address the plastic bag issue. At European level plastic bags belong to the general category of packaging according to the Directive 94/62/EC on Packaging and Packaging Waste, but this Directive had taken no specific measures to tackle this issue. In 2015 the EU, recognising the aforementioned problems and the gap of the Packaging Directive, introduced Directive 2015/720 on the reduction of the consumption of lightweight plastic carrier bags creating the first transnational agreement in the world.

The Directive 2015/720 sets the scope within which Member States ought to design their own policies in order to reach a significant reduction¹ in the plastic bag consumption over the following years and recognizes that there are Member States that have already implemented measures against plastic bags and have achieved a significant reduction, as well as, Member States that have not taken any prior actions therefore the consumption of plastic carrier bags is very high. Greece is one of the countries that have to cover a long way towards the desired outcome, since every Greek consumes on average 363 plastic carrier bags per year, whereas the European average number is 175 plastic bags.

All the Member States are called to take measures that will address the plastic bag issue by 27 November 2016. Within the scope of this decision Greece has to face a series of challenges since the financial recession in the last years has created a complex socio-economic reality. In short, the reduction in the consumption of plastic bags may lead to the reduction in the production of plastic bags setting in danger a sector that currently offers jobs and important cash flows in the economy, since more than the 70% of the plastic carrier bags consumed in Greece is produced by Greek businesses. Additionally, especially in the case of an economic instrument consumers' reactions may be intense since they do not trust government's efforts to tackle environmental issues believing that they try to collect money to cover other fiscal gaps. On the other hand Greece cannot be indifferent to the benefits of this Directive since two of its most important economic sectors (i.e. agricultural sector and tourism) depend on the nature for their viability, whereas it has been noticed that plastic bags are among the most common types of litter found in Greek marine ecosystems. It is very positive though that the last year some voluntary initiatives started for the reduction of plastic bag use at local level and within the framework of one of them (LIFE DEBAG project) the public discussion between the government and the stakeholders has already started.

The aim of this thesis is to examine whether or not there are both environmentally sound and efficient measures for the reduction in the consumption of plastic bags in Greece within the scope of the Directive, having in mind though that it is an extra advantage if these measures give incentives for improvements beyond the targets of the Directive. The main challenge is to

¹ According to Article 4 of the amended Directive 94/62/EC:

“The measures taken by Member States shall include either or both of the following:

- (a) the adoption of measures ensuring that the annual consumption level does not exceed 90 lightweight plastic carrier bags per person by 31 December 2019 and 40 lightweight plastic carrier bags per person by 31 December 2025, or equivalent targets set in weight. Very lightweight plastic carrier bags may be excluded from national consumption objectives;
- (b) the adoption of instruments ensuring that, by 31 December 2018, lightweight plastic carrier bags are not provided free of charge at the point of sale of goods or products, unless equally effective instruments are implemented. Very lightweight plastic carrier bags may be excluded from those measures.”

keep in mind the principles of sustainable consumption and production (SCP), since measures that will lead to the loss of jobs and the shutdown of businesses do not seem as an option at the moment in Greece.

The final outcome of this thesis is based on an ex-ante policy evaluation framework that I designed inspired by the European Commission's Indicative Guidelines on how to conduct ex-ante evaluation for expenditure programs. Through the evaluation, alternative policy options are compared taking into account the requirements of the Directive, the priorities of Greece regarding the waste management in the next years and external factors such as market signals and technological changes. Important part of this framework is also the lessons learned from other countries since their experiences can be used as a guide for countries such as Greece that have not implemented related policies in the past. All in all, this thesis addresses the following research questions:

- RQ1: What is the current status of the management of waste plastic bags in Greece?
- RQ2: Which are the factors that can secure the successful implementation of a policy on the plastic bag issue in Greece?
- RQ3: Which are the policy measures that can reduce the plastic bag consumption in Greece?
 - RQ3(a): Are there alternatives that can be discarded because they do not have a chance to reach the goals or because they are impossible to enforce?
 - RQ3(b): Can any measures be both environmentally sound and efficient in the case of Greece?
 - RQ3(c): How will the affected stakeholders respond to these measures (political acceptability and equity)?

The lessons we learned from other countries provide us with a series of measures for the reduction in the plastic bag consumption. These measures can be applied independently or in combination and are separated into three general categories: regulations (bans and limited bans), economic instruments (taxes and charges) and informative instruments (awareness campaigns). I decided not to examine all the policy options that theoretically can reach the desired targets since I considered from the beginning that some of them do not have a chance to reach the goals or they are impossible to enforce in the case of Greece. The collection of data for the evaluation of the examined policy options was done through a desktop literature review and interviews with affected stakeholders (retailers, producers, governmental and other organisations, NGOs and consumer associations). In total 18 interviews were conducted in June and July 2016. The interview guides used for the different stakeholder groups were built upon the same logic, but from group to group there were some distinctive differences for more targeted questions. Through the interviews I was in the position to register potential risks, costs and success factors that are involved in each category of measures.

- RQ1: What is the current status of the management of waste plastic bags in Greece?

The evaluation of the waste management of plastic bags in Greece took into account the European and national legislation in place (special focus on the Directive 2015/720), the current status of waste management in Greece and country's future targets for the improvement of the waste management.

In Greece it is estimated that there are 57 000 retailing points (supermarkets, SMEs, e.g. bakeries, kiosks etc. and street salesmen) that offer mainly lightweight plastic carrier bags made from high density polyethylene (HDPE), known also as T-shirt bags (thickness 18-20µm – weight 8g). These bags have dominated in the market, because they are light, durable,

waterproof, can hide the contained products and can be used one or more times (primary use). Also, Greeks use these bags as bin liners (secondary use). Most of the large Greek supermarkets offer oxo-degradable plastic bags. Based on collected data I monitored the pathways of waste plastic bags; the majority of plastic bags end up in landfills (about 66%), 24% of them is estimated to be recycled and the rest 10% ends up in the environment (littering). Examining the waste management of plastic bags it is interesting that only about 100 large retailers pay a fee in HE.R.R.Co. – the biggest PRO in Greece – for the quantities of plastic bags placed on the market, whereas it is believed that the majority of SMEs either do not know their obligation to be part of a PRO or they do not participate in a system since they know that they are unlikely to be caught.

- RQ2: Which are the factors that can secure the successful implementation of a policy on the plastic bag issue in Greece?

Measures for the reduction in the consumption of plastic carrier bags have been applied in countries around the world the last two decades, so a country that attempts nowadays to implement a related policy has to take advantage of the lessons learned from other countries in order to avoid making the same mistakes. However, each case is different so the special characteristics of the country under analysis have to be taken into account. I tried to do so via interviews with affected stakeholders so in the end the following list of success factors came up:

- Acceptance of the applied measures from the total of stakeholders
 - Awareness campaign: adjusted campaigns targeted to different age group of consumers as well as campaigns for the rest stakeholders, prior to the implementation of the measure(s) and after that on a continuous basis
 - A holistic approach – the improvement of waste management in general
 - Educational campaigns
 - Engagement of local stakeholders
 - Effectiveness of enforcement mechanisms
 - Gradual implementation of any measure(s)
 - Horizontal implementation of the measures²
 - In the case of a Fund: transparency and publishing of related info
 - Offering alternatives at reasonable prices
 - Readiness of the market (e.g. available standards, investments)
 - Taking into account special characteristics of Greece
- RQ3: Which are the policy measures that can reduce the plastic bag consumption in Greece?

Having studied the special characteristics of Greece I excluded some of the alternative options because I considered that they do not have a chance to reach the goals or they are impossible to enforce. So in the end I chose to examine four policy options:

- Limited ban on lightweight plastic bags other than 100% bio-based bags (Option1)
- Charge paid by consumers at the point of sale (Option2)
- Limited ban on thinner than 30µm plastic carrier bags and a charge on thicker bags paid by consumers at the point of sale (Option3)
- Tax on producers and charge on lightweight plastic carrier bags paid by consumers at the point of sale (Option4)

² Same measures imposed from all the retailers in order to avoid confusion among consumers.

Within the scope of this policy evaluation I used five criteria: environmental effectiveness, cost-effectiveness, equity, political and social acceptability and incentives for improvement. I evaluated each option independently and I pointed out the associated risks, costs and benefits in every case. In the end I compared the alternative policy options per criterion in order for the reader to acquire a better understanding of which measures prevail over the others, but I did not propose the best option based on all the criteria. My goal through this evaluation was to synthesize the collected data (literature review and interviews) in order for the reader to have the opportunity to understand how the situation may be formulated in the different scenarios. According to my evaluation three out of the four examined policy options (options 2, 3, 4) can be both environmentally and cost-effective on the condition that the possible risks are minimized. As a result, which of these options will bring the best results depends on how the affected stakeholders will respond to them (political acceptability and equity).

Taking into account the collected information and the outcome of the policy evaluation, I have made some recommendations to the main audience of this thesis: policy makers, producers and retailers.

Policy makers: As it is mentioned above, the PRO does not seem to work properly in the case of plastic bags, so a straightforward way to give a solution to this issue is to transfer the obligation from retailers to producers that are some hundreds and so much easier to be controlled. Furthermore, regardless the measures applied for the reduction in the consumption of plastic bags, there is a series of factors (emerged risks and success factors) that can affect the successful implementation of the measures, so policy makers should take them into account in every case. As it seems now the most possible scenario is for the government to impose a charge on plastic bags paid by consumers at the point of sale; in doing so they will implement a measure that it is anticipated to have a good performance given the lessons learned from other countries and is aligned with the Directive's targets. However, policy makers should not reject other policy measures without giving them a try. A good way to check other alternative measures is to implement them at local level. Last but not least, Greece is not ready to establish a bio-based market (i.e. no competitive advantage – other countries have already invested in it, no infrastructure in place to treat organic waste), but the government should keep in mind that this sector has the potential to boom within the next years and stay tuned with the technological news.

Producers: Producers should ask for time and incentives from the government in order to adapt successfully to the new conditions and try to find alternative products that can secure them a smooth transition. Producers that want to be frontrunners not only at national but also at European level should take a look at sustainable plastics.

Retailers: Retailers have to get prepared for the upcoming changes regardless what measures the government will apply or when a national awareness campaign will be initiated. They cannot risk their relationship with their customers so they should inform them for all the issues associated with the upcoming measures and offer them a variety of alternatives at reasonable prices.

Table of Contents

ACKNOWLEDGEMENTS.....	I
ABSTRACT	II
EXECUTIVE SUMMARY	III
LIST OF FIGURES.....	VIII
LIST OF TABLES	VIII
ABBREVIATIONS.....	IX
1 INTRODUCTION.....	1
1.1 AIM AND RESEARCH QUESTIONS	1
1.2 LIMITATIONS AND SCOPE	3
1.3 ETHICAL CONSIDERATIONS	4
1.4 AUDIENCE.....	4
1.5 DISPOSITION.....	4
2 LITERATURE REVIEW AND ANALYSIS.....	5
2.1 LEGISLATION ON PLASTIC BAGS	5
2.1.1 European and National Legislation	5
2.1.2 Directive (EU) 2015/720	8
2.1.3 Useful Concepts	9
2.1.3.1 Integrated Solid Waste Management (ISWM)	10
2.1.3.2 Sustainable Consumption and Production (SCP).....	10
2.2 WASTE MANAGEMENT IN GREECE.....	11
2.2.1 Current Status.....	11
2.2.2 Targets by 2020	13
2.3 PLASTIC BAGS IN GREECE	15
2.3.1 Current Status.....	15
2.3.2 Environmental and Other Problems.....	17
2.3.3 Voluntary and Other Initiatives	18
2.4 LOOKING AT THE UPCOMING CHANGES.....	20
2.4.1 Affected Stakeholders.....	20
2.4.2 Plastic Industry Sector.....	20
2.4.3 Retailers	21
2.4.4 Consumers	21
2.4.5 Governmental and other organizations	22
2.4.6 Others.....	23
2.4.7 Emerging Alternatives of Plastic Bags	23
2.5 LEARN FROM OTHER COUNTRIES	24
2.5.1 Alternative Policy Measures.....	24
2.5.2 Case Studies	26
3 METHODOLOGY.....	30
3.1 EX-ANTE POLICY EVALUATION FRAMEWORK	30
3.2 LITERATURE ANALYSIS.....	31
3.2.1 In general.....	31
3.2.2 Lessons Learned from Other Countries	32
3.3 INTERVIEWS.....	32
3.4 POLICY EVALUATION	34
3.4.1 Preparation Phase.....	34
3.4.2 Evaluation Phase	35
3.5 LIMITATIONS	36

4	FINDINGS	37
4.1	LEARN FROM THE AFFECTED STAKEHOLDERS.....	37
4.1.1	Plastic Industry Sector.....	37
4.1.2	Retailers.....	40
4.1.3	Consumers.....	42
4.1.4	Governmental and other organizations.....	44
4.1.5	Others	46
4.2	SUMMARY OF THE KEY FINDINGS	47
5	THE POLICY EVALUATION	52
5.1	OBJECTIVES FOR THIS POLICY EVALUATION.....	52
5.2	ALTERNATIVE POLICY MEASURES.....	53
5.3	EVALUATION OF ALTERNATIVE POLICY MEASURES	54
5.3.1	Limited ban on lightweight plastic bags other than 100% bio-based bags.....	54
5.3.2	Charge paid by consumers at the point of sale	57
5.3.3	Limited ban on thinner than 30µm plastic carrier bags and a charge on thicker bags paid by consumers at the point of sale.....	60
5.3.4	Tax on producers and charge on lightweight plastic carrier bags paid by consumers at the point of sale.....	63
5.4	OVERVIEW OF THE POLICY EVALUATION	66
6	CONCLUSIONS	67
6.1	CONCLUDING REMARKS	67
6.2	RECOMMENDATIONS.....	69
6.3	FUTURE RESEARCH.....	70
	BIBLIOGRAPHY	71
	APPENDIX I: DEFINITIONS OF KEY TERMS.....	78
	APPENDIX II: THE PATHWAYS OF SINGLE-USE PLASTIC CARRIER BAGS IN GREECE.....	79
	APPENDIX III: MONITORING STUDIES ON MARINE DEBRIS DISTRIBUTION IN GREECE.....	80
	APPENDIX IV: A TRIP AROUND THE WORLD – APPLIED MEASURES	81
	APPENDIX V: ANALYSIS OF ALTERNATIVE POLICY MEASURES (SOME EXTRA OPTIONS).....	84
	APPENDIX VI: A SAMPLE OF THE INTERVIEW GUIDE.....	89
	APPENDIX VII: LIST OF INTERVIEWEES	90

List of Figures

Figure 2-1: Waste hierarchy	6
Figure 2-2: Integrated Solid Waste Management (ISWM)	10
Figure 2-3: The 3 pillars of sustainable development	11
Figure 2-4: Pie chart of MSW treatment rates in Greece (Eurostat, 2013).....	13

List of Tables

Table 2-1: Targets for the recovery (recycling and energy recovery) of packaging materials.....	6
Table 2-2: Waste hierarchy stages – current status vs 2020 targets (special focus on waste packaging).....	14

Table 2-3: Consumption of all kinds of plastic bags from 2004 to 2014	21
Table 2-4: Emerging alternatives of plastic bags	23
Table 2-5: Alternative policy measures for the reduction in the consumption of plastic carrier bags	25
Table 3-1: Research questions and corresponding methodology	30
Table 3-2: The ex-ante policy evaluation framework	31
Table 3-3: Presentation of the selected evaluation criteria	35
Table 4-1: My personal estimations on how different stakeholders will receive the alternative measures	47
Table 4-2: Risks emerged by the alternative measures	48
Table 4-3: Costs associated with alternative measures	49
Table 4-4: Cost savings associated with alternative measures	50
Table 4-5: Success factors - the case of Greece	51
Table 5-1: Comparison of the alternative policy measures under analysis	66

Abbreviations

EC: European Commission

EPR: Extended Producer Responsibility

HE.R.R.Co.: Hellenic Recovery Recycling Corporation

HRA: Hellenic Recycling Agency

IELKA (Greek abbreviation): Institute of Retail Consumer Goods – GR

ISWM: Integrated Solid Waste Management

LCA: Life Cycle Assessment

MBT: Mechanical Biological Treatment

MCD: Ministerial Council's Decision

MD: Ministerial Decision

MRF: Material Recycling Facility

MSW: Municipal Solid Waste

NWMP: National Waste Management Plan

NSWMP: National Solid Waste Management Plan

PROs: Producer Responsibility Organizations

RDF: Refused-Derived Fuel

SCP: Sustainable Consumption and Production

SMEs: Small- and medium-sized enterprises

VAT: Value Added Tax

1 Introduction

Every Greek consumes on average 363 plastic carrier bags per year based on the results of a study conducted by the Institute of Retail Consumer Goods – GR (IELKA – Greek abbreviation) (liberal.gr, 2016b), whereas the European average number is 175 plastic bags (Bio Intelligence Service, 2011a). According to this number Greece is the “champion” in the consumption of plastic bags among the 19 Member States, which have provided EU with related data. The IELKA study intrigued the interest of the majority of the Greek press that reported it on Tuesday 14th of July 2016. But why are the media intrigued by this right now? Let’s see the whole picture!

In general developed countries apply first policies to tackle environmental issues, but in the case of plastic bags this norm has changed and developing countries set the example. Indicatively, Bangladesh, India, China and several African countries implemented related policies in the last years (see Appendix IV). Plastic bags are associated with environmental issues, mainly because of their light weight, since they are carried away resulting, among others, to aesthetic pollution and becoming a hazard for animals that may ingest them or get entangled. These problems are more intense in developing countries, since municipal waste collection and recycling is not well established and a huge amount of plastic bags is not collected or ends up in open landfills (Nhamo, 2008). However, the fact that in Europe more than 8 billion plastic bags end up in the environment (littering) only in 2010 and in general it is estimated that about 50% of the collected bags end up in landfills (Commission SWD(2013) 443 final) proves that the aforementioned environmental problems constitute part of the everyday life of European citizens, as well.

In order for these problems to be tackled, in the last two decades many local initiatives have been taken and several countries all over the world have introduced measures against the production and the consumption of plastic bags. These private and public initiatives have created an international anti-plastic bag norm that becomes stronger and stronger (Clapp & Swanston, 2009). However, until now no international agreement on how countries could commonly face this issue has been signed. This could be explained by the fact that one country may face more significant environmental problems associated with plastic bags than others and so it might be more interested in implementing a related policy. Whereas, even in countries that face equally significant environmental problems, people have different beliefs and way of thinking, so a government has to study the special cultural features of its people and design a fitting policy accordingly. In other words, a policy that has been successfully implemented in one country may not be equally successful in another.

Last year (2015) the European Union introduced a Directive on the reduction of the consumption of lightweight plastic carrier bags (Directive (EU) 2015/720) creating the first transnational agreement in the world. The Directive (EU) 2015/720 sets the scope within which Member States will design their own policies in order to reach a significant reduction in the use of plastic carrier bags over the following years. This Directive recognizes that EU Member States are separated into two broad groups of countries, countries that have already taken measures against plastic bags and have achieved a significant reduction in the use of plastic carrier bags and countries that have not yet implemented any related measures and the consumption of plastic carrier bags is very high. Looking at the number on the top of this page, Greece belongs to the second group.

1.1 Aim and Research Questions

After the announcement of the Directive (EU) 2015/720 regarding the reduction in consumption of lightweight plastic carrier bags, Greece is expected to take measures that will

address this problem by 27 November 2016. Retailers, plastic bag producers, municipalities, NGOs, government and consumers are among the affected stakeholders and they present sometimes conflicting interests. As a result, the biggest challenge for policy makers is to take into account all these different perspectives and end up with a solution acceptable for all the stakeholders.

In general, the decision making process and the implementation of a solution in the case of Greece is challenging. Firstly, this Directive could possibly be faced as a lower priority issue from the majority of the society given the social and economic problems that Greece faces in the last years. Furthermore, this Directive has, as a basic objective, the reduction of the consumption of plastic carrier bags that may lead to the reduction in the production of these bags. Whereas, in Europe this is not considered as a big issue since 70% of the plastic carrier bags used in EU is imported from countries outside Europe (Commission SWD(2013) 443 final). In Greece, this is different since less than 30% of these bags are imported and the rest 70% is produced by Greek businesses (Kaselimis I., personal communication). As a result, the Greek government is called to take measures that may reduce the potential of a sector that offers jobs and important cash flows in the economy, especially during a period of persistent economic downturn. On the other hand Greece cannot be indifferent to the benefits of this Directive since two of its most important economic sectors (i.e. agricultural sector and tourism) depend on the nature for their viability. These benefits are even more interesting in the case of Greece, where the waste management system has still big gaps. For instance, organic recycling is very low, at about 4%, about 80% of the municipal solid waste (MSW) is landfilled (WWF Greece, 2015), the recycling rate of plastic bags is officially unknown but it is considered low, since the majority of Greeks use plastic bags as bin liners³, and it has been noticed that plastic bags are among the most common types of litter found in Greek marine ecosystems (Ioakeimidis et al., 2014; Katsanevakis & Katsarou, 2004; Kordella, Geraga, Papatheodorou, Fakiris, & Mitropoulou, 2013; Koutsodendris, Papatheodorou, Kougiourouki, & Georgiadis, 2008).

This thesis coincides with a period when the official discussions between the government and the affected stakeholders have just started and for that reason the next months will be crucial. In addition to that, no other related report that monitors the current situation, and at the same time examines alternative policy measures, has been published by any affected stakeholder or NGO so far. Nevertheless, last year, some voluntary initiatives have started for the reduction of plastic bags at local level. In particular, on five Greek islands (Alonnisos, Santorini, Sifnos, Syros and Tinos) alternatives of plastic bags have been promoted and placed on the market and educational activities and awareness campaigns have been organized. These initiatives prove that something has started to change in Greece and for that reason more and more scientists and experts have to be involved in order to guide this change.

The aim of this thesis is to examine whether or not there are both environmentally sound and efficient measures for the reduction in the consumption of plastic bags in Greece within the scope of the Directive, having in mind though that it is an extra advantage if these measures give incentives for improvements beyond the targets of the Directive. The collection of data was done through a desktop literature review and interviews with affected stakeholders. The main challenge is to keep in mind the principles of sustainable consumption and production (SCP), since measures that will lead to the loss of jobs and the shutdown of businesses do not seem as an option at the moment in Greece. Finally, it is worth mentioning that within the scope of this thesis I am collaborating with WWF Greece that intends to use the outcome of

³ Basic outcome from interviews and personal observations

the thesis in order to participate in the public discussion. Subsequently, this thesis addresses one main research question (=RQ3) and two supplementary research questions (=RQ1, RQ2) that give the data needed for the RQ3 to be answered. In particular:

- RQ1: What is the current status of the management of waste plastic bags in Greece?
- RQ2: Which are the factors that can secure the successful implementation of a policy on the plastic bag issue in Greece?
- RQ3: Which are the policy measures that can reduce the plastic bag consumption in Greece?
 - RQ3(a): Are there alternatives that can be discarded because they do not have a chance to reach the goals or because they are impossible to enforce?
 - RQ3(b): Can any measures be both environmentally sound and efficient in the case of Greece?
 - RQ3(c): How will the affected stakeholders respond to these measures (political acceptability and equity)?

1.2 Limitations and Scope

I chose to study the case of Greece mainly because Greece belongs to the group of European countries that have not taken any related measures prior to the introduction of the Directive and there would be a long way towards the desired outcome. Furthermore, because of the financial recession in Greece the implementation of new measures (especially of economic measures) is a challenging procedure for policy makers and a very interesting case from a practical and political perspective.

Within the scope of this thesis it is not possible to monitor the perspectives of all the affected stakeholders. For that reason, the main focus will be on large-scale companies (supermarkets and producers) that are able to influence the smaller ones and representatives of key organizations on waste management. Plus, the perspectives of consumer associations and NGOs will be monitored and will be used as an indication of consumers' way of thinking, since it is not feasible for a national scale consumer survey to be conducted for the purpose of this thesis and a smaller survey is rejected as not reliable. Furthermore, the main focus of the thesis (RQ3) is on the pre-consumer aspect of the waste management of plastic bags, so measures such as EPR schemes and take-back systems are not among the examined measures. However, they have been examined secondarily in order for RQ1 (management of waste plastic bags in Greece) to be answered.

This thesis is based on an ex-ante evaluation framework, so it demands the collection of data⁴ from governmental bodies and public services and from interviews with affected stakeholders. As a result, the main limitation that I faced is that in some cases I did not manage to gather useful data for the analysis, either because it was difficult for the responsible governmental bodies and the interviewees to give the answers or because they were not willing to share this information. Furthermore, in some cases the interviewees were employees of a company/organization/etc., so they expressed their own personal opinions and not necessarily the position of the company/organization/etc. Of course, it has to be taken into account that these employees are experienced and their estimations have also high interest and weight. Finally, it has to be taken into consideration that, because of the aforementioned limitations, in the case of the absence of certain data, assumptions had to be made in order to fill the gaps.

⁴ Real data for the current situation and projections/estimations regarding the alternative examined measures.

1.3 Ethical Considerations

Within the scope of this thesis I am collaborating with WWF Greece that intends to use the outcome of the thesis in order to participate in the public discussion, but I did not receive any funding from WWF Greece or other organization. While I was writing this thesis, I discussed with a number of people in order mainly to acquire a better understanding of the Greek reality, but the interpretation of the collected information is a 100% result of data and my own way of thinking. Last but not least, I gathered data from 18 interviews that were conducted in June and July 2016. The interview guide or an outline of the interview was sent to the interviewees some days before the meeting or the skype call in order for them to have time to think about their answers. Each interview lasted 30 to 60 minutes and it was recorded after a request in the beginning. I did not transcribe all the interviews but only the key information. After that I translated and synthesized this information in order to be able to present the key findings per stakeholder (Chapter 4). I analysed all the collected information respecting the interviewees and the recorded material. Since I had to translate and synthesize what each individual said in a joint version, I sent a draft copy of this thesis to all the interviewees prior to the publication in order for all of them to have the opportunity to read it and verify their consent. Finally, during the interviews I did not ask for sensitive information and in the few cases that I considered that some of the collected information may be sensitive; I chose not to present it.

1.4 Audience

The audience of this research is policy makers that deal with the reduction of the consumption of plastic bags in Greece and affected stakeholders by the Directive (EU) 2015/720 – mainly businesses – that want to get prepared before the implementation of the upcoming measures. Besides, this thesis is interesting for scientists and economists around the world who deal with concepts such as SCP, since the examined case is a miniature of the challenges that a country under financial recession faces when it attempts to design a policy for the future.

1.5 Disposition

Chapter 2 – Literature review and analysis: It is the longest chapter of the thesis and it aims to present information necessary for the policy evaluation. It consists of three main parts: a) an evaluation of the waste management of plastic bags in Greece, b) an evaluation of the readiness of the market to accept the upcoming measures, and c) an analysis of policy measures that have been applied in other countries in order to monitor factors that are thought to be able to secure the successful implementation of measures on plastic bags.

Chapter 3 – Methodology: It presents the ex-ante policy evaluation framework based on which the outline of this thesis has been built and the methods used for the collection and the analysis of the data.

Chapter 4 – Findings: It synthesizes and presents per stakeholder the information collected from the interviews.

Chapter 5 – The policy evaluation: In this chapter the objectives of the policy evaluation, the examined policy measures and the policy evaluation of each alternative option are presented. In the end a comparison of the examined policy options per criterion is cited.

Chapter 6 – Conclusions: A summary of the answers to the RQs, a series of recommendations to the main audience of this thesis (policy makers, producers and retailers) and some ideas for future research are presented.

2 Literature Review and Analysis

The focus of this thesis is on measures for the reduction in the consumption of lightweight plastic carrier bags. Lightweight plastic carrier bags have a wall thinner than 50 microns and belong to the general category of packaging according to the Directive (EU) 94/62/EC on Packaging and Packaging Waste.

In Greece supermarkets, grocery stores, street markets, bakeries and many other small stores offer mainly lightweight plastic carrier bags made from high density polyethylene (HDPE), known also as T-shirt bags (thickness 18-20µm – weight 8g). These bags have dominated in the market, because they are light, durable, waterproof, can hide the contained products and can be used one or more times (primary use). Also, Greeks use these bags as bin liners (secondary use). These bags can sometimes contain prodegradant additives and biodegrade after some months under appropriate conditions of light and/or heat, this category is known as oxo-degradable plastic bags. Most of the large Greek supermarkets offer this type of bags.

All the aforementioned information will be analysed in detail in the chapter that follows.

Chapter 2 consists of three main parts: a) an evaluation of the waste management of plastic bags in Greece; taking into account the European and national legislation in place (special focus on the Directive 2015/720), the current status of waste management in Greece and country's future targets for the improvement of the waste management, b) an evaluation of the readiness of the market to accept the upcoming measures; examining the affected stakeholders and the readiness of the market to offer alternatives to plastic bags, and c) an analysis of policy measures that have been applied in other countries in order to monitor factors that are thought to be able to secure the successful implementation of measures on plastic bags.

2.1 Legislation on Plastic Bags

In this chapter the most related European and national policies on plastic bag issue are analysed in order to understand better the general frame in which the Directive 2015/720 got added. Plus, some state-of-the-art concepts (circular economy, sustainable plastics, SCP and Integrated Solid Waste Management (ISWM)) that are anticipated to affect the policy decisions on waste management in the near future are analysed.

2.1.1 European and National Legislation

At EU level the first Directive on waste was established in 1975 (Council **Directive 75/442/EEC**) and introduced some new concepts for the Member States. Among them one can highlight the polluter pays principle and the idea that the prevention of waste generation should be the first choice whereas reuse, recycle and energy recovery should follow.

In 1994 a Directive on packaging and packaging waste came into force (EU Parliament and Council Directive 94/62/EC)⁵. The objective of this Directive was the protection of the environment in the Member States and the affected third parties and at the same time the protection of the internal market and the trade among the Member States. Especially, for the trade there is a reference, Article 18: "Freedom to place on the market", that says that a Member State cannot stop the placing of a product that respects the requirements of this Directive on its domestic market.

⁵ I studied the last available version – published on 26.05.2015.

According to the Directive 94/62/EC and its amendments Member States should create the conditions for the fulfilment of the following targets:

Table 2-1: Targets for the recovery (recycling and energy recovery) of packaging materials

Target	Deadline
1. $\geq 60\%$ by weight of packaging waste should be recovered with material or energy recovery	31-12-2008(*)
2. (55-80)% by weight of packaging waste should be recycled (material recovery) ⁶	31-12-2008(*)
3. Minimum recycling targets per packaging material by weight ⁷ : <ul style="list-style-type: none"> • Glass: 60% • Paper and board: 60% • Metals: 50% • Plastics: 22,5% • Wood: 15% 	31-12-2008(*)
Greece, Portugal and Ireland were given a postponed deadline: 31-12-2011.	

In this Directive, it is also mentioned how crucial the role of citizens is for the fulfilment of these targets. Only if the right information reaches the citizens, they will be able to participate actively in this effort.

The **Directive 94/62/EC** was transposed into the Greek context with: the Law 2939/2001 on packaging and alternative management of packaging and other products, the **Ministerial Decision (MD) 9268/469/2007** that amends the national targets for the recovery and recycling of packaging waste and the **Law 3854/2010** that amends the national legislation on the alternative management of packaging and other products and the national organization of alternative management of packaging and other products.

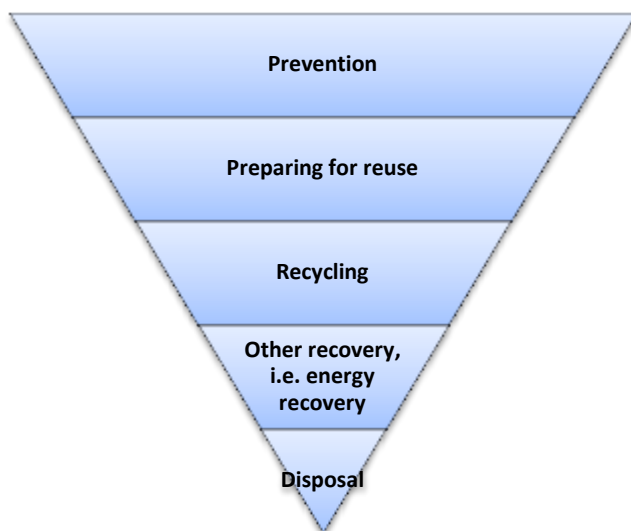


Figure 2-1: Waste hierarchy

In 2008 the European Parliament and Council repealed certain Directives and published the **Directive 2008/98/EC** on waste. Among others this Directive presents the concepts of waste hierarchy and Extended Producer Responsibility (EPR) across the EU countries.

Waste hierarchy sets the priorities that each Member State ought to take into account when they plan and enforce their waste management system. The preferred option should be the prevention of the generation of waste and the least preferred option should be the disposal of it. It is worth mentioning here that this Directive states explicitly the need

⁶ Minimum 65% by 31/12/2025 and 75% by 21/12/2030 (COM (2015) 596 final).

⁷ Plastic: 55%, wood: 60%, ferrous metal: 75%, aluminum: 75%, glass: 75%, paper & cardboard: 75% by 31/12/2025 (COM (2015) 596 final).

for the establishment of separate collection streams for paper, metal, plastic, glass and bio-waste if it is technically, environmentally and economically possible. Also, this Directive defines the concept of EPR, according to which each Member State ought to ensure that all the producers (see Appendix I) are responsible practically and financially for the management of the waste generated from the production and subsequent use of their products.

In 2015 the EC published a proposal for amendments on this Directive (COM (2015) 595 final) suggesting, among others, the promotion of actions in order for the re-use and recycling of MSW to increase – a minimum of 60% by weight of MSW should be re-used or recycled by 2025 – and several changes related to EPR, for instance the formulation of a stricter framework for the determination of producers' financial and managerial obligations.

The **Directive 2008/98/EC** was transposed into the Greek context with the **Law 4042/2012** on Waste Management.

In 2008 EU publishes the first Directive on marine environmental policy (**Council Directive 2008/56/EC**) recognizing the need for the creation of a common framework for the protection of the marine environment. Among the objectives of the Marine Strategy Framework Directive one can highlight the commitment that countries should “prevent and reduce inputs in the marine environment”, whereas within the scope of this Directive the good environmental status has been predefined through some qualitative descriptors (Annex I of the Directive 2008/56/EC) in order to help Member States track down their progress. It is also mentioned that in the case that some Member States share the same region or sub-region they ought to collaborate in order to achieve the best possible protection. Furthermore, beyond EU, the United Nations have also recognised that humanity has to take measures for the protection of marine environment choosing to include among their 17 Sustainable Development Goals 2030 one goal (Goal 14 “life below water”) especially for this issue (Nino, 2016).

The **Directive 2008/56/EC** has transposed into the Greek context with the **Law 3989/2011** on the National Marine Strategy.

Apart from the aforementioned Directives that set the general framework within which the national policy regarding the plastic bag issue should be formulated, two Commission Proposal Papers, the Green Paper (Commission Proposal COM(2013) 123 final) and the EU action plan for the Circular Economy (Commission Proposal COM(2015) 614 final), present also ideas and suggestions for a more sustainable plastic industry by 2020. In particular, both Papers point out that:

- Member States should intensify their efforts in order to stop the disposal of waste into landfills. It is considered that one way for that is to increase the reuse and recycling rates, especially in the case of packaging materials since it constitutes 63% of the total plastic waste generated (Commission Proposal COM(2013) 123 final). Within the same scope the creation of separate streams for collection, sorting and material recovery may be helpful, whereas the political and enterprising support of a secondary raw materials market can make more stakeholders get involved.
- The use of economic instruments and an extensive awareness campaign can change consumers' behaviour.
- There is a need for the establishment of labels that will show the life cycle performance of a product, the type of plastic and the contained additives.

- There is a confusion regarding the definitions of biodegradable and bio-based plastics that should be solved before this market grows more.

In the Annex of the Action Plan there is a list of measures that show how the EC designs to move towards a circular economy. Among these measures one can highlight:

- “Strategy on plastics in the circular economy” from 2017.
- “Development of quality standards for secondary raw materials (in particular for plastics)” from 2016 onwards.
- “Specific action to reduce marine litter implementing the 2030 Sustainable Development Goals” from 2015 onwards.

Earlier this year (2016) two studies conducted by private organizations, “The new plastics economy: Rethinking the future of plastics” by Ellen Macarthur Foundation and “Scaling sustainable plastics: Solutions to drive plastics towards a circular economy” by Trucost for the Ocean Recovery Alliance, agree with the aforementioned points and underline the need of the establishment of a new plastic generation: the sustainable plastics that will be designed on the circular economy principles. In other words, sustainable plastics have:

- to support an effective after-first-use economy (reuse – recycle – biodegrade),
- to stay away from natural environment and
- to be fossil-fuel independent.

2.1.2 Directive (EU) 2015/720

The Directive (EU) 2015/720 of the European Parliament and of the Council of 29 April 2015 amending Directive 94/62/EC as regards reducing the consumption of lightweight plastic carrier bags was the result of a long consultation that started in 2013. European Commission and Council adopted this Directive in order to fill the gaps of the Packaging Directive 94/62/EC that had no particular measures on the consumption of plastic carrier bags. Next, some important points of the Directive (EU) 2015/720 are underlined:

- The high consumption and low recycling rates of plastic carrier bags make them one of the main cause of marine littering and inefficient use of resources in Europe.
- The Directive proposes measures against the lightweight plastic carrier bags (below 50 microns), since they represent the majority of plastic bags that circulate in the market. Whereas the very lightweight plastic carrier bags (below 15 microns) may be exempted for hygiene reasons.
- The European Commission (EC) could not introduce EU level measures since they address to both Member States that have already applied related policies and have succeeded the desired reduction and to other countries that have done nothing.
- The need of an EU level methodology for the calculation of the annual plastic bag consumption has been identified. This methodology will help Member States to measure in a common way whether or not they fulfil their targets.
- The Directive recognizes the need of an extensive awareness campaign that will focus on the recognition of the environmental problems connected with plastic bags and attempt to correct the misconception that plastic is “a harmless and cheap commodity”.
- Member states may apply economic instruments, i.e. pricing, taxes and levies, and marketing restrictions such as bans. In the case of bans Member States should be very careful since they have to respect the Article 18 “Freedom to place on the market” of the Directive 94/62/EC.

- The Directive recognizes the European Standard EN 13432 on compostability in industrial composting installations and the need of the establishment of a new standard on the home-compostable packaging. Therefore, the need of the introduction of related labels on the bags is considered crucial.
- The Directive does not ban the oxo-degradable bags, but it raises concerns for their environmental impacts and gives the responsibility to the EC to study the issue, publish the results and make the respective corrections in this Directive if needed.
- The Directive points out that the reduction of the consumption of plastic carrier bags should not lead to the increase of the consumption of alternative packaging.

As I said above, Member States are separated into two broad categories, the countries that took measures prior to the introduction of the Directive and the countries that did not. The EC recognizing this fact and the fact that each Member State has some special characteristics – climate, consumers' patterns etc. – and gives them the freedom to decide separately how they will reduce the consumption of lightweight plastic carrier bags. However, the EC sets the general framework (see following excerpt), since they consider there is a risk that some countries would underestimate the problem and take no measure if they do not have the obligation to follow some common rules (Commission SWD(2013) 443 final).

According to Article 4 of the amended Directive 94/62/EC:

“The measures taken by Member States shall include either or both of the following:

(a) the adoption of measures ensuring that the annual consumption level does not exceed 90 lightweight plastic carrier bags per person by 31 December 2019 and 40 lightweight plastic carrier bags per person by 31 December 2025, or equivalent targets set in weight. Very lightweight plastic carrier bags may be excluded from national consumption objectives;

(b) the adoption of instruments ensuring that, by 31 December 2018, lightweight plastic carrier bags are not provided free of charge at the point of sale of goods or products, unless equally effective instruments are implemented. Very lightweight plastic carrier bags may be excluded from those measures.”

Finally, one can highlight some important dates from the Directive:

- By 27/05/2016 the Commission should announce the methodology for the calculation of the annual consumption (delayed, until now there is no announcement).
- By 27/11/2016 all the Member States shall bring into force the measures that they will have decided to take within the scope of this Directive.
- From 27/05/2018 Member States shall report their annual consumption rates of lightweight plastic carrier bags per person.
- By 27/11/2021 the EC shall publish the results of an assessment report of the taken measures at EU level. In the case that the results are far away from the initial targets, the EC shall examine alternative ways to reach the desired reduction in the consumption of plastic carrier bags under consideration.

2.1.3 Useful Concepts

In this sub-chapter two state-of-the-art concepts at global level and how they could affect the decision making process in Greece are analysed.

2.1.3.1 Integrated Solid Waste Management (ISWM)

“ISWM is based on the concept that all aspects of a waste management system (technical and non-technical) should be analysed together, since they are in fact interrelated and developments in one area frequently affect practices or activities in another area” (UNEP, 2009, pg. 25). ISWM follows the concept that waste hierarchy has set, but at the same time it recognizes that local needs and conditions may determine that in a particular case the choice of a lower ranked option in the waste hierarchy it is more suitable than a higher ranked option. For that reason, a number of (social, financial, institutional, technical and environmental) factors have to be examined before the completion of a waste management plan. Of course, these factors are different from place to place and as a result the plan of a waste management system is better to be held at local level (EPA, 2002).



Figure 2-2: Integrated Solid Waste Management (ISWM)

In Greece the government has the responsibility to design the national solid waste management plan (NSWMP)⁸ and local provinces are responsible to adapt the national plan to their own needs and priorities. Studying the NSWMP one can highlight that Greece is forced to adopt the EU targets and trends into the Greek reality and so sometimes it sets very ambitious targets (see Table 2-2). In that case ISWM can help local provinces decide which the most feasible way is to apply the NSWMP respecting their own special characteristics.

An indicative example is insular municipalities. Greece is a popular destination for a considerable number of tourists each year. More than 15 million tourists visit Greece each year since 2010 and last year (2015) this number reached 22 million, whereas the next years it is anticipated to be expanded even more (Chatzidakis, 2015). This population increase affects the volume of the MSW generated and also the composition of the collected waste, since aluminium cans, glass bottles, paper and plastic packaging are found more often among the MSW during the summer months (Gidarakos, Havas, & Ntzamilis, 2006). For this reason, insular municipalities have to take into consideration these fluctuations when they plan their waste management system. Another interesting conclusion here is that when a researcher examines the pre-consumer aspect of waste management (prevention), he has to do it having in mind the post-consumer aspect (recycling, composting, disposal), as well, since these two aspects are not independent but interrelated.

2.1.3.2 Sustainable Consumption and Production (SCP)

“Sustainable consumption and production (SCP) is about the use of services and related products, which respond to basic needs and bring a better quality of life while minimizing the use of natural resources and toxic materials as well as the emissions of waste and pollutants over the life cycle of the service or product so as not to jeopardize the needs of further generations” as it was stated by the Oslo Symposium in 1994 (UNEP, n.d.). SCP is a part and parcel of sustainable development that attempts to succeed social and economic development without environmental degradation. Last two decades civil society and entrepreneurs have

⁸ NSWMP constitutes part of the national waste management plan (NWMP).

promoted the concept of SCP organizing awareness campaigns, sharing information and tools, pushing governments for the establishment of related policies and so they have managed to make the term known worldwide. It is not a coincidence that UNEP has chosen SCP as one of the 17 Sustainable Development Goals for 2030 Agenda (Goal 12 “Responsible production and consumption”) (Nino, 2016),

whereas EU has created a considerable number of Directives based on this concept (i.e. Eco-Design, Energy Labelling, Green Procurement)(European Commission, 2016).

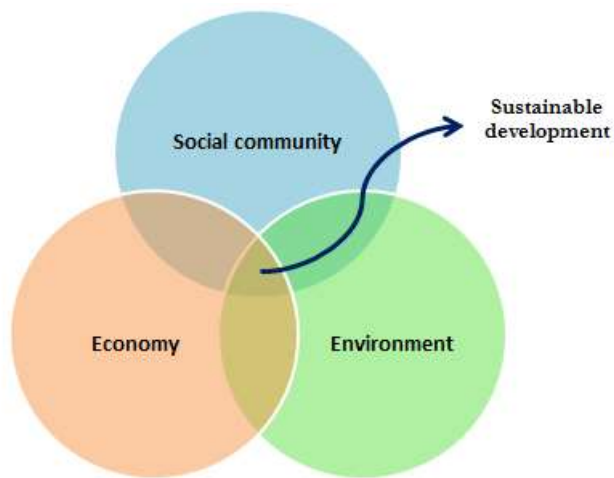


Figure 2-3: The 3 pillars of sustainable development

However, this idea struggles to be applied on a broader scale, since sometimes SCP’s objectives argue with each other in the short term. One of the most common dilemmas that individuals, businesses and governments face is how to think about the future generations and what is best for

them when nowadays they are at the edge and they have to survive (World Bank Group, 2001). The case of Greece is an indicative example. The financial recession is a dissuasive factor for businesses to invest in cleaner technologies and innovative business models for sustainable development. People are tired from their everyday life problems and have downgraded the significance of environmental problems. The government is obliged to transfer the EU policies into the Greek reality but it does not usually go a step beyond that.

2.2 Waste Management in Greece

2.2.1 Current Status

The solid waste management in Greece is organized at two levels: a) at national level and b) at regional level. At national level the Ministry of Environment and Energy is responsible for national planning and organizing all the technical and financial issues related to waste management. It sets the general priorities through the National Solid Waste Management Plan (NSWMP) that is revised at least every six year (Directive 2008/98/EC) and it is the organization umbrella that controls all the other smaller entities that are involved into it. At regional level prefectures are responsible for adopting the NSWMP into their own special conditions and implementing it, whereas municipalities are responsible for the collection and transportation of MSW.

The Hellenic Recycling Agency (HRA)⁹ is responsible for designing, implementing and monitoring the implementation of policies related to recycling at national level. It is a competent authority of the Ministry of Environment and Energy and financially and managerially independent (non-profit private organization). The HRA is responsible for approving and monitoring national alternative management systems based on the EPR principle. According to 2014 data in Greece there are 22 alternative management systems for eight waste streams (packaging, end of lifecycle vehicles, portable batteries, accumulators,

⁹ Ελληνικός Οργανισμός Ανακύκλωσης (Ε.Ο.ΑΝ) (in Greek).

WEEE, used tires, waste oils, waste from excavation, construction demolition and excavation waste) (eoan.gr, 2016).

The management of packaging waste is held by three producer responsibility organizations (PROs) at national level, two collective systems (Hellenic Recovery Recycling Corporation (HE.R.R.Co.)¹⁰ and Rewarding Recycling¹¹) and one individual system (AB Vasilopoulos). Within the scope of the Law 2939/2001 every producer has to be part of a PRO and every collective or individual system has to be approved by the HRA, whereas the producer(s) have to be able to provide financial and technical guarantee for his/their system. In the case of a collective system the amount of the subscription for each member has to be determined according to predefined criteria, i.e. the volume and the weight of the packaging placed on the market, the volume of the generated waste etc.

At this point it is useful to give some more details on HE.R.R.Co. since it is the largest PRO in Greece. HE.R.R.Co. was founded in 2001 by Greek producers. The Central Union of Municipalities in Greece participates in the system having a shareholding of 35% in its capital and the rest 65% of shares are held by 19 companies. HE.R.R.Co. has in total 1 875 members (HE.R.R.Co., 2016) and each one of them can potentially become a shareholder, as well. HE.R.R.Co. has adopted the national recycling targets per packaging material by weight (see Table 2-1) and in 2015 they managed to offer their services to 92% of the population (HE.R.R.Co., 2016). Right now, there are two separate collection streams, one for plastics, paper, metals and wood and one for glass. HE.R.R.Co. fulfils the targets for all the materials (blue bins); the only exemption is glass and for that reason a separate collection stream (blue bells) has been created.

Some interesting points about HE.R.R.Co.

- HE.R.R.Co.'s recycling rates during the last years have been declining because of the financial recession in Greece. In particular, financial recession has led, among others, to the drop of the consumption, the growth of the informal sector¹² (especially in the case of cartons), the reduction of the itineraries that the collection trucks carry out (the highest reduction (=30%) monitored in Attica) (Lasaridi, Zorpas, Abeliotis, Chroni, & Ioannou, 2012; HE.R.R.Co., 2015). However, these percentages have started to increase steadily since 2014.
- 40% of producers obliged to participate in the system do not fulfil their obligations (i.e. they do not participate in the system and so they do not pay a fee) (HE.R.R.Co., 2015; Dimou, E.& Arvaniti, T., personal communication).
- Municipalities collect packaging waste from blue bins and transport it to a material recycling facility (MRF)¹³. Nationally, 32 MRFs operate under HE.R.R.Co.'s responsibility (HE.R.R.Co., 2016).
- It has been noted that still there are people that throw mixed municipal waste into recycling (blue) bins. On average only 60% of blue bins' content is recyclable materials (MCD 49/15.12.2015).

¹⁰ Ελληνική Εταιρεία Αξιοποίησης Ανακύκλωσης (Ε.Ε.Α.Α) (in Greek).

¹¹ Ανταποδοτική Ανακύκλωση (in Greek).

¹² In Greece scavengers (= ρακοσυλλέκτες) constitute the informal sector.

¹³ Κέντρα Διαλογής Ανακυκλώσιμων Υλικών (ΚΔΑΥ) (in Greek).

As it was mentioned above, there are two more PROs at national level, the Rewarding Recycling (collective) and the AB Vasilopoulos system (individual). Both of them though are built upon the same logic: they offer monetary incentives in order to make consumers participate. These systems promote the sorting at the source, since they provide machines for plastic bottles, aluminium cans and glass bottles in certain meeting points in the cities (e.g. outside stores, at squares, at metro stations etc.) and consumers have to deliver their empty packaging containers in the funnels of the take-back machine. Plus, they provide also the choice for consumers to recycle other waste but without take back incentives. These systems are feasible despite the high cost of buying these machines and they are expanding in more areas in Greece (AB Vasilopoulos, 2004, 2014; Rewarding Recycling, n.d.).

Despite the fact that Greece seems to reach the EU targets for packaging waste recycling¹⁴, in total recycling rates are still very low. Indicatively, according to 2013 data recycling and composting reaches only 19% of MSW generation, whereas landfilling is the main option of

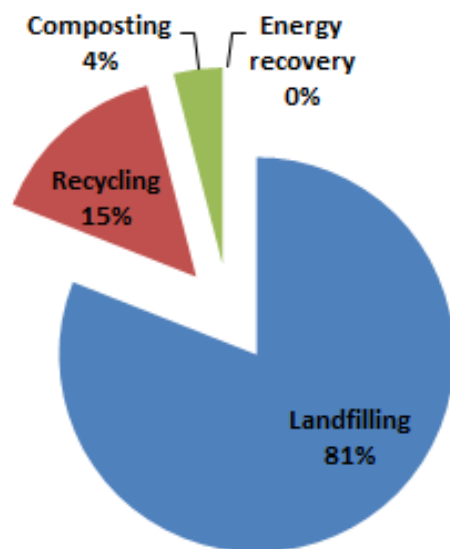


Figure 2-4: Pie chart of MSW treatment rates in Greece (Eurostat, 2013)

MSW management in Greece, since 81% of MSW ended up there (WWF Greece, 2015). The number of legally operating landfills reaches 75 (European Commission, 2012), whereas at the same time Greece continues to pay fines to the EU due to illegal dumping sites that still operating in some areas (39 active dumping sites and 206 inactive ones (Ministry of Environment, 2014a)).

As far as the organic recycling is concerned, according to Eurostat data (2013) Greece compost less than 4% of the organic material generated per person (WWF Greece, 2015). It is worth mentioning though that this number may be higher in reality, since in rural areas people do not throw away their organic waste but they use it in order to feed their animals or to make their own compost for the fields (Ouzounoglou, 2014). Furthermore, in Greece four mechanical biological treatment (MBT) plants¹⁵ operate and produce compost and/or refused-derived fuel (RDF)¹⁶. RDF is stored, used in landfills or sold to industries¹⁷ to be used for co-incineration with other solid fuel. Finally, in Greece there is no incineration plant for MSW (Bakas & Milios, 2013; Euroconsultants & EPTA, 2010).

2.2.2 Targets by 2020

The National Waste Management Plan (NWMP) is issued every six years (Directive 2008/98/EC) and takes into account the current situation in Greece and the EU targets for

¹⁴ Recycling rate for packaging waste = 52.4% (Eurostat, 2013)

¹⁵ Four operational MBT plants and one out of operation. Joined capacity = 600 000t MSW/year. Locations: Ano Liosia (Athens), Chania (Creta), Heraklion (Creta), Kefallonia (Ionian Island), Kalamata (Peloponnese – out of operation) (Euroconsultants & EPTA, 2010). According to (Bakas & Milios, 2013) six MBT plants were supposed to have started operations by 2014 but I could not find more updated data.

¹⁶ Fuel from organic components of MSW, mainly biodegradable and plastics waste.

¹⁷ Cement kilns or other industries that need a considerable amount of energy.

the next years in order to plan how Greece should proceed to fulfil these targets. The last version of the NWMP was published in 2015 and set the main targets by 2020 (MCD 49/15.12.2015). The National Solid Waste Management Plan (NSWMP) is part of the general plan and it set, among others, the following targets by 2020:

- The accomplishment of a significant waste reduction generated per person following the principles of the waste hierarchy.
- Home composting has to be promoted as recycling and not as prevention.
- The energy recovery has to be promoted as a supplementary source of energy.
- Preparation for reuse and recycling has to be conducted in separate collection streams for recyclable materials and bio-waste covering at least the 50% of the total of MSW.
- 40% by weight of compostable waste has to be composted.
- 75% by weight of recyclable waste has to be reused or recycled (paper= 69%, plastic= 78%, metal= 92%, glass= 81%)¹⁸.
- Especially, for packaging waste the NSWMP sets new higher targets per material (paper= 92%, plastic= 70%, metal= 70%, glass= 70%, wood=80%)¹⁹.
- The disposal of waste into landfills has to be the last and least preferable option; less than 30% of the MSW has to end up in open landfills.

Table 2-2: Waste hierarchy stages – current status vs 2020 targets (special focus on waste packaging)

Stage	Targets by 2020	Current status
Prevention	They should be promoted as first choices.	Not the first choices, but financial recession has made Greeks redefined them in their minds.
Reuse		
Recycle	Composting: 40% by weight of compostable waste has to be composted – a separate collection stream has to be created.	Less than 4% (2013) 4 MBT (2013)
	Recycling in general NSWMP target for the designing phase: 75% by weight of recyclable waste has to be reused or recycled EU target: 65% by weight of recyclable waste has to be reused or recycled (from COM (595) final)	About 15% (2013)
	Recycling of packaging materials – it has been proposed the creation of separate collection streams if feasible. Targets per packaging material by weight: NSWMP targets for the designing phase: paper= 92%, plastic= 70%, metal= 70%, glass= 70%, wood=80% EU revised targets ²⁰ : paper= 75%, plastic= 55%, metal= 75%, glass= 75%, wood=60% by 2025	According to HE.R.R.Co. Greece fulfils the targets (=minimum targets, Table 2-1) for all the materials (blue bins); the only exemption is glass (blue bells) and for that reason a separate collection stream has been created. Recycling rate for packaging waste = 52.4% (2013)
Energy	≥ 60% by weight of packaging waste should	RDF is generated from the MBT located in Ano

¹⁸ Targets for the designing phase (Στόχοι Σχεδιασμού 2020 – in Greek)

¹⁹ Targets for the designing phase (Στόχοι Σχεδιασμού 2020 – in Greek)

²⁰ These targets come from COM (2015) 596 final and indicate that EU pushes more and more Member States for better performance on waste packaging re-use and recycling.

Stage	Targets by 2020	Current status
recovery	be recovered with material or energy recovery (Table 2-1) – this is an old target. NSWMP promotes energy recovery, but it does not set a certain target.	Liosia. No incineration plant for MSW.
Disposal	Less than 30% of the MSW has to end up in open landfills	Right now more than 80% of MSW ends up in open landfills (75 landfills (2012)).
	Zero dumping sites	39 active dumping sites and 206 inactive ones (2014)

2.3 Plastic Bags in Greece

2.3.1 Current Status

In 2010 98.6 billion plastic carrier bags were placed on the EU market and according to estimations about 90% of them were single-use bags. On average every EU citizen consumes 198 plastic carrier bags per year; 175 of which belong to the single-use type (Bio Intelligence Service, 2011a). It is undeniable that these numbers are very high, but they do not prove that all the EU members perform in a similar way, since the respective individual numbers differ from country to country. On the one hand there are countries that have successfully implemented related policies in the last years (e.g. levy at the point of sale paid by consumers in Ireland, tax on producers in Denmark, voluntary initiatives in Austria and Germany) and as a result their citizens consume less than 70 plastic bags per year. On the other hand there are countries that have introduced no related policy and it is calculated that they consume more than 400 plastic carrier bags per citizen per year (Kasidoni, Moustakas, & Malamis, 2015).

Greece belongs to the second group of countries, since except from some voluntary initiatives it has not implemented a policy at national level. It has been calculated that in Greece 4 billion plastic carrier bags are consumed per year (Enviroplan A.E., 2013); a number that got verified in June 2016 by a study conducted by the IELKA. According to this study every Greek²¹ consumes on average 363 plastic carrier bags per year (liberal.gr, 2016b), a number much higher than the 242 plastic carrier bags that EU used for the impact assessment in the case of Greece (European Commission, 2013). It is also observable that only in Attica (Athens and surrounding areas) at a daily basis 8 million plastic bags are distributed by the supermarkets (kathimerini.gr, 2008)²² and 2.5 million plastic bags in street markets (Kakaratzas K., personal communication).

The vast majority of these bags is considered to be single-use bags since most of the retailers offer lightweight bags (less than 20µm). In Greece plastic bags are offered for free from all the retailers, including supermarkets, minimarkets, kiosks, bakeries, street markets etc. The only exception is Lidl Hellas that since the beginning of its operations followed the mother company's standard and charged a certain fee for carrier bags. The cost of the purchase of all these bags is either paid directly by the retailer or allocated to products' prices and paid indirectly by the consumers. In both cases retailers try to reduce this cost and so they prefer buying as light bags as possible. Here, it is worth mentioning that the use of oxo-degradable plastic bags got spread in the last years and nowadays it is believed that most of the large retailers use only oxo-degradable plastic bags. Smaller retailers had also adopted these bags,

²¹ Greek population = 10 823 730 (worldbank.org, 2016), 11 309 855 (Hellenic Statistical Authority, 2011).

²² Currently, it may be lower since Greeks shop less because of the financial crisis (see Chapter 2.4.1.3).

but in the last years because of the financial recession they try to reduce their expenses, so most of them went back to the conventional plastic bags that are slightly cheaper.

Plastic carrier bags are included into transport packaging category and so they come under the Packaging Directive. As a result, polluter pays principle and EPR should be applied in the case of plastic bags, as well. In Greece the role of the producer is played by retailers that offer plastic bags to consumers and they have usually put their brand name on the bags. According to the Law 4042/2012 all the producers that place bags on the market should participate in collective or individual PROs. According to HE.R.R.Co's approximations (Dimou, E.& Arvaniti, T., personal communication) about 100 enterprises from the total number of 1 875 that participate in the system pay subscription for plastic bags and most of them are large companies. In general, 40% of the companies obliged to participate in HE.R.R.Co. do not fulfil their obligations and in the case of plastic bags this percentage may be much higher. This is believed since there is a significant number of small and medium sized enterprises (SMEs) that operate at local level and either do not know that they have this obligation or they do not participate since the risks to be caught are very low. It is indicative that according to Kioses and Doukidis (2011) there are 57 000 retailing points in Greece and only 4 400 of them are supermarkets, so it is very difficult for the enforcement mechanisms to control all these points.

Now, there are no officially published data on the recycling rate of plastic carrier bags, so below I made a rough estimation using data that I collected from my research.

Year of reference: 2013, assumptions are made.

- About 4 billion plastic carrier bags are placed on the national market (Enviroplan A.E., 2013). I assume that the average weight of a carrier bag (included very lightweight, lightweight, thicker plastic carrier bags) is 10g. So the total weight placed on the market is about 40 000t.
- 72 800t of plastic bags of every type were placed on the market (55 000t of them are produced in Greece + 17 800t are imported) (ICAP, 2015)
 - So plastic carrier bags constitute about the 60% of the total amount placed on the market.
- 15 800t of plastic (the type from which plastic carrier bags are made²³) are collected and recycled (Dimou, E.& Arvaniti, T., personal communication)
 - Combining the above data the amount of plastic bags that are recycled is 9 480t.
- $\text{Recycling rate}(\%) = \frac{\text{recycled}}{\text{placed on the market}} \% = \frac{9\,480}{40\,000} \% = 23.7\% \approx 24\%$
- This recycling rate refers to plastic carrier bags in general, but since lightweight plastic carrier bags constitute the vast majority of them, I assume that this is their recycling rate, as well.

As far as the other two PROs are concerned, they provide in their stations a special reception where consumers can leave their plastic bags for recycling without though taking back a reward. In the case of AB Vasilopoulos, no considerable amount of plastic bags is collected (Machera, A., personal communication). This is likely to be the case for Rewarding Recycling

²³ They could not give a number only for plastic carrier bags, since from the same material other products are made as well. However, this number refers to blue bins' content, so household waste.

as well, since these two systems are similar. Finally, the vast majority of Greeks uses plastic bags as bin liners and does not buy special bags for throwing away their rubbish, so most of these bags end up in landfills. Finally, at least 10% of single-use (HDPE) plastic carrier bags placed on the market end up as litter (Kasidoni et al., 2015).

In Appendix II a figure that shows the pathways of plastic bags in Greece is cited.

2.3.2 Environmental and Other Problems

Despite the fact that marine litter distribution differs slightly from place to place because of the different kind of land- and marine-based activities taking place, plastics are almost always the most often monitored marine debris in oceans (Pham et al., 2014). It has been proven by a series of scientific studies that plastics cause significant environmental problems in marine environment (ARCADIS, 2013; Bio Intelligence Service, 2011b; Derraik, 2002; McKinsey Center for Business and Environment, 2015; Pham et al., 2014; Thompson, Moore, vom Saal, & Swan, 2009). For example, seabirds, fish and mammals can mistake them for food and swallow them or suffocate in the case they are covered by these plastic bags. Big pieces of plastics can also break down to micro-plastics with still unknown impacts for environment and human health. Apart from the environmental impacts, plastic debris contribute to financial problems, since they cause aesthetic pollution resulting in high clean-up costs and they also cause problems to marine activities, such as fishing and tourism.

A really interesting point about plastics is that 80% of them ends up in oceans via rivers and storm waters because of waste generated by land-based activities, such as beach tourism, recreational activities, dumping sites, landfills and agriculture (ARCADIS, 2013; McKinsey Center for Business and Environment, 2015).

As far as Greece is concerned, it is a country that faces all the aforementioned problems since it is surrounded by sea. The coastline of Greece reaches 13 676 km, the 2nd longest coastline in Europe and the longest among the Mediterranean countries. Greece has 1 200 to 6 000 islands depending on how small islets are taken into account, whereas its inhabited islands are 227 (mapsofworld.com, 2016). As a result, it is very difficult for the exact situation in the Greek marine environment to be recorded. In the last years more and more studies are conducted and a clearer picture of the real situation has started to be formulated (Appendix III). From these studies one important conclusion is that the majority of littering in Greek seas comes from land-based activities, as well. Indicatively, the Saronicos Gulf may be the most polluted marine area in Greece ($1\,211 \pm 594$ items/km², (Ioakeimidis et al., 2014)). This high litter density can be explained by the fact that the area around the Gulf hosts half the Greek population and many industries. Undeniably, plastics are the most often observed marine litter in Greek seas followed by metals, glass and rubbers. Whereas, papers are found more and more often, because cigarette butts are sometimes monitored in this material category (Ioakeimidis et al., 2014; Katsanevakis & Katsarou, 2004; Kordella et al., 2013; Koutsodendris et al., 2008).

Interesting points about plastic littering in the Greek marine environment

- The majority of the aforementioned studies prove that among plastic litter, bags, bottles and sheets are dominating.
- The vast majority of plastic bags comes from land-based activities, especially recreational

and domestic activities (Kordella et al., 2013; Koutsodendris et al., 2008).

- In September 2015 Eleonora's falcons²⁴ were for first time recorded to feed their nestlings plastic waste on a Greek islet (Steen, Torjussen, Jones, Tsimpidis, & Miliou, 2016).
- Big concentration of micro-plastics is observed in Greek seas, even in remote places, according to the Institute of Marine Conservation, Archipelagos. Researchers from Archipelagos studied samples from 167 different shores of Aegean Sea and they found micro-plastics in all of them. In addition to that, they studied samples from the three most common fish in Greek seas, anchovy, mackerel and tuna, and noticed 85%, 91% and 100% of plastic micro-fabrics in their stomachs, respectively (kathimerini.gr, 2016a).
- Despite all these indications South Mediterranean Sea is still cleaner than the northwest part of Mediterranean (Katsanevakis, Verriopoulos, Nicolaidou, & Thessalou-Legaki, 2007; Koutsodendris et al., 2008). However, sea has no borders and waste is travelling in the water, so marine pollution should be faced as a shared challenge among neighbour countries as the Marine Directive proposes. Indicatively, even if the majority of marine debris in the Greek seas come from activities based on Greece, waste from neighbour countries such as Italy and Turkey have also been observed (kathimerini.gr, 2016; Stefatos, Charalambakis, Papatheodorou, & Ferentinos, 1999).

2.3.3 Voluntary and Other Initiatives

The Greek government has taken no measures for the reduction of the consumption of plastic carrier bags at national level as of this moment (summer 2016). However, since 2005 a series of public and private initiatives has taken place, mainly at local level.

The first time that a measure on plastic bags was discussed was in 2005. The association that represented supermarkets located in Greece proposed the pricing of plastic carrier bags having in mind mainly that this charge could reduce the expenses of the enterprises (in.gr, 2005a). So the motivation behind this proposal was financial. Back then this suggestion was welcomed by consumer associations that recognized the environmental benefits, but not by the total of enterprises. Most of the supermarkets – especially the large ones – were negative considering that their customers would receive badly the charging and it might have an impact on their sales (in.gr, 2005b). As a result, finally this proposal did not become a reality.

In 2008 the Municipality of Athens, recognizing the environmental issues due to plastic bags and the fact that many countries and metropolitan cities had already taken related measures, decided to run a pilot project. The municipality collaborated with the largest supermarkets and other businesses (i.e. bakeries, fast-food restaurants) located in Athens and agreed to withdraw steadily conventional plastic bags and replaced them with (a) oxo-degradable plastic bags that would be offered for free, (b) biodegradable bags made by starch that would be charged 0,07 euros and (c) fabric bags that consumers could buy (aftodioikisi.gr, 2008). It is worth mentioning though that back then the environmental impacts that now are associated with oxo-degradable plastic bags were not broadly known and these bags were presented as the most environmentally friendly option²⁵. The municipality had also stated that they would

²⁴ During the breeding season Greece hosts the 85% of the global population of this bird (ornithologiki.gr, n.d.). The Greek name of this bird is *μυρδοπετρίτης* and belongs to the family of Falconidae.

²⁵ The last years several studies have been published pointing out that oxo-degradable plastic bags may result in a series of environmental problems (i.e. they generate microplastics, they cannot be composted, they downgrade recycling). One of the most known related report is conducted for DEFRA in 2010 (Thomas, Clarke, McLauchlin, & Patrick, 2010). Officially, the Directive 2015/720 does not ban the oxo-degradable bags, but it raises concerns for their environmental impacts and gives the responsibility to the EC to study the issue the next years.

support financially the production of new materials suitable for the manufacture of biodegradable bags, a commitment that seems not to have thrived (kathimerini.gr, 2008). I could not locate data for the evaluation of this project, except from the fact that the large retailers have indeed replaced conventional plastic bags with oxo-degradable plastic bags since then (Domprets L. & Kamarinakis A., personal communication; Machera A., personal communication).

In December 2015 Alonnisos became the first area in Greece that decided to ban plastic bags. The project “Plastic bag-free Alonnisos” is implemented by two non-governmental organizations, MedSOS and MOM, financed by the Thalassa Foundation and supported actively by the local Municipality and aims to make the island of Alonnisos free of plastic bags. This project includes educational activities and an extended awareness raising campaign, whereas all the supermarkets and other businesses (i.e. bakeries, butcher shops etc.) located on island stopped offering plastic bags. In the case that a customer does not have a fabric bag or does not want to buy one at the point of sale, there is the choice to pay 0.10 euro in order to buy a plastic bag (Tounta E., personal communication). Until now this project is evolving in a successful way, 95% fewer plastic bags are distributed on the island (Garoufalia Ch., personal communication). Finally, in order to understand better why Alonnisos manages to run this project with great success, it is important to take into consideration that it is a really small island (2 750 citizens), where most of the citizens are environmentally conscious due to the existence of the National Marine Park of Alonnisos, which hosts Mediterranean monk seals²⁶, and enhances financially the local society attracting tourists from all over the world.

In 2015 two more islands, Sifnos and Syros, started to implement actions for the reduction of the consumption of plastic bags.

The island of Sifnos, where the Sifnos Island Cooperative organized educational activities and promoted the use of fabric bags made by locals (prasinoi.gr, 2015).

The island of Syros, where the project “LIFE DEBAG” is implemented by 5 partners (Department of Geology in the University of Patras, Terra Nova Ltd consulting company, MEDITERRANEAN SOS Network (MedSOS), Ecological Recycling Company, Research University Institute of Sustainable Development and Human Resources/ Urban Environment and Human Resources of Panteion University) tries to reduce steadily the consumption of plastic bags. Within the scope of this project educational activities and awareness raising campaigns are organized at local level and special consultation days are held at national level. On these days LIFE DEBAG – supported by the Ministry of Environment and Energy and the HRA – calls representatives of the affected by the Directive 2015/720 stakeholders in order to examine which is the best set of measures for the reduction of the consumption of plastic bags in Greece. The outcome of each consultation day is communicated to the interested stakeholders, whereas at the end of the program a total outcome will be published (lifedebag.eu, 2016 ; Garoufalia Ch. & Koukiasas E., personal communication).

In 2016 two more islands, Tinos and Santorini, started similar efforts. The projects on these islands are organized by the HRA and aim to increase the awareness of local citizens and steadily decrease the consumption of plastic bags (econews.gr, 2016). The HRA tries to make local supermarkets to participate in the project actively. The exact conditions of this participation are under negotiation, whereas the imposition of a price on plastic bags is examined, as well (Tritopoulou E., personal communication).

²⁶ Known as *monachus monachus*, one of the world's rarest species of seal.

Apart from the aforementioned efforts and the measures that the Greek government processes within the scope of the transposition of the Directive 2015/720, it is interesting to mention some examples of related actions that the NSWMP analyses. The NSWMP includes a special report dedicated to waste prevention (Ministry of Environment, 2014b), where a series of actions on plastic bags is proposed. In general this report proposes measures that could change consumers' behaviour during consumption and use phase and point out how determinant the role of the General Secretariat for Consumers and the individual consumer associations is, since consumers trust more information that have been cross-checked before from an independent third party. Especially for plastic bags, economic instruments, such as pricing, awareness campaigns, labels and the promotion of reuse are considered really helpful.

2.4 Looking at the Upcoming Changes

2.4.1 Affected Stakeholders

In the last years Greece faces social and financial problems because of a long period of financial recession. As a result, a new reality has been created, where governments take tough austerity measures (i.e. cut wages, impose taxes) and so most of the citizens face every change more and more sceptically. The upcoming measures on plastic bags are expected to receive contradictory reactions. In this chapter the key affected stakeholders are analysed in order for their main characteristics and motives to be pointed out.

2.4.2 Plastic Industry Sector

According to the socio-economic assessment conducted by Eunomia (Sherrington et al., 2012) there are about 250-300 producers of plastic carrier bags in Europe. It is worth mentioning though that this number is not so accurate given the fact that according to their collected data plastic carrier bags are produced in at least 19 EU countries and for example Greece – where it is a fact that several producers exist – is not among them. Besides, the fact that they support that the 80% of plastic producers is SMEs is another indication that many companies may have escaped from this monitoring. In other words at EU level it is not known exactly how many businesses produce plastic carrier bags. Whereas it is believed that the majority of plastic carrier bags (70%) placed on the EU market is imported from countries outside Europe (Commission SWD(2013) 443 final). Nevertheless, the situation in Greece is different. According to Mr. Kaselimis (personal communication) the total number of businesses that produce plastic bags has been calculated at 192, whereas 121 of them produce lightweight plastic carrier bags and the number of employees that work on the production of lightweight plastic carrier bags (T-shirt) has been calculated at 783, while 156 additional employees are considered to work in jobs indirectly connected with this production. Furthermore, the Greek companies cover almost the 70% of the local demand, whereas the rest 30% is imported.

The majority of the Greek businesses are SMEs that present low production and low productivity (Kaselimis, I., personal communication; ICAP, 2015). According to data for the consumption of all kinds of plastic bags (ICAP, 2015):

- The total consumption of plastic bags on the Greek market has changed a lot throughout the last years. In Table 2-3 one can notice the reduction in the consumption since 2010 that can be explained by a series of factors. For example, the fluctuation in oil prices, the reduction of the consumption of goods because of the financial recession or the fact that plastic carrier bags are lightweight products that can easily and cheaply get imported from other countries.

- In 2013 among the countries with the highest number of imports in the Greek market were Germany, Turkey, Italia, Bulgaria, Spain and China. In particular, imports reached 17 800t.
- The Greek industry exported 3 824t in 2013 to countries, such as Bulgaria, Cyprus, UK, Turkey, Switzerland and Israel.

Table 2-3: Consumption of all kinds of plastic bags from 2004 to 2014

Year	Consumption level (tonnes)
2004	80 000
2005	76 500
2006	78 000
2007	80 000
2008	82 000
2009	75 000
2010	70 000
2011	62 000
2012	58 000
2013	55 000
2014 (estimation)	57 200

2.4.3 Retailers

The retailing sector in Greece is divided into three types of stores: a) non-specialized stores, such as supermarkets and grocery stores, b) specialized stores, such as butchers, fish stores, bakeries etc. and c) street markets that are mostly held in urban areas. Sales coming from supermarkets in Greece represent 54% of the total retailing market, whereas the respective percentage in other European countries is higher than 75% (bankingnews.gr, 2016). This number proves that the role of the SMEs in Greece is crucial. Indicatively, according to 2011 IELKA's data in Greece there are 57 000 retailing points and only 4 400 of them are supermarkets' stores (Kioses & Doukidis, 2011). Although supermarkets bought many smaller enterprises in the last years and there was a prediction that they will prevail over the market (kathimerini.gr, 2015a), in 2016 SMEs seem to have taken back their lost share on the market since many big "players" face serious financial problems (bankingnews.gr, 2016). In general though it is very difficult to predict how the dynamic of the retailing market will be formed in the next years, since apart from the unpredicted relations among SMEs and large retailers, market conditions are changing all the time. For example, the value added tax (VAT) (ΦΠΑ – Greek abbreviation) is increasing more and more (liberal.gr, 2016a) and new types of consumers (see chapter 2.4.3) have appeared (markettoday.gr, 2015a). Finally, street markets seem to be one of the "victims" of the financial recession, since nowadays farmers spend more money in order to produce their products but they are obliged to sell at lower prices in order to be competitive (emprosnet.gr, 2014).

2.4.4 Consumers

Greek consumers' behaviour has changed a lot in the last years due to the financial recession. Besides according to a study by Credit Suisse, 1.2 million Greeks have fallen to lower financial layers, so they should adapt their expenses into a new reality (markettoday.gr, 2015b). As a result, now more Greeks prefer buying only the essentials and they are searching more for offers and discounted products. It is not a coincidence that more and more Greeks visit more

than one supermarket per week, while before every visit they check leaflets and websites for news and offers (kathimerini.gr, 2015b). According to another study conducted by IELKA Greek consumers can be separated into four broad categories: indifferent consumers, loyalty lovers, omnichannel consumers and newly poor consumers (markettoday.gr, 2015b). Each of these categories has some typical characteristics that I used in order to predict how they could react in the implementation of measures on plastic bags:

- Indifferent consumers: They do not enjoy going to the market and they do not care how much money they will spend. They usually go spontaneously for shopping, so they have not prepared a list beforehand and consequently it is unlikely they carry a reusable bag with them.
- Loyalty lovers: They visit a certain supermarket on a permanent basis because they trust more the quality of its products. It may be easier for them to accept a measure on plastic bags if this supermarket will provide the right information to them on time.
- Omnichannel consumers: They visit more than one supermarket per week because they chase all the economic offers. So since they do care about a discount of some cents, they are more likely to stop using plastic bags if they should pay for them.
- Newly poor consumers: They face financial problems and they usually buy only the essential products. As a result, also this category may stop using plastic bags if a charge – especially a high one – is imposed on plastic bags.

Additionally, here, it is worth mentioning that the “Not In My Back Yard” syndrome is met among Greeks, as well. It is indicative that the majority of Greeks makes complains about the bad waste management, but they do not activate themselves in order to improve the waste management conditions in their settlements and when the local authorities propose for instance to establish a waste sorting centre near their settlement, they do not accept it (Ouzounoglou, 2014 ; Kalofonos P., personal communication). Furthermore, the interviews with consumer associations (personal communication) offered two main outcomes for the behaviour of the Greek consumers in the last years: a) consumers have stopped asking questions about environmental issues since they have more important problems and b) they show reduced trust in governmental actions to solve their problems. Finally, to mention that the reduced transparency and the lack of published data, regarding the route that Green Fund’s revenues follow, have made citizens question governments’ efforts to tackle environmental issues. The Green Fund was founded in 2010 in order for environmental purpose revenues to be collected and finance environmental projects. However, in the last years it is believed that most of this money is spent in other public financial obligations. It is indicative that despite the fact that debriefing and budget reports should be published every year on the Green Fund’s official website, there is no update since 2012 (WWF Greece, 2015).

2.4.5 Governmental and other organizations

It has been mentioned above that the Ministry of Environment and Energy and the HRA are the two main authorities regarding the waste management of MSW at national level, whereas municipalities play a very crucial role at local level. Also, PROs and the way they operate affect the final performance of the alternative waste management of packaging. All these organizations will not only be responsible for the implementation of measures on the reduction in the consumption of plastic bags, but also for the provision of the right information to the consumers and the affected stakeholders. Of course, the most important role here belongs to the Ministry of Environment and Energy, since it sets the priorities of waste management in Greece taking into account parameters, such as available budget, technicalities, emerging issues etc., that are not broadly known.

2.4.6 Others

Beyond the aforementioned key stakeholders, NGOs, tourism industry, fishing industry and smaller manufacturers could, among others, be affected by the implementation of measures on plastic bags. There are many NGOs that deal with environmental issues in Greece and normally they will support actively measures on the reduction of the consumption of plastic bags recognizing the environmental benefits. It is anticipated for NGOs in the field of marine pollution to show more interest. Enterprises from tourism and fishing industry will normally be in favour, since marine environment is a tool for the maintenance of their revenues. Smaller manufacturers that could import or produce emerging alternatives to plastic bags will also support this measure, since they see a business opportunity.

2.4.7 Emerging Alternatives of Plastic Bags

If the upcoming measures for the reduction of the consumption of plastic bags are successful and the number of plastic bags declines, a question will emerge: What alternatives of carrier bags and bin liners are there in Greece?

Table 2-4: Emerging alternatives of plastic bags

Emerging alternatives	Short description
“Bags for life” – LDPE bags	These plastic bags are thicker and heavier (about 35 g). Right now, they are available in supermarkets, but consumers have to pay for them. They are reusable.
Non-woven PP bags	They are thicker and much heavier (about 110 g). Right now, they are not available in many supermarkets, but consumers can buy them at a reasonable price from stores that sell packaging or souvenirs.
Cotton bags	T-shirt or net reusable bags. Right now, they are not available in many supermarkets, but consumers can buy them at reasonable prices from stores that sell bags or souvenirs. Also, many NGOs promote (offer or sell) these bags. Net bags were very popular some decades ago in Greece and they have the potential to come back. However, they are not waterproof and you cannot hide the contained products.
Paper bags (with or without handles)	Right now only some grocery stores use these bags without handles in order to pack fruits and vegetables and after that they put these paper bags in bigger plastic bags. Some supermarkets offer also the option to their customers to buy paper bags with handles. Paper is a material that is considered very valuable in Greece and for that reason it is recycled with great success. A paper bag is not durable, so usually it is used only once and its LCA is not better in comparison with the LCA of a plastic bag, since it has a really heavy production phase.
Bio-based bags	Right now, they are available in Greece from importers, whereas their quantities on the market are considered extremely low. Mostly they are offered by smaller catering shops owned by environmental conscious people (Sotiropoulou G., personal communication), whereas one larger brand that offer them is the Autogrill catering shops (100% subsidiary of the Italian Autogrill SpA) (Papadopoulos Ch., personal communication). Currently, in Greece, the cost of a bio-based bag is about 0.09 euro (Sotiropoulou G., personal communication). They look alike conventional plastic bags (similar weight and thickness, single use), but they can decompose since they are made from plant-based starch, or starch made from renewable sources such as corn, potato, tapioca or wheat combined with polyesters manufactured from hydrocarbons. At EU level the only related standard that exists is the EN 13432: 2000 (see Appendix I), which is for composting under industrial conditions and it is also recognized by the Greek legislation (MD Z3–1531). Standards and obligatory labelling for home compostable and water compostable materials are anticipated within a few years from now. These bags have also an intense LCA due to their production and end-of-life phase (methane release). Another issue in Greece is that composting infrastructure is at an initial stage. These bags are also a good option for bin liners, especially in the case of organic waste. It is worth mentioning that bio-based materials have an increasing potential and their consumption may be tripled by 2020 (estimation for 300 000 t). Compostable bags constitute the 2/3 of this consumption now and it is anticipated to

Emerging alternatives	Short description
	keep or even increase their share by 2020 (Kaeb, Aeschelmann, Dammer, & Carus, 2016).
Shopping trolley	Right now, they are not available in many supermarkets, but consumers can buy them at a reasonable price from stores that sell household stuff. This alternative has a big capacity and is very popular among old people. They are very convenient when consumers visit street markets.
Conventional bin liners	They are usually made by HDPE as plastic bags, but they are much bigger, thicker and heavier in comparison with them. They are bought by consumers that want to use them for their rubbish and for that reason in most cases they indeed end up in a landfill and not in the environment. In Greece the majority of plastic producers manufacture bin liners by scrap or recycled plastic and not from raw materials. Some people support that they are too big and so during summer months when temperature is really high, you cannot keep them for many days indoor due to bad smell. So people throw them away earlier and raw materials are lost. Right now, in Greece consumers do not usually buy conventional bin liners and so bigger bin liners – better for a restaurant or a business that generate a considerable amount of waste each day – are available on the market. A bin liner is almost three times more expensive than a conventional plastic bag, but it is usually much bigger, as well (Papadopoulos Chr., personal communication; Sargologos N., personal communication).

Source: (Bio Intelligence Service, 2011a; Great Britain & Environment Agency, 2011; Sherrington et al., 2012; personal observations)

Most of the aforementioned alternatives can be manufactured in Greece by plastic producers or other manufacturers (i.e. clothing industry) depending on the material. However, they are also likely to be bought from countries outside Greece in order for the retailers to save money. In the case of bio-based bags, plastic producers support that they are able to produce them using in most cases the same equipment, but at this point the raw materials are three times more expensive than the raw materials for plastic bags and since there is no demand in Greece, it is not feasible for them to produce them (see Chapter 4.1.1). Finally, LCA is not a straightforward process and for that reason it is not certain which option is the best one. However, all the LCAs agree that each option becomes better as more a consumer reuses it.

2.5 Learn from Other Countries

2.5.1 Alternative Policy Measures

There are three main types of environmental policy instruments: regulations/command and control tools, economic instruments and informative instruments. The main difference between regulations and the other two options is that regulations are designed in order to achieve a pre-defined outcome, whereas economic and informative instruments are used to educate consumers, to make them think and make their own decisions (Hasson, Leiman, & Visser, 2007; Mickwitz, 2003). Especially, in the case of plastic carrier bags travelling around the world one can meet different measures for the reduction in their consumption. These measures can be applied independently or in combination. The Table 2-5 includes the most often applied measures as I monitored them²⁷ (Appendix IV). I notice that bans and economic instruments are always accompanied by informative instruments, but informative instruments are not applied independently. EPR schemes and take-back systems are usually part and parcel of efforts for the improvement of the waste management of plastic bags. However, they are not examined here, since the focus of this thesis is on the prevention step.

²⁷ I examined the measures applied in 24 countries around the world the last two decades.

Table 2-5: Alternative policy measures for the reduction in the consumption of plastic carrier bags

Regulations	Economic instruments	Informative instruments
<ul style="list-style-type: none"> • Outright ban • Limited ban on thinner than $\chi\mu\text{m}$ plastic bags • Limited ban on non-biodegradable plastic bags 	<ul style="list-style-type: none"> • Tax paid by producers • Tax paid by consumers • Charge paid by consumers 	<ul style="list-style-type: none"> • Awareness campaign • Education programs • Promotion of alternatives • Labels

Examining case studies around the world I ended up with the following conclusions:

- An outright ban on plastic bags attempts to force a sudden change in consumer's behaviour, whereas retailers are forced to replace plastic bags with alternatives (see Bangladesh, Rwanda).
- A limited ban (i.e. ban on thinner plastic bags, non-biodegradable plastic bags) aims not to remove plastic bags from the market, but to achieve some environmental benefits and at the same time to modify the production of the bag in order to create or support local/national economy (see Italy, France).
- Taxes or charges on plastic bags (product taxes or charges) paid by consumers aim to discourage the consumption of plastic bags and to encourage the use of alternatives. In other words, consumers are free to choose if they will buy durable bags, reuse the purchased plastic bags more than once or pay the levy. These are downstream taxes (see Ireland, South Africa, UK).
- There are also upstream taxes that are imposed on producers and/or retailers and aim mainly to reduce the amount of plastic (raw material) used for the manufacture of the bags. These are usually weight-based taxes (see Denmark).

The main difference between taxes and charges is where the revenues go. In the case of a tax government takes advantage of them for any purpose, whereas in the case of a charge the government or the beneficiaries (retailers) or a third (non-governmental) party will be responsible for the final collection, management and investment of this money aiming to tackle the problem for which the charge got imposed.

Through the literature review there were many references about the success story of the environmental levy in Ireland, so before the analysis of this case study (next chapter) it is useful to present here some of the special characteristics of the environmental tax (OECD, 2011):

- Its main purpose is to incorporate environmental impacts into prices.
- It should be imposed as directly as possible on the polluter (polluter pays principle).
- It should have a scope as broad as the scope of the environmental damage.
- The tax revenues should be used for environmental improvements and the correction of distortions on the tax system (double dividend).
- The tax should be communicated in a simple and clear way to the public.
- Most of the times environmental taxes should be combined with other policy instruments to address certain issue(s).

In theory an environmental tax on plastic bags could be Pigovian and set equal to the social cost of the negative externalities, but in practice this is not easy to happen, since it is very

difficult to identify the marginal costs and determine which the optimal price of the tax should be (Convery, McDonnell, & Ferreira, 2007).

2.5.2 Case Studies

2.5.2.1 Command and Control Tools

In 2002 **Bangladesh** was the first country in the world that banned the use and manufacture of plastic carrier bags. Bangladesh decided to take so effective measures after the floods of 1998, where plastic bags blocked the drains causing floods in a big part of the country for months. Another factor that contributed to this decision was that in Bangladesh the jute industry is one of the main national industries and their lobby is much stronger than the plastic bag industry's. As a result, after the floods jute industry found the opportunity to push the government for a stricter regulation on plastic bags in order for them to dominate again in the packaging industry, since in 1990s they lost a part of their market share due to the introduction of plastic bags on the national market. This ban is not considered as successful though, since nowadays plastic bags are still distributed illegally on the market (black market) (Clapp & Swanston, 2009). This failure can be explained by two main factors:

- There is a significant lack of enforcement, so offenders are not afraid of being arrested (Larsen & Venkova, 2014).
- The other alternatives on the market and especially jute bags are much more expensive and consumers cannot afford them (National (Australian) Plastic & Shopping Bags Working Group, 2002).

In 2008 **Rwanda** became the first country that banned non-biodegradable plastic bags thinner than 100µm in Africa. It seems that they have managed to implement it in an effective way, since littering has disappeared from the streets. However, at the same time a black market has been created in some areas, where poor people – mainly women – smuggle plastic bags from neighbour countries into Rwanda (Larsen & Venkova, 2014). Plastic bag ban is part of the Vision 2020 that plans to make Rwanda a sustainable middle-income nation. Within the same scope Rwanda considers also to ban other types of plastics (Guardian, 2014). Plastic bag ban in Rwanda is considered to be a success story at global level, so it is important to figure out why their case has positively differentiated itself (Aljazeera, 2014; Guardian, 2014; UNEP, 2005):

- In the beginning they organized a broad awareness campaign through media in order for all the citizens to get informed about the importance of the ban.
- They have put signs and voice messages at the airport to inform tourists that they cannot carry plastic bags into the country.
- They offered tax incentives to manufacturers to replace production with recycling of plastic bags.
- They try to discourage illegal imports having imposed strict punishments for the offenders (high fines and imprisonment); whereas police searches for smugglers at borders take place on a permanent basis.

However, black market still exists and creates problems, mainly because in the beginning the government did not take into account that the proposed alternatives (paper and cloth bags) are too expensive for the majority of consumers and street vendors. As long as people cannot afford buying these alternatives, plastic bags are not going to disappear completely from Rwanda.

In Europe in the last years there are two countries, **Italy** and **France**, which attempt to ban non-degradable lightweight plastic carrier bags promoting at the same time bio-based bags. Italy passed a law in 2011 that is still on nowadays despite the fact that in 2012 UK requested a block on the law claiming that there was a derogation of article 18 of the Packaging Directive that put obstacles to the free movement of goods within the EU (Bardelline, 2011; plasticnews.com, 2013). In July 2016 France joined Italy and banned lightweight plastic bags. France moved one step forward and announced that they are going to ban also wraps and very lightweight bags from January 2017 (france24.com, 2016). Both countries support the creation of a stronger bio-based packaging industry considering that the development of this sector will create more jobs and revenues the next years. Currently, in France 80% of the conventional plastic bags is imported from Asian countries.

However, the smooth transition into this new reality is not given despite the fact that there is a strong political commitment from the national governments, since there are some emerging risks. For example (euronews.com, 2016; thelocal.fr, 2016):

- Currently the raw material for the manufacture of 100% bio-based packaging in big quantities is not enough. So a big part of the production may combine fossil- and bio-based materials manufacturing a final product that neither can end up in the same recycling stream with the conventional plastics nor be composted.
- A sudden change may result in the loss of jobs for recyclers, importers of other alternatives and increase in product's prices since bio-based bags are more expensive.

2.5.2.2 Economic Instruments

The country with the lowest annual plastic bag consumption in Europe is **Denmark** (only 4 plastic carrier bags per person). In 1994 Denmark introduced taxes on packaging paid by producers. In the case of plastic and paper bags government wanted to reduce the amount of material used per bag, so they imposed a weight-based tax. Finally, producers passed the cost on to retailers and most of them to their customers (Larsen & Venkova, 2014; UNEP, 2005).

In March 2002 **Ireland** became the first country in the world that introduced a product tax on plastic bags paid by consumers at the point of sale. The tax was equal to 0.15 euro and had a huge success decreasing the consumption of plastic bags from 328 to 21 bags per person per year. In 2006 a slight increase to the consumption (31 bags per person) was noticed and for that reason in 2007 the tax raised to 0.22 euro. According to recent data (2014) the consumption has fallen again to 14 bags per person. The so called Irish "PlasTax" was set high enough to make consumers realize their responsibility to littering and change their behaviour. The tax has been imposed on all plastic bags – including biodegradable – in order to connect the pricing with government's anti-litter effort (Jones, 2015). All in all, the PlasTax managed to decline by 90% the use of plastic bags and so the related environmental issues fell dramatically. The Irish PlasTax is considered to be one of the most successful policies on plastic bags at global level and for that reason it is very important to monitor the factors that have contributed most to that. In particular (Convery et al., 2007; Dikgang, Leiman, & Visser, 2012a; Nhamo, 2008):

- The government gained consumers' trust and made them allies in their efforts for the reduction in the consumption of plastic bags through a series of actions. For instance:
 - A comprehensive advertising campaign was held before the imposition of the levy and as a result the levy was just a reminder for the already conscious public. The campaign informed consumers, among others, how the revenues

- will be collected, managed and invested and this transparency made citizens trust government more.
- A special Fund for the management of the collected revenues was founded and all the related information was communicated.
- Plus, the government notified consumers since the beginning that levies would be used for the same or other environmental programs (double-dividend).
- The Irish government had a long consultation with retailers in order to end up with some necessary exemptions (e.g. fresh fish, fresh meat). However, they clarified that when these bags are used for other reasons, they will be charged.
- Costs of administration have been kept low (about 3% of the total revenues) because reporting and collection of the revenues was integrated into the existing VAT system.
- The implementation of the tax was supported by the total of the affected stakeholders, including manufacturers. The government had some special consultations with them in order to limit anticipated impacts on their production. It is worth mentioning though that this sector in Ireland is very small.
- Finally, according to the regulations a strict punishment (i.e. fines, imprisonments) for non-compliance incidents is imposed. Local authorities are responsible to check if all the retailers charge the tax.

One year after the implementation of the Irish PlasTax (2003) **South Africa** decided to apply a combination of regulations and market-based instruments on plastic bags, because plastic bag littering had ended up to be a big hazard for animals and had resulted in high clean-up costs and the loss of a considerable amount of money due to the degradation of touristic resorts. As a result, South Africa decided, among others, to ban plastic bags thinner than 30µm and impose a levy on thicker plastic bags paid by consumers at the point of sale. The tax revenues would be collected by a non-profit organization and be invested in related research projects and awareness campaigns (double-dividend). However, South Africa did not finally manage to reduce the consumption, since despite the initial decrease after a while consumers got used to paying for a bag and the consumption increased again. Below I have collected some possible explanations to this failure (Dikgang et al., 2012a; Dikgang, Leiman, & Visser, 2012b; Nhamo, 2008):

- No awareness campaign was organized prior to the introduction of the new measures, so consumers have not got the right information on time.
- The government did not manage to gain manufacturers' trust. On the contrary, manufacturers were negative since the beginning and press the government all the time for lighter measures. As a result, only three months after the introduction of the levy, the government decided to let retailers internalize different amounts of charges and supermarkets started to sell bags at different prices. So the prices per bags fell more and in most cases they got absorbed into the shopping bill.
- The government delayed one year to establish the non-profit organization that would be responsible for the management of the revenues, so there were many unanswered questions on how the money was treated during the first year and if it was used for other purposes, so there were significant transparency issues.

The case of **England** is slightly different from the aforementioned case studies, since they have chosen to implement a 5p charge at the point of sale that it is explicitly clarified that it is not a tax. There is no central Fund that collects and manages the revenues, but each retailer is responsible to donate this money to whichever good cause he wants. However, retailers have the obligation to report where the money goes and this information is published each year. The measures are applied only by enterprises that employ more than 250 people – this

number is not referred to the size of each individual branch but to the mother company. Finally, paper bags and plastic bags used for hygiene reasons are exempted, whereas biodegradable plastic bags are within the scope of the charge. According to data that the DEFRA published at the end of July 2016 the plastic bag consumption has declined by 85% within the first six months of the policy implementation; a positive sign for the next months (theguardian, 2016). The previous years similar charges have been imposed across Wales, Northern Ireland and Scotland, as well, and especially in the case of Wales the reduction of the consumption was very high, 79% in the first three years (DEFRA, 2015). Nevertheless, it is not possible to conclude to some success factors here since the introduction of this charge is comparatively new and there are no certain results yet.

2.5.2.3 Voluntary Approaches

In 2002 **Australia** decided to take voluntary measures for the reduction of the consumption of plastic carrier bags. Their initial target was to increase recycling and reduce the consumption by 50% by 2005. Finally, they managed to almost reach the reduction target (41%), but the recycling percentage remained low (3%) (Clean Up Australia, 2007). One possible explanation of the low percentage was that smaller retailers did not join that effort. Within that scope Australia had introduced the National Code of Practice for the Management of Plastic Retail Carry Bags that provided advice to retailers how to promote alternative bags and encourage people to recycle (Nhamo, 2008). Nowadays, Australia does not have a nationwide policy on plastic bags, but there are still individual initiatives and applied measures at state level.

In Europe there are many countries that have signed voluntary agreements with retailers the previous years and they have managed to drop the plastic bag consumption. Among these countries one can highlight Austria, Germany, Finland and Belgium, whereas some other EU countries (i.e. Hungary, Lithuania, Slovakia and Latvia) despite the voluntary agreements did not have good results (Kasidoni et al., 2015). A voluntary agreement is a controversial approach, since retailers usually decide independently the measures that they will take, so consumers can possibly get confused among the different approaches. Besides, it is not binding and so there is no punishment for the offenders.

2.5.2.4 Success Factors

To sum up, globally there are a lot of different approaches on the plastic bag issue and no single solution that could suit to all the cases, since each country is so different (i.e. climate, consumers' habits, number of retailers, population etc.). However, I consider that the aforementioned case studies indicate some of the key success factors regardless the policy instruments applied. Particularly, policy makers should take the following factors into consideration when they design a policy on plastic bag issue:

- Acceptance from the total of stakeholders (important parameter here: to give time for consultations)
- Available reusable alternatives at reasonable prices
- Extensive awareness campaign prior to and after the implementation of the policy
- Readiness of the market (i.e. available standards, investments)
- Same measures imposed from all the retailers in order to avoid confusion among consumers (horizontal implementation)
- Strict enforcement mechanisms (controls and strict punishment)
- Transparency as far as the management of the collected money is concerned to lower resistance when introducing the policy

3 Methodology

The aim of this thesis is to examine whether or not there are both environmentally sound and efficient measures for the reduction in the consumption of plastic bags in Greece within the scope of the Directive, having in mind though that it is an extra advantage if these measures give incentives for improvements beyond the targets of the Directive. In order for this matter to be answered, two main categories of data have to be collected: baseline data on the situation in place before the introduction of the alternative measures (waste management of plastic bags in Greece) and practical data about how the involved stakeholders will respond to these policy measures. Plus, examples of other countries have to be studied in order to see which measures are more often applied and which factors are more crucial for the successful design and implementation of these measures (Vaz & European Environment Agency, 2001).

The following table presents the arisen RQs and the methodologies used to address them. These methodologies have been incorporated in the ex-ante policy evaluation framework upon which the outline of this thesis has been built.

Table 3-1: Research questions and corresponding methodology

Research Questions	Methodology
RQ1: What is the current status of the management of waste plastic bags in Greece?	<ul style="list-style-type: none"> • Literature analysis • Interviews (the 1st part of the interview)
RQ2: Which are the factors that can secure the successful implementation of a policy on the plastic bag issue in Greece?	<ul style="list-style-type: none"> • Lessons learned from other countries • Interviews (the 2nd part of the interviews)
RQ3: Which are the alternative policy measures that can reduce the plastic bag consumption in Greece? <ul style="list-style-type: none"> ○ RQ3(a): Are there alternatives that can be discarded because they do not have a chance to reach the goals or because they are impossible to enforce? ○ RQ3(b): Can any measures be both environmentally sound and efficient in the case of Greece? ○ RQ3(c): How will the affected stakeholders respond to these measures (political acceptability and equity)? 	<ul style="list-style-type: none"> • Policy evaluation

3.1 Ex-ante Policy Evaluation Framework

This evaluation concerns policies that may be applied in the future and not existing policies, so an ex-ante policy evaluation that will assess the expected effects²⁸ of the alternative policy options is demanded (Vaz & European Environment Agency, 2001). From the beginning I searched for a framework that is used in practice from countries to evaluate alternative measures to address the same problem, so I ended up examining three broadly known frameworks: a) the European Commission's Indicative Guidelines on how to conduct ex-ante evaluation for expenditure programs (European Commission, 2001), b) the EU Impact Assessment Guidelines (European Commission, 2006) and c) the OECD framework for regulatory policy evaluation (OECD, 2014). I decided to use the European Commission's Indicative Guidelines, since they have been used since 2001, so this is an experienced

²⁸ Causal links between a policy and its impacts

approach and they are written in a more straightforward and step-by-step way. As a result, the outline of this thesis is built upon the ex-ante policy evaluation framework that I designed inspired by the European Commission's Indicative Guidelines. Of course, the Indicative Guidelines have some specific details that aim to address issues that are connected with the nature of these programs (i.e. finance from EU funds, evaluation in the future etc.), as a result, only the steps that fit to the thesis' scope are followed. In Table 3-2 I have analysed the steps that I adopted and how I adapted each one in order to address all the RQs.

Table 3-2: The ex-ante policy evaluation framework

Steps	Short description	Outcome
1.1 Problem analysis	Environmental problems have some special characteristics that can affect the policy evaluation and for that reason the evaluator has to take them into account. These characteristics can be separated into two broad categories: features of the problem (e.g. complexity, long time-frame, geographical scope) and features related to the knowledge (e.g. current technological knowledge, legislation in place, technological development, stakeholders' beliefs) (Mickwitz, 2003). These features constitute the baseline data that have to be collected.	Answers to RQ1
1.2 Needs assessment	Identification of the affected stakeholders and assessment of their needs.	Who I should interview and what I should ask them (which are their intentions, conflicting interests, needs etc.)
2. Objective setting	The objectives of this policy evaluation are built upon the aim of this thesis; taking into account the requirements of the Directive, the priorities of Greece regarding the waste management in the next years and external factors such as technological changes and market signals.	Objectives for the policy evaluation
3. Preparation for the policy evaluation	Lessons learned from other countries	The most applied measures around the world Key factors for their successful implementation (Answer to RQ2)
	From a number of alternative policy options I will end up with a small number of policy options for this policy evaluation taking into account the special characteristics of Greece and lessons learned from other countries.	Examined measures
	The policy evaluation criteria are formulated based on the policy objectives.	Policy evaluation criteria
	Intervention theory: Analysis of the collected data (literature review and interviews) and separation of it into key elements in order for the policy effects to be arisen.	Key elements: risks, costs, savings, success factors, stakeholders' positions
4. Policy evaluation	Comparison of the examined policy options	Answers to RQ3

3.2 Literature Analysis

3.2.1 In general

Books, academic papers, law texts, grey literature and online sources in Greek and in English were analysed via a desktop literature review. The literature analysis had two main purposes: a) to find and analyse data for the evaluation of the waste management of plastic bags in Greece

and b) to find and analyse measures on plastic bag issue around the world (lessons learned from other countries). In order to evaluate the waste management of plastic bags in Greece, firstly I had to find out how the Greek waste management works in general. For that reason, I combined data from reports produced by public bodies, consulting companies and third parties (NGOs, European bodies). The majority of data comes from 2013 since it was very difficult to find updated data from the last two years. As far as the lessons learned from other countries are concerned, it was not feasible to examine in detail all the measures that have been applied for the reduction in the consumption of plastic bags in countries around the world, so I had to exclude some case studies.

3.2.2 Lessons Learned from Other Countries

Therefore, I monitored the most applied measures around the world cross-checking four sources²⁹ that had already collected examples and seeing which countries are repeated. As a result, I created a table (Appendix IV) with some of the most popular case studies at global level. Subsequently, for the most applied measures I examined case studies (bad or good examples) that are known worldwide. For that reason, I checked which countries have been mentioned online from recent reports and articles and also if there are academic papers that evaluate their performance (e.g. environmental effectiveness, efficiency). Also, I presented a few popular cases (i.e. England, Italy and France) that are comparatively new – even if there is not so much available data – because I considered that their presentation will contribute to a more complete picture of the current situation.

3.3 Interviews

In the case of an ex-ante policy evaluation that attempts to foresee how successful the implementation of alternative police measures will be, there are no records from the progress of the measure as in the case of an ex-post evaluation. Whereas even if there is data from older applications or lessons learned from other countries, it cannot be used as the only input to the analysis, since the conditions are different in any case. So data coming from interviews with the affected stakeholders can fill some of the gaps (e.g. their positions on the measures, estimations based on their experience etc.).

Interviewees have to be representatives of the key affected stakeholders with experience on the topic under analysis. So even if in some cases they do not know how to answer or they are not allowed to give an official answer, they will be in position to make their own estimations and/or express their own views based on their experience. Here, 18 semi-structured interviews were arranged with representatives of the key stakeholders and conducted in June and July 2016. Firstly, I monitored the key stakeholders and attempted to contact many of them in order to ask for an interview. In this thesis the key stakeholders are considered to be: retailers, producers, governmental and other organizations dealing with the waste management and consumers. Plus, I decided to contact NGOs focused mainly on marine pollution since they have a lot of knowledge on the subject and businesses that imports bio-based products in order to see how this sector is evolving in Greece.

As far as retailers and producers are concerned, the main focus was on large-scale companies that are able to influence the smaller ones, whereas in the case of governmental and other organizations the point was to discuss with representatives from the three main bodies in waste management in Greece (i.e. Ministry of Environment and Energy, HRA, HE.R.R.Co.). Especially, in the case of Ministry and HRA it was really important to speak with employees that deal with the Directive 2015/720. Now, for consumers the obvious choice was the

²⁹ Sources: (allaboutbags.ca, 2012; Kasidoni et al., 2015; Larsen & Venkova, 2014; UNEP, 2005).

conduct of a survey, but I rejected it and I decided instead of that to interview consumer association that could give an indication of how consumer would react. I decided not to do a survey because a national scale survey was very expensive and a smaller survey is rejected as not reliable. In particular, for a small-scale survey there were two options: uploading it on the WWF site or sharing it to my friends and family. In both cases the bias would be high, since WWF friends are environmentally conscious citizens that normally would react positively on measures on plastic bags realizing the environmental issues, whereas my friends and family might not be objective since I had discussed with most of them issues related to my thesis.

My initial target was to stop interviewing representatives when the information started to be repeated and I managed to do so in the case of producers and consumer associations. Unfortunately, in the case of retailers and NGOs the number of interviews was too small to draw general conclusions, but comparing the information some really useful input came up.

The interview guides used for the different stakeholder groups were built upon the same logic, but from group to group there were some distinctive differences for more targeted questions. The initial idea behind the guide was to make stakeholders evaluate the alternative options using a numerical scale so that I could have a direct way to compare them in the end. However, soon after the first interviews I realized that it was much more useful to conduct interviews in a less formalized way and monitor risks, costs and success factors that each stakeholder foresees for each measure according to his/her own experience, instead of stakeholders' direct positions on the alternative measures. I decided to conduct the interviews as open discussions, using open-ended questions but also giving the opportunity to interviewees touch upon related issues that I missed out.

The interview was separated into two parts: the first part of the interview was about more general issues and aimed to gather information in order to cover gaps that the literature review could not supply and the second part was questions on the alternative policy measures. The questions of the second part were formulated taking into consideration the information needed to evaluate the selected criteria.

I examined the three general categories of measures for the reduction in the consumption of plastic bags (bans, economic instruments and awareness campaigns) and not particular policy measures in order to focus on general practical issues and not to lose time on technical differences among different options.

In the case of the ban, I ended up asking only questions on a limited ban. An outright ban is not a possible option in the case of Greece, because it is highly possible to derogate the Article 18 "Freedom to place on the market" of Packaging Directive and to cause a mess in the market since it forces a sudden change without giving time to the businesses to react. Plus, I chose to examine the deposit-refund system in order to be able to draw some extra conclusions beyond the Directive's targets. A deposit-refund system belongs to policies applied for the improvement of the post-consumer aspect of the waste management, so outside the scope of the examined policy. However, as pointed out in SCP concept, pre- and post-consumer aspects are interrelated and they should be examined together. Knowing since the beginning that a deposit-refund system is not the ideal solution in the case of plastic bags³⁰, I used it more as a cause to initiate a short discussion on waste management of plastic bags in order to see how it can be improved.

³⁰ There are technical difficulties. For a machine it is very difficult to accept a plastic bag and read the special barcode, since the material is extremely flexible.

The interview guide or an outline of the interview was sent to the interviewees some days before the interview in order for them to have time to think about their answers. Each interview lasted 30 to 60 minutes and it was recorded after a request in the beginning. The recording gave me the opportunity to concentrate on the answers and involve better to the discussion. The interviews were either personal meetings or skype calls. Key information was transcribed from the records of the interviews in order for me to be able to compare the collected information per stakeholder group and organize them into key elements (risks, costs, success factors, positions). In the end joint tables per element were created (see Chapter 4). All the interviewees received a draft copy of this thesis prior to the publication. An analytical list of the interviews is cited in the Appendix VII and a sample of the interview guide is cited in Appendix VI.

3.4 Policy Evaluation

3.4.1 Preparation Phase

In order for a policy evaluation to be successful, the preparation phase is determinant. In particular, here, the following steps were held before the policy evaluation phase:

- The selection of the policy evaluation criteria: There is a series of policy evaluation criteria used for an ex-ante evaluation. I examined the definitions of these criteria from three papers known in the field of the environmental management (Mickwitz, 2003; Panayotou, 1994; Vancini, 2000), since the examined policy attempts to address a problem with a strong environmental objective.

In particular, I cross-checked the three papers and I noticed which criteria are repeated in at least two of them. In the cases that the authors use different terms for a criterion that addresses the same issue, I decided to join these terms under one common term (see political and social acceptability and incentives for improvement). Whereas, I did not take into account criteria that deal with issues partially covered by other criteria. For instance, I consider that ease of monitoring and enforcement (= “How difficult or costly will monitoring and enforcement be?”, (Panayotou, 1994, pg. 51)) and ease of administration (= “the extent to which the instrument is expected to be feasible to carry out”, (Vancini, 2000, pg. 71)) as part of the cost-effectiveness criterion, whereas predictability (= “Is it thus possible for those regulated, as well as others, to prepare and take into account the policy instrument and its implications?”, (Mickwitz, 2003, pg. 426)) as part of the equity criterion. Finally, I chose the cost-effectiveness criterion over the cost-benefit criterion (= “Are the benefits worth the costs? Both benefits and costs are valued in (cost–benefit) monetary terms”, (Mickwitz, 2003, pg. 427)), since cost-effectiveness is the one used when it is not easy to measure costs and benefits in monetary terms.

All in all, the criteria that I used to evaluate the alternative examined measures are cited in Table 3-3. Before the conduction of the evaluation, I adapted the selected criteria to the objectives of this policy evaluation (see Chapter 5.1).

- The exclusion of some policy measures: There was a series of alternative policy measures that can theoretically lead to the desired outcome, but I did not examine all the alternatives since I considered that some of them do not have a chance to reach the goals or they are impossible to enforce in the case of Greece.
- The elements of the intervention theory: A straightforward way for the effects associated with the alternative policy options to be monitored is the intervention theory that attempts to describe how the alternative policy options will be applied (Mickwitz, 2003). The

intervention theory examines the causal links among some key elements (Mickwitz, 2003; Vaz & European Environment Agency, 2001):

- Actors: stakeholders affected by the policy, i.e. stakeholders' needs and positions.
- Inputs: resources that affect the design and the implementation of a policy instrument, i.e. personnel, administration, awareness campaign, emerged costs.
- Outputs: the results of the measure, i.e. increased cost for producers (tax), increased cost for consumers (charge at the point of sale), no plastic bags in the market (outright ban) etc.
- Outcomes: the response of the stakeholders to the outputs (emerged risks, cost savings), i.e. reduced plastic bag consumption, reduced plastic bag production, increased sales of alternatives, shut down of businesses.
- Impacts: the effects of the implemented changes on the environment and human health, i.e. less marine pollution, less littering etc.

Table 3-3: Presentation of the selected evaluation criteria

Criteria	Definition
Environmental Effectiveness	<p>“Will the instrument achieve the environmental objective within the specified time span and what degree of certainty can be expected? “, (Panayotou, 1994, pg. 50).</p> <p>“The extent to which the instrument is expected to achieve established waste prevention objectives and/or the extent to which improvements in waste prevention occur from year to year. Components of environmental effectiveness may include changes in environmental quality, health risk reduction, and resource efficiency”, (Vancini, 2000, pg. 70).</p>
Efficiency (Cost – effectiveness)	<p>“Will the instrument achieve the environmental objective (or target) at the minimum possible cost to society?”, (Panayotou, 1994, pg. 50).</p> <p>“Do the results justify the resources used?”, (Mickwitz, 2003, pg. 427).</p>
Equity	<p>“Will the costs and benefits of the instrument be equitably distributed? Who gains and who loses?”, (Panayotou, 1994, pg. 51).</p> <p>“How are the outcomes and costs of the environmental policy instrument distributed? Do all participants have equal opportunities to take part in and influence the processes used by the administration?”, (Mickwitz, 2003, pg. 427)</p>
Political and Social acceptability	<p>(=Acceptability): “Is the instrument understandable to the public, acceptable to the industry, and politically saleable?”, (Panayotou, 1994, pg. 52).</p> <p>(=Legitimacy): “To what degree do individuals and organizations, such as non-governmental organizations (NGOs), interest organizations and firms accept the environmental policy instrument?”, (Mickwitz, 2003, pg. 427)</p> <p>(=Political Acceptability): “The extent to which the instrument is expected to enjoy political acceptance”, (Vancini, 2000, pg. 71)</p>
Incentives for improvement	<p>(=Dynamic Efficiency): “Does the instrument provide incentives for developing and adopting new environmentally cleaner and economically more efficient technologies? Does it promote development of an environmentally sound infrastructure and economic structure in general?”, (Panayotou, 1994, pg. 50).</p> <p>(=Innovative advancement): “The extent to which the instrument is expected to stimulate technological and managerial innovation.”, (Vancini, 2000, pg. 71)</p>

3.4.2 Evaluation Phase

The policy evaluation takes advantage of all the data collected and the interpretation of them and evaluates the selected criteria accordingly. In addition to that, external factors, such as market signals, changing financial conditions, state-of-the-art concepts, technological

development etc., should be taken into account, since the real world is variable (Mickwitz, 2003; Vaz & European Environment Agency, 2001).

According to Mickwitz (2003) it is very difficult for the evaluator to predict whether the effects expected by a policy measure will be arisen only due to its implementation or other reasons play a determinant role, as well. This problem is known as the impact problem and one way to address it is triangulation. There are four types of triangulation: multiple methods, multiple data using one method, multiple theories and multiple analysts. For instance, multiple methods can be statistical analysis of the collected data, literature review, interviews, surveys etc. Here, I attempted to address as much as possible this issue collecting data via literature analysis and interviews.

The policy evaluation has to assess the alternative policy measures independently and compare them per criterion in order for the prevalence of some measures over others to be pointed out. However, the evaluator is not the one that has to make the final decision about the best possible option. The final decision is a political one, since only the policy makers know the whole picture (available budget, governments' priorities etc.) (European Commission, 2006; Hertin et al., 2009).

3.5 Limitations

The main issue in this thesis is that I could always have more interviews, since I just contacted representatives of the key stakeholders, but the affected stakeholders are more. Besides, among the key stakeholders I interviewed some representatives and so I have to assess if the sample per stakeholder is sufficient. I have to say that if I exclude the governmental and other organization where I contacted representatives of the main bodies, in the other cases I tried to book an interview with as many people as possible. In the case of consumer associations and producers, I consider that the sample was sufficient in order to draw some general conclusions since the validity of the information was verified via the repetition of the information among the interviewees. In the case of supermarkets, the sample was too small (only two businesses) so it was not possible to conclude with remarks for the majority of the supermarkets. However, these two supermarkets are among the biggest retailer brands, so the input of their representatives has a great importance. Plus, the interview with the President of the Panhellenic Confederation of smaller unions of salesmen at street markets gave an extra validity in the thesis since I took into account street markets, as well. As far as the NGOs are concerned, their sample is also small, but these two NGOs are participating in programs for the reduction in the consumption of plastic carrier bags at local level and so they are among the most appropriate stakeholders to express their views.

This thesis is based on the collection of data from governmental bodies and public services and from interviews with affected stakeholders. As a result, one of the main limitations that I faced is that in some cases I did not manage to gather useful data for the analysis, either because it was difficult for the responsible governmental bodies and the interviewees to give the answers or because they were not willing to share this information. Furthermore, in some cases the interviewees were just employees of a company/organization/etc., so they expressed their own personal opinions and not necessarily the position of the company/organization/etc. Of course, it has to be taken into account that these employees are experienced and their estimations have also high interest and weight.

4 Findings

4.1 Learn from the Affected Stakeholders

The final outcome of this thesis is the comparison of policy measures for the reduction of the consumption of plastic bags in Greece. For that reason, it was important to discuss with stakeholders affected by the implementation of these measures about their positions.

I conducted in total 18 interviews in June and July 2016. I tried to conduct as many interviews as possible per stakeholder in order to cross-check their inputs and gather as much data as possible. Each interview was divided into two parts. The first part was devoted to gathering general information on the current status of the waste generation and management of plastic bags in Greece and the second part was about the Directive 2015/720 and how Greece can reduce the consumption of plastic bags within and beyond the Directive's targets. The policy measures that I examined within the scope of the Directive were three: a) a limited ban (i.e. on lightweight plastic carrier bags other than bio-based bags or on plastic carrier bags thinner than μm), b) an economic instrument (i.e. a tax or a charge on lightweight plastic carrier bags (the distinction that I used between these two terms is the one mentioned in the chapter 2.5.1)) and c) an extensive awareness campaign. Additionally, at the same time I chose to examine the deposit-refund system in order to be able to draw some extra conclusions for the waste management of plastic bags in Greece.

In Appendix VII there is an alphabetic list with the names of interviewees and next to each name a serial number. This serial number will be used instead of a conventional citation in this chapter.

4.1.1 Plastic Industry Sector

I interviewed representatives from five Greek producers of plastic bags. Two of them are located in Attica (Georgiou A.E. [5], Peiraika Plastika S.A. [11]), two of them in other prefectures of the mainland (Civil EPE [9], Achaika Plastics S.A. [12]) and one of them on an island (Plastika Syrou [13]). I chose to contact small and medium-sized enterprises that are located in different areas of Greece and produce different quantities of plastic bags in order to have a representative sample. Among those companies the production of plastic bags varies from only 10% to 80% of the total production. This fact indicates that there are companies that could easily switch to other products and cover immediately the possible loss of plastic bag production, but also there are other companies that currently are highly dependent on plastic bags and would need more time. In total, these five companies employ directly 66 people especially for the plastic bag production. All of them produce conventional and oxo-degradable plastic bags, the majority of them produces also bin liners and exports plastic bags.

First of all, I asked the interviewees to foresee possible challenges or risks that will be called to face after the transition of the Directive 2015/720 into the Greek law. The discussion with them was really constructive and a list of possible changes and risks came up:

- Reduced production of plastic bags that can lead to the loss of jobs if companies do not adapt to the new conditions in time [5, 9, 11].
- Production of bags from other materials (i.e. bio-based) [9].
- Bigger production of bin liners [5, 9, 11, 12].
- Unbalanced market conditions: If all the producers switch to other products, the existing balance will be disrupted. That means that other plastic producers will be affected as well, since the competition on their products is anticipated to grow [5].

- Difficulties to adapt to the new markets: The majority of the enterprises in Greece are SMEs that do not have a R&D department to search for alternatives and/or they do not have available resources (i.e. machines, capital) to make the changes immediately, so they need time [11]. As a result, the SMEs are going to start delayed on a new market, whereas the bigger companies will do it faster and so it will be difficult for the SMEs to find customers [13].
- Loss of capitals invested in plastic bag production: Companies that have made investments in the production of plastic bags in the last years and did not have time to take their money back; they may face higher risk [5].
- Indirect loss of jobs and revenues for other sectors: There are many other enterprises that collaborate with the plastic industry (importers, machine manufacturers, transporters etc.), so any change may affect them as well [11].

Furthermore, through the interviews a series of crucial parameters for the success of the alternative measures came up:

- Smooth transition in order for all the producers to have time to adapt [5].
- All the involved stakeholders should be informed via an extensive awareness campaign (mass media, especially social media) [5, 12].
- The role of supermarkets is determinant for a successful awareness campaign [5].
- It is nodal to check what kind of alternatives are available [9].
- The implemented measures should take consumers' habits in Greece into consideration. Every country is different [9, 11].
- It is important to promote the 3Rs (Reduce – Reuse – Recycle) at the same time. A holistic approach – the improvement of waste management in general could help, i.e. the shutdown of dumping sites that give the chance to plastic bags to fly away [11].

The interviewees share similar opinions on the alternative measures. In general, they believed that a (limited) ban and a tax or a charge would have the biggest positive impact on the environment but also the biggest negative impact on their enterprises, whereas the majority of the interviewees believe that an awareness campaign should be a part and parcel of the implemented policy but they did not consider it as a highly effective way of making consumers reduce the consumption. They point out that a deposit-refund system is outside the scope of the Directive, but the government could apply it in order to increase recycling rates and this action could actually help them. Also, they point out that the effectiveness of the measures depends on how they will be applied.

Limited ban

A limited ban could be proven as a good option if it is planned in a right way. For example, the promotion of thicker bags that can be reused more times and recycled in a better way. Of course, it should be taken into consideration that they are more expensive and contain more raw materials [9].

Tax/Charge

In the case of a tax it is crucial where the money ends up – especially, if the money gets collected by a public Fund, since there is a limited trust to the state from citizens [9] and they may consider that the government will use the money in order to cover other fiscal gaps [11]. Besides, the height of a tax/charge is a determinant factor, since as higher it is as more consumers will be discouraged to buy a bag [9, 11, 12].

Awareness campaign

An awareness campaign and a monitoring of the existing situation should be held before the implementation of any measure(s) in order to see where consumers stand and be able to judge the results of the campaign later on [11]. Plus, it is important to organize targeted awareness campaigns for each age group (special focus on children) and each stakeholder [5, 12, 13] not only in the beginning but on a continuous basis [12], where the reuse of a plastic bag as many times as possible should be one of the main points [9]. Furthermore, more educational and awareness campaigns should be organized in general about how consumers should treat packaging materials [9, 11].

Here, it has to be mentioned that the position of the plastic industry association is the implementation of a steady replacement of lightweight plastic carrier bags by alternatives accompanied by an extensive awareness campaign. The alternative initially is proposed to be thicker plastic bags ($50 \pm 8 \mu\text{m}$) that can be reused many times and, at a later stage, bio-based bags. The introduction of bio-based bags depends on when their raw material will be available on the global market in big quantities and at reasonable prices [9].

Regarding the possibility of a deposit-refund system two suggestions are made:

- Recycling bins outside supermarkets could collect plastic bags giving back a low price and these bags could be recycled to other products, i.e. bin liners [5].
- Rewarding reuse of plastic bags within the concept of reducing the plastic bag consumption – monitoring how many times one consumer used a plastic bag and reward him [9].

All the interviewees believed that it is better if the implementation of the measures is horizontal and all of them were positive to participate in the public discussions, whereas they knew that their association has already started to discuss the issue with governmental and other related bodies.

When I asked them if they see any incentives to improve their environmental performance due to the upcoming measures, the answers were not similar: one of them answered that rewarding recycling and awareness campaign will give them incentives to get improved [9], another one that a limited ban or a tax/charge may give them higher incentive [12], another one supports that plastic bags are already very thin, so they cannot do much more [5] and two of them believed that their performance is not connected with the measures per se, but it is more a matter of character [11, 13].

Finally, it is worth mentioning that all of them agreed that it is too early for them to shift their production into bio-based materials. Despite the fact that some of the existing machines can produce bio-based bags, as well [5, 13], bio-based raw material is three times more expensive than the raw material for plastic bags [5, 9, 11, 12, 13] and also these bags are heavier (13 g) than conventional plastic bags (8 g), so finally they are even more expensive because it is demanded more raw material per bag [9]. Besides, globally the amount of the available raw material is really small, so it is not possible to start producing big quantities right now [9, 11, 13]. In addition to that, at European level there are no standards on bio-based bags – the only exemption is EN 13432 – so Europe is not ready for this market [9]. As far as Greece is concerned, there is no demand currently on the market [5, 11, 12, 13], Greece has not a separate stream for organic waste [9] and in the case that bio-based bags produced in big

quantities now, they could end up in the same recycling stream with conventional plastic bags and they would create problems to recycling [11].

Also, in the case of degradable bags one mentioned that degradable bags pass on the message that throwing them away is approvable since they are able to biodegrade, so they downgrade the value of recycling and learn consumers think in a wrong way [11], whereas especially for oxo-degradable bags another interviewee mentioned that EU has not decided if their impacts on the environment are negative or not, so it is wiser to wait for their report [9].

4.1.2 Retailers

I interviewed representatives of two of the biggest retailer brands in Greece, AB Vasilopoulos [10] and Sklavenitis [3], which are also among the most profitable companies in Greece (fpress.gr, 2015). I chose to contact large retailers for two reasons. First of all, they have special departments that deal with environmental and social issues so it is easier to gather the right information from them and secondly their actions usually make smaller retailers follow. Furthermore, I had an interview with the President of the Panhellenic Confederation of smaller unions of salesmen at street markets [6]. I considered that it was crucial to speak with representatives of salesmen at street market, since they distribute a huge amount of plastic bags per day and they face different challenges in their working life than a large retailer.

As far as the supermarkets are concerned, it is important to see their current status regarding plastic bags, if they had realized the plastic bag issue and if they had taken actions for the reduction of their consumption prior to this Directive. The interviewees pointed out that:

- Plastic bags are among their significant environmental impacts.
- They cost to their businesses a considerable amount of money each year.
- They offer photodegradable plastic bags, since after the Municipality of Athens' initiative (2008) for the promotion of friendlier shopping bags oxo-degradable bags stand up as a friendlier option.
- They sell reusable plastic bags. In particular, AB Vasilopoulos sells reusable plastic bags giving incentives to consumers (extra points in their member cards) when they use it at the point of sale. The revenues from these sales are given for social causes. Whereas Sklavenitis sells reusable plastic bags at cost prices so they do not have profits from that. However, in both cases it has not been noticed a considerable reduction in the consumption of plastic bags since the implementation of these initiatives.

The following parameters were mentioned from the interviewees as prerequisites for the reduction in the consumption of plastic carrier bags:

- Changing consumers' way of thinking. People are used to taking one bag per kind of products and to use plastic bags for bin liners [6, 10], so it is difficult to persuade them change their habits.
- Offering alternatives at reasonable prices [6, 10].
- Gradual implementation of any measure(s) [3].
- An extensive awareness campaign in order to make consumers allies in this effort. They have to understand why, how and when the new measures will be applied [3].
- Not only consumers but also salesmen have to get informed [6].

The sample of interviewees in this category was too small so it is not possible to have an indication of the most desired policy option. Instead of that some very interesting points came

up for each of the alternative options. These points are crucial for the monitoring of emerging costs and difficulties during the implementation phase. In particular:

Limited ban

A ban would have an economic benefit for supermarkets [10], since they will save a huge amount of money that currently spend on the purchase of plastic bags. A limited ban though can result in the increase of their expenses if it is a ban on thin bags and they will be obliged to use thicker bags that are much more costly [3].

Tax/Charge

The representative of AB Vasilopoulos was positive to discuss the imposition of a price on plastic bags mentioning though that the success of the measure depends on the height of the price and the available alternatives to plastic bags [10]. Whereas she assessed that it is feasible from a financial and managerial point of view to organize a special flow of money for the collected revenues. The basic changes for that will be some accounting changes and that every bag should have a product code [10].

In the case of Sklavenitis the interviewees explicitly stated that they would not like to charge their customers and to manage revenues raised from this charge, but if necessary they are open to discuss all the possibilities [3].

Finally, for salesmen at street markets it is crucial to keep their prices low, so it is impossible to impose a price on plastic bags that will increase consumers' shopping bill. In order to persuade them to participate in the implementation of an economic instrument, the government could give them incentives (e.g. tax credits) if they replace plastic bags with better alternatives [6].

Awareness campaign

An awareness campaign is a part and parcel of the successful implementation of measures on plastic bags, but only a campaign will not be effective enough to reduce the consumption [10]. Supermarkets can participate actively in this campaign [3, 10], since the basic costs of running a campaign (e.g. printing some leaflets and banners) is comparatively low [10], but of course the collaboration with the state is necessary [3].

As far as the possibility of the establishment of a deposit-refund system for plastic bags is concerned, it was mentioned that it is not profitable for consumers to participate in a deposit-refund system because the material is very cheap so they have to deliver a huge number of bags in order to take back a low price [3, 10]. Besides, a supermarket needs to devote some employees to this exchange, since there is no machine that can do that automatically [3, 10] and this demands an important managerial cost [10]. Finally, there are limitations due to hygiene reasons, since it is not possible to accept in a store, which sells food, a bag that is not known where it was before [3].

All the interviewees agreed that the horizontal implementation of the imposed measures is better in order for confusions among consumers to be avoided. It is important to say that the President of the Panhellenic Confederation of smaller unions of salesmen at street markets pointed out that if the government wants really to solve the plastic bag issue should find a solution that will take into account the special characteristics of street markets, as well.

All the interviewees are positive to participate in public consultations on this issue. The representatives from the supermarkets knew that a public discussion has already started, whereas Mr. Kakaratzas [6] did not know anything before my call. Finally, Mrs. Machera [10] underlined that these measures will give a strong incentive to retailers that care about environment to improve their environmental performance.

4.1.3 Consumers

Since the beginning I had realized that it was not feasible to conduct a national wide survey to monitor consumers' reactions on alternative measures for the reduction in the consumption of plastic bags. However, I knew that consumers' behaviour is a determinant factor for the successful enforcement of any measure, so I decided to interview representatives from consumer associations and use their input as an indication of consumers' way of thinking. In particular, I interviewed four consumer associations, two located in Athens (EKPIZO [1], Union of Working Consumers of Greece [7]) and two in the Northern part of Greece (Consumers' Protection Association in Serres [15], Consumers' Protection Centre in Thessaloniki [18]). I chose associations located in different parts of Greece, because it was important to see whether or not there are notable differences in people's everyday lives.

After the interviewees the general impression is that in the last years Greeks do not really ask questions on environmental issues and especially regarding plastic bags there was no interest. For that reason, all the interviewees, despite the fact that they had realized the environmental problems associated with plastic bags, pointed out that due to the financial recession Greeks face many problems and plastic bag issue should not make their reality more difficult or put another high financial burden on them.

Below I have collected all the interesting points per alternative category of measures:

Limited ban

Through a ban or a limited ban a pre-set reduction target can be succeeded, whereas in the case of the other measures it is difficult to predict the final outcome [7]. The enforcement mechanisms play a big role in that effort, but in Greece they are not known for their effectiveness. For example, the ban of indoor smoking has been violated repeatedly [15].

Now, a limited ban on everything except bio-based bags is questionable, since currently bio-based bags are very expensive and retailers cannot afford offering them for free, so either they will charge them or they will pass the cost onto consumers increasing other products' prices. So in that case an awareness campaign should proceed in order to create the demand for these bags [15].

Tax/Charge

All the interviewees agreed that a price on plastic bags could be dissuasive. People will use fewer bags than usual. However, in the case of Greece another charge is not the ideal scenario since the last years people face many financial difficulties and they will not be positive if another charge will come to get added to the existing ones.

As a result, there are some factors that the government should take into account:

- A transitional period should proceed, where people will get informed why, how and when a price on plastic bags will be imposed [15, 18].
- If the charge is imposed on consumers directly, many people will see it as another way for

the government to raise money in order to cover fiscal gaps. It is indicative that there are similar reactions for the tax on pollutants paid via the electricity bill, where people are not sure where the money goes [1, 18].

- If a charge on plastic bags is not connected with the environmental problem (marine pollution), people will not learn this perspective. So an awareness campaign has to offer also this information and also communicate the emerging alternatives [1, 7]. All the interviewees pointed out that Greeks use plastic bags as bin liners so it is important to offer them alternatives to that, as well.
- If a Fund has to be established for the management of the money, it has to be addressed by a third - not public - body. This money should go to actions with rewarding character, not necessarily for environmental causes but also for social causes [1].
- Another idea is the money to be kept by supermarkets but then supermarkets should be obliged to organize actions for social causes, to reward consumers – give incentives, to reduce product prices [1].

Finally, Lidl Hellas is the proof that the imposition of a charge on plastic bags does not reduce retailers' popularity, since they have imposed a charge since the beginning and they have grown a lot since then. However, their customers many times take away some of the cartons that there are in the store in order to carry the shopped products, so there is higher consumption of other recyclable packaging materials [7].

Awareness campaign

It is a fact that the awareness campaign has already been mentioned many times by now and some prerequisites (i.e. the key role of supermarkets, campaign's content, and campaign before and after the imposition of any measure) have been met repeatedly. But, here, some new ideas came up:

- A campaign has to target all the age groups and especially older people because they are not aware about environmental issues so it is more difficult to persuade them to change their way of doing things [7].
- It is crucial to inform citizens for the success of the measures in order to make them allies in the national effort. For instance, leaflets with the reduction of the consumption could be shared with electricity or water bills in order for all the households to get informed about the progress [7].
- Citizens have to see real actions and not another spot on TV, because they need to see that their money is invested in a right way and there is a true commitment [1].

Deposit-refund system was not a likable choice among the interviewees. They underlined that the price back is very low because this material has low value for recyclers, so this system has no hope to succeed in the case of bags [15]. However, some of them mentioned that the idea behind of a deposit-refund system could be transferred in a different way for the use phase of the bags – offering incentives for the reuse of plastic carrier bags or/and the use of reusable bags [7, 15].

All the interviewees agreed that the measures have to be applied horizontally and gradually. Furthermore, they mentioned that they had not received any invitation to participate in public discussions but they were positive to participate in them and also to contribute to an awareness campaign later on.

4.1.4 Governmental and other organizations

I interviewed representatives from the main organizations that are responsible for the waste management of plastic bags in Greece: the Ministry of Environment and Energy [8], the HRA [17] and HE.R.R.Co. [2]. In short (see more in Chapter 2.2.1), the Ministry of Environment and Energy is responsible for national planning and organizing all the technical and financial issues related to waste management, the HRA is responsible for designing, implementing and monitoring the implementation of policies related to recycling at national level, and for approving and supervising the PROs. PROs are non-profit private organizations and HE.R.R.Co. is the largest PRO for packaging materials in Greece, it was founded in 2001 by Greek producers and currently it has 1 875 members. From these interviews, I tried to understand the challenges, the emerging risks and the existing difficulties that Greece will face in front of the upcoming transition of the Directive 2015/720 into the Greek law.

First of all, it is important to underline some useful clarifications regarding the Directive and the waste management of plastic bags in Greece:

- The government has to take into consideration that plastic industry will be affected and has to examine the possibility to give them incentives to adapt to the new reality steadily [8].
- Country's timeframe on the issue is the same with the Directive's timeframe (2025) [8].
- HRA may be responsible for some important parts of the policy (awareness campaigns, the management of the relevant future Fund, if it is so decided) [17].

Mrs. Karpodini [8] and Mrs. Tritopoulou [17] both agreed that a charge seems to be the predominant choice that comes from the Directive, but there are questions that have to be answered (e.g. how high the price will be, where the money will go etc.). Whereas, HE.R.R.Co's representatives supported that awareness campaign independently or implemented with an economic instrument will be crucial for consumers to change their way of thinking. Finally, HE.R.R.Co was against a deposit-refund system for plastic bags, since it will decrease industries' net benefits and this loss could burden municipalities in the end. Some more details on the alternative measures are mentioned below:

Limited ban

Greece cannot impose a limited ban: a) on all plastic bags other than bio-based bags since their definition is not officially clear (only EN 13 432 exists) and b) on oxo-degradable bags since there is still an open discussion about their environmental impacts [8]. However, HE.R.R.Co. is in favour of a ban on oxo-degradable bags recognizing that they cause problems in recycling [2]. A limited ban is possible to be applied in some areas provided that local institutions such as local retailers' associations take the initiative, provided that this ban is proportionate and non-discriminatory at national level (an indicative example is Alonnisos) [8].

Tax/Charge

It is anticipated that smaller shops will be positive in the imposition of a price on plastic bags, since they will externalize a currently internal cost that is part of the service every customer is expecting [8]. If a tax/charge will exist, a controlling system should be necessary in order to reduce the number of salesmen that will circumvent the law [17].

Awareness campaigns

Supermarkets could organize their own campaigns, but of course it is unlikely that they will organize a joint national campaign, a responsibility of national authorities and PROs [17].

All the interviewees were in favour of a horizontal implementation of the measures. However, it was mentioned that exemptions may have to be examined according to Greek consumers' habits [8] and could be tested within the scope of pilot programs at local level [17].

Of course, the implementation of the aforementioned measures is connected with some costs:

- Countries have to monitor the pathways of waste plastic bags, so actually they have to monitor another recycling sub-stream [8, 17].
- Enforcement mechanisms [8].
- The organization of awareness campaigns [8].
- In the case that the establishment of a Fund is needed, this is connected with managerial cost – employees, infrastructure, development of special computer programs, i.e. a record with producers in order to monitor the quantities placed on the market, another record with retailers in order to know the consumed quantities and the money raised [17].
- In the case of an economic instrument, supermarkets may have to change their logistics; bags need their own product code [17].

Whereas it is also connected with some risks:

- Either in the case of a limited ban or in the case of a tax/charge, black market for plastic bags may rise. In that case a product flow, which is not easy to be controlled, will be created resulting in revenue loss and unfair competition between producers and importers [17].
- Producers may start to produce thicker bags and just replace the existing ones [8].
- Plastic bags may be replaced with paper bags. This change will have no benefit for Greece, since the raw materials for the production of both are imported and such a change might have negative effects on the achievement of the targets of the Packaging Directive which are weight based [8].

As far as the bio-based bags are concerned, once again issues that producers have already mentioned repeated here. But also there were some new inputs:

- Right now recycling systems are not affected because the percentage of bio-based packaging distributed on the Greek market is low, but if their number can increase in the near future, triggering the need for new investment (different collection stream, or otherwise sorting and for sure different treatment). This will require money and time. It is worth mentioning though that this is also something new for Europe, no Member State has organized yet a separate stream for bio-based materials, and they treat them with organic waste [2].
- Other EU countries have already invested a lot of money in bio-based materials, so there might be difficulties for Greece to enter this market but research and innovation on the issue could be fostered [8].
- Bio-based bags will be a good alternative only if their use is linked to organic waste collection, not necessarily to simply replace conventional plastic bags [17].

Finally, the interviewees agreed that the two most determinant stakeholders here are supermarkets and producers. Supermarkets are the key stakeholders since they will implement the measures so the effectiveness depends on them and producers since it is crucial to

collaborate with them and find alternatives for their production in order to limit the financial impacts on their businesses.

4.1.5 Others

4.1.5.1 NGOs

I interviewed representatives of two NGOs, MedSOS [4] and Mom [16], aiming to monitor their perspectives. The choice of these NGOs was not a coincidence, since both of them run programs for the reduction of the consumption of plastic bags on Greek islands (Chapter 2.3.3).

The interviewees were in favour of the imposition of a price on plastic bags pointing out though some nodal points:

Tax/Charge

- A public discussion with all the involved stakeholders before the implementation of any measure(s) is crucial for the monitoring of any emerging difficulties [4].
- Awareness raising campaign prior to and after the implementation will help consumers change their way of thinking [4, 16].
- A price on plastic bags is also a direct way to inform all the citizens, even the ones that have not got informed via the awareness campaign [4].
- The price of a bag should not be determined only by the production cost but also by costs associated with the end-of-life phase (collection, clean-up, recycling etc.) [4].
- A higher price will be more dissuasive [16].

Awareness campaign

All the interviewees agreed that:

- An extensive awareness raising campaign on a continuous basis to all the target groups and via all the possible ways (especially social media) is crucial.
- It is also important to associate the measures with the environmental problems and offer analytical information about the implementation process.
- Also, the engagement of local stakeholders and the establishment of local agreements may increase the effectiveness of the measures.
- Last but not least, educational activities at schools, targeting both students and educators, are considered a part and parcel of an awareness raising campaign.

Deposit-refund system in the post-consumer aspect will not have a success in the case of plastic bags, since the price back will be low and so it cannot work as an incentive for non-environmentally friendly people to recycle. The already environmentally conscious people will do it any way [4].

The horizontal implementation of any measures was considered as a better approach, since one exemption can easily give the opportunity to consumers to ask for more exemptions [4]. Also, in the beginning it is important to offer all the necessary information and give incentive to consumers to apply the measures in the best way but later on the government should apply strict enforcement mechanisms in order to punish the offenders and avert others from violating the law.

4.1.5.2 Bio-based bag producers

In Greece there are no manufacturers of bio-based packaging, but there are importers. One of these companies is Naturesse Hellas that is located in Thessaloniki [14]. Having understood that this sector has an increasing potential in EU, I conducted an interview with them in order to include also their perspective in my research. Through the discussion with Mrs. Sotiropoulou some really interesting points came up:

- Her main customers are restaurants and individuals that care about environment.
- The first products in sales are catering packaging and not bio-based bags.
- The price of a bio-based bag is 0.09 euro (2016). Last year the price was much higher (0.15 euro). This drop may prove that these products will be cheaper and cheaper in the next years, since now the demand globally is still low but it is anticipated to grow.
- One way to promote bio-based bags is to set a price on conventional plastic bags near the cost of bio-based bags.
- The bags that she imports are more expensive since she counts in the transportation costs that are very high. If there are manufacturers in Greece, the price will be cheaper and as a result this option can be promoted as an alternative to plastic bags.

4.2 Summary of the Key Findings

In the previous sub-chapters a summary of the interviews' key findings is cited in the form of a text. Here, I attempted to organize the findings (including the lessons learned from other countries) in a more comprehensive way. So I organised the collected data to five main categories: stakeholders' positions, risks, costs, benefits and success factors.

In Table 4-1, I estimated based on the interviews how some of the affected stakeholders will receive the alternative measures. Of course, this is just an indication since the number of interviewees is small and the estimation is based on how I interpreted the different views in each group of stakeholders. The symbols equal with: (-) = negatively, (0) = neutral or cannot say, (+) = positively, (++) = very positively.

Table 4-1: My personal estimations on how different stakeholders will receive the alternative measures

Stakeholders	Limited ban	Economic instruments	Awareness campaign
Producers	+	-	++
	Could be a good option if it is planned in a right way, since they could gain time.	Biggest negative impact on their businesses	Necessary if you want to change consumers' way of thinking
Retailers	-	0	++
	A ban would have huge economic benefit, but a limited ban on thin bags without a charge on thicker bags will increase their expenses.	No clear outcome. Open to discussions. Open issues especially in the case of street markets.	Part and parcel of any other measure. Their role should be presented in a clear way.
Consumers	-	0	++
	Questionable enforcement Alternatives on the market	No clear outcome. A high charge will be effective but it will be another burden for Greeks. Open issues: who will collect the revenues and how, how	Part and parcel of a policy against plastic bags

Stakeholders	Limited ban	Economic instruments	Awareness campaign
		this money will be invested, enforcement mechanisms.	
Governmental and other organizations	0	++	++
	Only at local level.	High effectiveness – lessons learned from other countries. Direct correlation with the Directive 2015/720.	Part and parcel of a policy against plastic bags.
Environmental NGOs	0	++	++
	No clear outcome – too few inputs.	High effectiveness – lessons learned from other countries and Alonnisos.	Part and parcel of a policy against plastic bags.

As one can see in the previous table the deposit-refund system is not included. As I mentioned above, I did not examine the deposit-refund system as an alternative option for the reduction in the consumption of plastic bags but as a cause to collect inputs useful for me to draw further conclusions regarding the waste management of plastic bags in Greece. Therefore, here, I have to mention that the assumption that deposit-refund systems are not a good option for plastic bags was also verified by the majority of the interviews. However, I would like to point out that some of the interviewees mentioned that the concept behind the deposit-refund system can also be used in the pre-consumer phase, since supermarkets can incentivize consumers to give up plastic carrier bags by offering them discounts, gifts etc.

Table 4-2 sums up the risks emerged by the alternative measures based on the information collected from the interviews and the lessons learned from other countries. There is a special column that points out the stakeholders that are mainly affected in every case.

Table 4-2: Risks emerged by the alternative measures

Risks	Who is affected	Policy measure	Interviews with stakeholders	Lessons learned from other countries
Loss of jobs directly or indirectly associated with plastic bag production	Plastic bag producers Companies associated with them (transporters, importers, machine manufacturers etc.)	In every alternative option	✓	✓
Unbalanced market conditions If plastic bag producers switch to other products, the other plastic producers will be affected as well.	The total of plastic producers	In every alternative option	✓	
Shut down of SMEs The SMEs have reduced resources (people, money) to start on a new market on time, so the larger companies will do it faster and it may be very difficult for SMEs to find customers.	Plastic bag producers that are SMEs	In every alternative option	✓	
Shut down of businesses	Plastic bag producers	In every	✓	✓

Risks	Who is affected	Policy measure	Interviews with stakeholders	Lessons learned from other countries
Companies that have made investments in the production of plastic bags in the last years, they may face higher risk.		alternative option		
Black market	Resulted in a loss of money for the state and unfair competition for plastic bag producers	(Limited) ban Economic instruments	✓	✓
Offenders	State and law abiding businesses (producers and retailers). It is higher the risk in the case of street markets and really small retailers, where salesmen cannot stand increasing their prices in any way.	(Limited) ban Economic instruments	✓	✓
Problematic operation of the Fund	State since it will affect the effectiveness of the measure. (secondarily) Retailers since they will be part of the collection process.	Economic instruments	✓	✓
Considerable increase of alternatives – not necessarily better than lightweight plastic carrier bags (e.g. paper bags, thicker plastic bags)	Environment State (accomplishing some targets and failing others)	(Limited) ban Charge at the point of sale.	✓	✓

Tables 4-3 and 4-4 summarise the costs and the benefits associated with the alternative measures for the reduction in the consumption of plastic bags as they have been monitored by the interviewees. The estimation of the expenses is based on interviews and lessons learned from other countries.

Table 4-3: Costs associated with alternative measures

Costs	Who is charged with them?	Estimation of the expenses (high, medium, low)
Advertising costs	State has the main responsibility but retailers could help financially and managerially. Other organizations (HE.R.R.Co.), NGOs and consumer associations could be part of this effort as well.	Low (especially if it shared among stakeholders) An awareness campaign should be organized prior to and after the implementation of any measures on a continuous basis (success factors). Part and parcel of any alternative policy option.
Administration costs (people, resources)	State. In the case of a Fund: the manager of the Fund (governmental or a 3rd	Low in the case of a ban – straightforward process. Large - In the case of an economic instrument. Especially, when a Fund is established because of the operations associated with the revenues (collection, investments of the collected money). Keep in mind

Costs	Who is charged with them?	Estimation of the expenses (high, medium, low)
	party organization)	that there are thousands retailing points, so the collected money requires costly logistics.
Enforcement costs	State. Local authorities could be responsible (police, tax office) – they know better the local conditions.	Low if existing employees get involved. In the case of a (limited) ban they should make sure that the ban is enforced. In the case of an economic instrument they should make sure that the levy is charged.
Implementation costs (computers, development of special computer programs)	State. In the case of a Fund: the manager of the Fund (governmental or a 3rd party organization)	High in the beginning. Their maintenance cost is low. Similar costs for a ban and an economic instrument, since in both cases two important records should be organized, i.e. record of producers = quantities placed on the market, record of retailers = consumed quantities In the case of a Fund an extra cost associated with the monitoring of the raised money.
Incentives to businesses (retailers, producers) for the successful implementation of the measures	State. Subsidies, tax incentives, finance R&D projects	Medium (depends on government's general priorities)
Revenue collection & reporting (book keeping, logistics changes – code on bags)	Retailers	Low (especially if it is integrated in the VAT system) Only in the case of a charge at the point of sale.
Investments	Plastic bag producers Loans, R&D and market studies for the production of new products	Medium (depends on the size of the business and its marketing plan)

Table 4-4: Cost savings associated with alternative measures

Cost savings	Who saves money in the case of the accomplishment of high reduction rates (successful implementation of any measure)?	Estimation of the savings (high, medium, low)
Plastic bag purchase reduced or foregone	Retailers	High
Additional sales of alternatives	Retailers	Medium
Clean-up costs	State. Local municipalities.	High (plastic bags is a big part of littering). It has to be mentioned though that this cost is very difficult to be determined and in the case of Greece I did not manage to find a related estimation (most possible there are no available data).
Waste management costs (collection, transportation, disposal)	State. Local municipalities.	Low (plastic bags is a small part of the total waste stream)

Table 4-5 presents the factors that seem to be determinant for the successful implementation of a policy on the plastic bag issue in the case of Greece. In particular, the affected stakeholders based on their experience pointed out some factors that were added to the list of success factors that I monitored from the study of the lessons learned from other countries.

Table 4-5: Success factors - the case of Greece

Success factors	Interviews with stakeholders	Lessons learned
Acceptance of the applied measures from the total of stakeholders – give them incentives	✓	✓
Awareness campaign: adjusted campaigns targeted to different age group of consumers as well as campaigns for the rest stakeholders	✓	✓
Awareness campaign: prior to the implementation of the measure(s) and after that on a continuous basis	✓	✓
A holistic approach – the improvement of waste management in general	✓	
Educational campaigns	✓	
Engagement of local stakeholders	✓	
Effectiveness of enforcement mechanisms	✓	✓
Gradual implementation of any measure(s)	✓	
Horizontal implementation of the measures	✓	✓
In the case of a Fund <ul style="list-style-type: none"> • Transparency • Publishing of related info 	✓	✓
Offering alternatives at reasonable prices	✓	✓
Readiness of the market (e.g. available standards, investments)	✓	✓
Taking into account special characteristics of Greece	✓	✓

5 The Policy Evaluation

5.1 Objectives for this Policy Evaluation

The objectives of this policy evaluation are built upon the aim of this thesis. The aim of this thesis is to examine whether or not there are both environmentally sound and efficient measures for the reduction in the consumption of plastic bags in Greece in short term (within the scope of the Directive), having in mind though that it is an extra advantage if these measures give incentives for improvements beyond the targets of the Directive. So taking into account the requirements of the Directive, the priorities of Greece regarding the waste management in the next years and external factors such as market signals, technological changes and state-of-the-art concepts, i.e. circular economy, SCP, ISWP, increasing bio-based market, I ended up with the following objectives:

Environmental objectives: i) Directive's objectives: a) to reduce the consumption of plastic carrier bags (90 plastic bags per person per year by 2019 & 40 by 2025), b) to protect marine environment, reduce littering, increase resource efficiency, c) to raise public awareness (incl. environmental problems, waste hierarchy), d) not to increase the consumption of alternative packaging, **ii) National objectives:** the achievement of 2020 targets (NSWMP).

Financial objectives: a) To find the right balance among financial, social and environmental aspects, b) To minimize the risk for the loss of jobs and the shutdown of businesses.

Other objectives: To align society with sustainable development and increased well-being.

The aforementioned objectives formulated the policy evaluation criteria, the definitions of which are mentioned in the Table 3-3:

Environmental effectiveness: This criterion examines which measure(s) have the highest possibilities to fulfil the environmental objectives of a policy. The environmental objective of the examined policy is to prevent waste generation in the case of plastic bags in order to protect marine environment, reduce littering and increase resource efficiency. At the same time according to the Directive's objectives the proposed measure should not increase the consumption of alternative packaging, since also the unreasonable consumption of other carrier bags could lead to negative environmental impacts. Here, I will take into account the risks (see Table 4-2) that can affect the implementation of the measure(s) and so the environmental effectiveness.

Cost-effectiveness: This criterion examines whether or not each alternative measure is possible to achieve the environmental objective keeping a balance between social, financial and environmental costs. Here, I will compare costs and savings based on the Tables 4-3 and 4-4.

Equity: This criterion examines how the costs and benefits (not only financially) are distributed among the affected stakeholders and if the stakeholders have the opportunity to get involved in the design of each policy. Here, I will examine who loses and who gains most based on risks, costs and savings (see Tables 4-2, 4-3 and 4-4).

Political and social acceptability: This criterion examines whether or not the measure(s) are possible to gain the acceptance of the society in its totality. Here, I will use my estimations for

stakeholders' views (see Table 4-1) and I will assume how the different stakeholders may react based on lessons learned from other countries.

Incentives for improvements: This criterion examines whether or not the examined measure(s) give incentives to key stakeholders (state, producers and retailers) to improve their environmental performance. Here, I will focus more on how these measures can be used by the government in order to fulfil their waste management targets by 2020 and whether these measures can boost state-of-the-art concepts such as sustainable plastics.

5.2 Alternative Policy Measures

During the interviews I chose to examine the general categories of the alternative policy measures for the reduction in the consumption of plastic carrier bags (bans, economic instruments, and awareness campaigns) in order not to concentrate on technicalities but to monitor general issues (risks, associated costs, success factors, stakeholders' positions).

However, here a more focused approach is demanded. For that reason, I went back to Table 2-5 with the most applied measures in order to see which ones are worth examining in the case of Greece.

First of all, I rejected to examine an outright ban for two reasons. Initially, it is a policy option that can derogate the Article 18 "Freedom to place on the market" of Packaging Directive and secondly it is not a good option according to SCP concept since it forces a sudden change (stop of the production) in a business sector that currently offers jobs and important cash flows in the Greek economy.

A limited ban on thinner than μm plastic bags is rejected as a very simplified approach. Lessons learned from other countries have shown that a limited ban usually fails because of ineffective enforcement mechanisms, which is an existing risk in Greece, as well. Plus, there is no incentive for retailers to enforce it in a right way since thicker bags are more expensive and so it is more costly for them to offer these bags for free.

A limited ban on lightweight plastic carrier bags other than 100% bio-based bags faces the same risks as the previous example. I believe though that it is an interesting case to be examined, since it seems to be the new trend among the alternative measures in EU (Italy (2011), France (2016)) and the bio-based market is a new promising and fast growing market at global level.

A tax paid by producers is rejected since its environmental objective is different from the environmental objective of the examined policy. A tax imposed on producers aims mainly to reduce the amount of plastic (raw material) used for the manufacture of the bags and not to reduce the consumption of plastic bags at consumer level. However, a tax on producers could also be used as an extra tool from the government to push producers give up the production of plastic bags and start exploring other opportunities, but it should be combined with another measure in order for the environmental objective to be achieved.

A tax paid by consumers is rejected as difficult to happen in the case of Greece, since last years in Greece a significant number of taxes have been imposed and so citizens are negatively minded. The basic differences between a tax and a charge (as I see it) are that in the case of a charge not necessarily the government but also another third party can be responsible for the management of the money, it is explicitly known where the money will end up and how they will be invested, whereas they are used mainly to cover the needs of the same project. On the other hand a tax could be used from the government for any purpose.

A charge on lightweight plastic carrier bags paid by consumers at the point of sale will be analysed since lessons learned from other countries (i.e. the Irish PlasTax) have proven that a charge can be highly effective and reach the goals. Besides, analysing the case of Greece and Directive's suggestions, I realized that a charge paid by consumers at the point of sale seems to be the most possible option, because Greece has not many chances to fulfil the 2019 Directive target (90 bags per year) since according to 2015 data the average number is 363 plastic bags per Greek per year. In that case the Directive's alternative is for Greece to adopt measures to ensure that plastic bags are not provided for free at the point of sale by the end of 2018.

Finally, an awareness campaign is rejected as insufficient to reach policy's objectives independently, but in my analysis I assume that it constitutes a part and parcel of any policy applied on the plastic bag issue (advertising costs).

Now, examining the lessons learned from other countries I realized that most of the times a combination of measures and not an independent measure is applied. For that reason, I decided also to examine two combinations of measures that have been applied by other countries and seem to have possibilities to reach the targets in the case of Greece, as well:

- a limited ban on thinner than 30 μm plastic carrier bags accompanied by a charge paid by consumers at the point of sale, since lessons learned have proven that a limited ban has the potential to reach high environmental effectiveness but some emerging risks create burdens that an economic instrument may overcome, and
- a tax on producers accompanied by a charge paid by consumers at the point of sale, since as I said above only a tax on producers does not reach the environmental objectives of the examined policy but it could make it if it is combined with a charge at the point of sale.

5.3 Evaluation of Alternative Policy Measures

5.3.1 Limited ban on lightweight plastic bags other than 100% bio-based bags

Environmental effectiveness

This measure reaches a 100% reduction of lightweight plastic carrier bags, but it places a substitute on the market. As a result, if consumers do not change their way of thinking, carrier bags will still end up in the environment. Right now, in Europe the only available standard for bio-based bags is EN 13432 for industrial composting, meaning that if these bags end up in the environment, they will still result in littering since they demand special conditions in order to biodegrade. In short term, Greece is not ready for that, since Greeks are not used to composting³¹, there is no separate stream for organic waste and there are only 4 plants³² that can process organic waste at national level. In long term, 40% by weight of compostable waste has to be composted by 2020 according to the NSWMP. As a result, the target has been set and Greece plans to promote composting. So if in the next years an awareness campaign informs citizens how to treat organic waste and the right infrastructure is into place, there will be effective ways to treat bio-based bags and as a result littering and the other environmental problems will reduce. However, some risks have to be taken into account:

³¹ They compost less than 4% of generated organic waste (2013 data).

³² 4 MBTs (2013 data)

- People could think that this type of bag is environmental friendlier so it is approvable to throw it away and the littering could increase even more.
- Black market for the banned products may be created, especially if bio-based bags are very expensive and there are not alternatives at reasonable prices on the market.

*I think that the environmental effectiveness of this measure is highly dependent on a series of factors: how effectively consumers will get informed, how fast Greece will organize a separate stream for organic waste and when the bio-based market will be ready to flower in Greece. Italy and France have already implemented related policies but since they are comparatively new, no clear outcome about their environmental effectiveness exists. In total, I consider that the environmental effectiveness of this measure will be **MEDIUM**.*

Cost-effectiveness

- State
 - Advertising costs: Low. It can be even lower if they collaborate with retailers.
 - Administration costs: Low – a ban is a straightforward process.
 - Enforcement costs: Low. This responsibility can be taken by local authorities (police), so existing employees can do it.
 - Implementation costs: Medium. They will be high in the beginning since the development of computer programs is demanded (record of producers and retailers), but the maintenance of them does not cost a lot.
 - Incentives to businesses: It depends on government's priorities. They can offer help (e.g. subsidies, tax incentives) to businesses to produce bio-based packaging and/or invest in R&D projects in order to support the new sector. Here, it has to be mentioned that incentives to one sector over another may be considered as an infraction of the EU competition law, so it is not possible for the government to jeopardize it, especially if promoting of the bio-based sector is not within its priorities.
 - Savings from reduced clean-up costs: High if the measure is applied successfully.
 - Savings from the management of less waste: Low since plastic bags is a small part of the total waste.
- Producers
 - Investments: High. Producers will be obliged to spend a considerable amount of money for R&D and market studies on the potential of bio-based bags or other products to supplement their lost production.
 - If they start to produce other products and they do not manage to adapt soon, they will be obliged to fire employees, their turn-over will drop, some of them may shut-down.
 - The risk is higher for: a) SMEs that do not have R&D department and money to be prepared for the upcoming changes on time, and b) companies that have invested money in the production of plastic bags in the previous years and they did not have time to take them back.
 - Companies that collaborate with them are in danger, too.
 - If they start to produce 100% bio-based bags:
 - Some of them have machines that are able to manufacture these bags; others have to buy the machines.
 - The bio-based raw material is three times more expensive than the raw material for plastic bags and also these bags are heavier (13 g) than conventional plastic bags (8 g), so finally they are even more expensive because it is demanded more raw material per bag.

- Revenues: There are predictions that bio-based market will be tripled by 2020 (see chapter 2.4.7), which means that their raw material will be available at reasonable prices soon. As a result, the price per bag will drop and their sales will increase. However, when this will happen is unknown and by then the sales of these bags are anticipated to be low. Besides, it is given that there are other countries that have already invested a lot of money in this sector so Greek producers will not have a competitive advantage over them either in the internal or in the external market.
- Retailers
 - Advertising costs: Low
 - Purchase of bags: Low. I consider that since the price per bag will be very high, they will have no choice from passing the cost onto consumers.
 - Revenues from increased sales of alternatives: Medium. Normally, after the awareness campaign more people will get informed and start buying the emerging alternatives.

*Given that the environmental effectiveness is anticipated to be medium, and the implementation of this measure demands a series of high investments especially from producers and the government, I consider that the cost-effectiveness will be **LOW**. Even if the examined ban is applied in some years from now - plastic bag producers will have time to adapt to the new conditions and the bio-based market will be more mature at EU level - the aforementioned costs will be lower but still considerable.*

Equity

State and producers are called to make a series of changes compared to a business-as-usual scenario.

- State: The deduction gains minus costs will give a positive result if the implementation of the measure is successful. However, the unprepared market conditions will oblige them to invest a lot of money in order to create a bio-based market.
- Producers: They have to invest a lot of money in order to expand in a new market (bio-based or other products). Plus, a new market is strongly connected with higher risks.
- Retailers: If they have to purchase bio-based bags, the costs will be high, but they can pass the cost onto consumers.

*In total I consider that the equity of this measure will be **LOW**. Producers seem to be affected more.*

Political and social acceptability

- State: Negative. The government knows all the aforementioned difficulties and they are not ready to overcome them, since this demands a lot of money and the outcome will be uncertain. They cannot risk increasing the unemployment rates especially in a sector that offers jobs and important cash flows in the economy. Besides there is no competitive advantage since other EU countries have already invested a lot in this sector, so it will be difficult to sell this proposal to the other political parties. However, the government wants to fulfil the NSWMP targets and so this measure can give an extra push for the establishment of i.e. more industrial composting units.
- Producers: Negative. Industry is not ready to invest in this new sector immediately. However, producers have already realized that bio-based products are not just in fashion but a trend that is growing more and more. They are positive to invest in it, but they need time. The main reason is that the raw materials are very limited now and so very

expensive. They are willing to engage in this market in the next years, and they will be even more willing if the government will support them financially.

- Retailers: Negative. They will be hesitant since they are not sure if these bags are durable as the plastic bags and they are much more expensive than the conventional plastic bags, so most of them cannot offer them for free³³.
- Consumers: Negative. They will get confused since there are many new terms that do not understand and they will need time for that.
- NGOs: Negative. They will be negative for an immediate implementation since there is no available infrastructure so these bags are likely to end up in the nature with all the aforementioned negative environmental impacts.

*In total, I consider a **VERY LOW** political and social acceptability. This outcome may be much higher though in some years from now.*

Incentives for improvement

- State: High. They should invest in R&D projects for bio-based products and in the establishment of industrial composting.
- Producers: High. It is a survival issue for them to adapt on time to the new conditions.

*I consider that this measure can generate **VERY HIGH** incentives for improvements both to producers and the government.*

5.3.2 Charge paid by consumers at the point of sale

Environmental effectiveness

Lessons learned from other countries have proven that the imposition of a price on plastic bags can reduce significantly their consumption and as a result littering will drop. Also, a higher price seems to discourage more a consumer to buy a bag.

However, some risks have to be taken into consideration:

- Loose enforcement mechanisms will give the chance to some retailers to continue offering them for free. For example, the competitive advantage of salesmen at street markets is their low prices, for that reason they will not accept easily the imposition of a price on plastic bags in order to keep the shopping bill low.
- Consumers will get used to the charge after the initial shock, so if they do not connect plastic bags with the environmental problems, they will start consuming them again. For that reason, an awareness campaign on a continuous basis is demanded.
- The imposition of different prices among the retailers can confuse consumers.

*If the government manages to control these risks, the environmental effectiveness of this measure will be **HIGH**. Lesson-learned from other countries have shown that it is possible to apply this policy measure in a successful way, so I consider that this measure will be highly environmental effective.*

³³ According to Mrs. Sotiropoulou (personal communication) a bio-based bag costs 0.09 euro (2016). The price of a conventional bag is about 0.01 to 0.02 euros.

Cost-effectiveness

To point out, here, that a charge is not necessarily a cost in the societal perspective, since if it is comparable with the purchase cost of a bag, it is just a transfer of the purchase cost from retailers to consumers. This is not the case if the charge is much higher. Also, to mention that I assume the parallel establishment of a Fund to manage the collected revenues, since this is the most usual scenario as the lessons learned from other countries have shown. This Fund can be held by a governmental or a third party organization. Finally, I assume that retailers have agreed with the government to keep the amount of the charge that equals to the purchase cost of a bag.

- State
 - Advertising costs: Low. It can be even lower if they collaborate with retailers.
 - Administration costs: Large. People and resources responsible for the collection of the revenues and how these revenues will be invested.
 - Enforcement costs: Low. This responsibility can be taken by local authorities (tax office), so existing employees can do it.
 - Implementation costs: Medium. They will be high in the beginning since the development of computer programs is demanded (record of producers, record of retailers, monitoring of money), but the maintenance of them does not cost a lot.
 - Incentives to businesses: Medium/High. The government has to support businesses that are willing to invest in R&D projects and adapt their production in the new market conditions. However, how much money the government is willing to spend on that depends on their priorities.
 - Savings from reduced clean-up costs: High if the measure is applied successfully.
 - Savings from the management of less waste: Low since plastic bags is a small part of the total waste.
 - Collected money from charges
- Producers
 - Investments: Medium
 - Low if they decide to continue producing plastic bags.
 - High if they decide to supplement their lost production with other products. They have to spend a considerable amount of money for R&D and market studies on the potential of new products.
 - Revenues from plastic bags: Low
 - They will sell fewer bags if the measure is successfully implemented.
- Retailers
 - Advertising costs: Low
 - Purchase of bags: Zero. In the case that they will agree with the government to keep a share from the revenues to cover their purchase costs.
 - Revenue collection and reporting (book keeping): Low. Especially, if the charge is integrated into the VAT system.
 - Revenues from increased sales of alternatives: Medium, normally after the awareness campaign, more people will get informed and start buying the emerging alternatives.

*This measure seems to be **HIGHLY** cost-effective since most of the costs can be covered from the revenues or from mechanisms and employees that the government has. Here, I have to mention once again that I assumed the foundation of a Fund run by the government or from a third non-governmental organization, since in most countries around the world this approach has been chosen. However, in the case of a charge the money could also be kept and managed by retailers (i.e. the case of England).*

Equity

- State: Financial and managerial costs. The collected money balanced the emerging costs.
- Producers: If the implementation is successful, producers will lose a big part of their revenues and are called to shift their production to other products. This loss of production is connected with a series of risks (see Table 4-2).
- Retailers: They have to change their routines.

*All the involved stakeholders are called to make changes. However, given the fact that the environmental effectiveness of this measure is considered high, producers may lose a considerable amount of their production and so they will face a series of risks. These risks may lead them even to shut down their businesses, so producers face the highest risk. Therefore, I consider that the equity of this measure is **MEDIUM**.*

Political and social acceptability

- State: Positive. It will be easy to support it since there are some really successful examples abroad and the imposition of an economic instrument suits better with the Directive's requirements.
- Producers: Negative. They may recognize the environmental effectiveness of this measure but they will consider it really bad for their enterprises.
- Retailers: Neutral. In general, for retailers it is a good option, since they will get rid of a significant cost. However, large retailers will demand an extensive awareness campaign with clear messages since they do not want to take the blame for the implementation of this charge on consumers. For SMEs this measure will be even better for the same reasons. But for street retailers, kiosks, bakeries (really small retailers) this option is not feasible. Their competitive advantage is their low prices, so they do not want to charge their customers with extra costs. In addition to that, their business is organized in a different way in comparison with a supermarket; it is much more complicated for them to collect money etc.
- Consumers: Neutral. The biggest challenge here is consumers' reactions. In the last years the lack of transparency and the financial recession has made Greeks think that any levy will be used to cover fiscal gaps. The only way to make them accept this measure is an extensive awareness campaign focusing on making them allies in this effort, e.g. how the Fund operates, how the money will be invested, the progress of the measure etc. It is worth mentioning though that one of the biggest retailer brands, Lidl Hellas, charges for a plastic bag the last years, so a charge is not something completely new for Greek consumers.
- Environmental NGOs: Positive. NGOs will be in favour of a price on plastic bags recognizing that it is a horizontal way to inform all the citizens about the environmental issues associated with plastic bags and that experiences from other countries have proven that this is a highly environmentally effective option.

*In total, I consider that this measure will have a **MEDIUM** political and social acceptability. There are stakeholders that are in favour of and others that are against this measure and at the same time the reactions of two important stakeholders (retailers and consumers) are controversial.*

Incentives for improvement

- State: Medium. It is an opportunity to promote waste hierarchy and the prevention targets of waste management in general. In addition to that, the government could invest in R&D

projects and give incentives to producers to overcome the difficulties moving towards environmentally friendlier products.

- Producers: Medium. Their production is anticipated to drop significantly and they have to invest in new products and technologies in order to overcome the difficulties. However, if they make changes towards a more environmental friendly direction depends on their personal interest.
- Retailers: High. It is an opportunity to take advantage of this measure and upgrade their environmental profile adopting other environmental actions, as well.

*In total, I consider that this measure can generate **MEDIUM** incentives for improvement, since these incentives are strongly associated with the environmental profile and the personal choices of the stakeholders.*

5.3.3 Limited ban on thinner than 30µm plastic carrier bags and a charge on thicker bags paid by consumers at the point of sale

Environmental effectiveness

Right now in Greece supermarkets offer plastic bags thinner than 20µm and the majority of smaller retailers offer even thinner bags in order to save money. These bags are very light, difficult to be collected and recycled, having a significant share to littering. As a result, a ban on them accompanied with an awareness campaign, the promotion of alternatives and the reuse of thicker bags could improve rapidly the current situation.

However, some risks should be counted:

- Producers can just shift their production to thicker bags and consumers will not understand any difference.
- Black market for the banned products may be created, especially if the alternatives are expensive.
- Retailers may violate the law if they are obliged to offer thicker plastic bags that are more expensive.

These risks can be avoided with the imposition of a charge on plastic bags that will work as: a) a horizontal way for all the consumers to get informed for the changes and b) an incentive for retailers to enforce the law in a right way since they will get rid of the purchase cost. However, an extensive awareness campaign is more than necessary since it is more complex to explain a combination of measures to consumers. Furthermore, a horizontal implementation (standard price) among all the retailers will reduce the confusion.

*I consider that the environmental effectiveness of this policy option will be **VERY HIGH** if the enforcement mechanisms work in a proper way.*

Cost-effectiveness

To mention once again that I assume the parallel establishment of a Fund to manage the collected revenues, since this is the most usual scenario as the lessons learned from other countries have shown. This Fund can be held by a governmental or an independent no-governmental organization. Finally, I assume that retailers have agreed with the government to keep the amount of the charge that equals to the purchase cost of a bag.

- State
 - Advertising costs: Low. It can be even lower if they collaborate with retailers.

- Administration costs: Large. People and resources responsible for the collection of the revenues and how these revenues will be invested.
- Enforcement costs: Low. This responsibility can be taken by local authorities (police and tax office), so existing employees can do it.
- Implementation costs: Medium. They will be high in the beginning since the development of computer programs is demanded, but the maintenance of them does not cost a lot.
- Incentives to businesses: Medium/High. They have to help (subsidies, tax incentives) businesses that are willing to invest in R&D projects in order to explore new opportunities. However, how much money the government is willing to spend on that depends on their priorities.
- Savings from reduced clean-up costs: High if the measure is applied successfully.
- Savings from the management of less waste: Low since plastic bags is a small part of the total waste.
- Collected money from charges
- Producers
 - Investments: Medium
 - Low if they decide to continue producing plastic bags.
 - High if they decide to supplement their lost production with other products. They have to spend a considerable amount of money for R&D and market studies on the potential of new products.
 - Revenues from plastic bags: Low
 - They will sell fewer bags if the measure is successfully implemented.
- Retailers
 - Advertising costs: Low
 - Purchase of bags: Zero. In the case that they will agree with the government to keep a share from the revenues to cover their purchase costs.
 - Revenue collection and reporting (book keeping): Low. Especially, if the charge is integrated into the VAT system.
 - Revenues from increased sales of alternatives: Medium, normally after the awareness campaign, more people will get informed and start buying the emerging alternatives.

*The cost-effectiveness of the measure is considered **HIGH** in the case that the environmental effectiveness will be high, as well, since the raised revenues and the emerged savings will cover the costs.*

Equity

- State: The deduction gains minus costs will give a positive result if the implementation of the measure is successful.
- Producers: If the implementation is successful, producers will lose a big part of their revenues and are called to shift their production to other products. Here, they do not have plenty of time to adapt as in the case of just a limited ban.
- Retailers: They have to change their routines.

*I consider that producers are called to make more changes than the other stakeholders since this combination of policy measures targets all the lightweight plastic carrier bags and they oblige them to replace them as soon as possible in order to survive. As a result, I believe that the equity of this policy option is **MEDIUM**.*

Political and social acceptability

- State: Positive. The main problem of the limited ban is that it is not certain if it fulfils the environmental objective that the examined policy sets. However, the combination with an economic instrument is anticipated to tackle this issue. So it will be easier for the government to support this measure. Plus, the imposition of an economic instrument suits better with the Directive's requirements.
- Producers: Negative. This option obliges them to make changes as soon as possible; it does not give them plenty of time to adapt to the new reality.
- Retailers: Neutral. As I said above, for retailers it is a good option, since they will get rid of a significant cost. However, large retailers will demand an extensive awareness campaign with clear messages since they do not want to take the blame for the implementation of this charge on consumers. For SMEs this measure will be even better for the same reasons. But for street retailers, kiosks, bakeries (really small retailers) this option is not feasible. Their competitive advantage is their low prices, so they do not want to charge their customers with extra costs. Besides, their business is organized in a different way in comparison with a supermarket; it is much more complicated for them to collect money etc. Finally, in this case except from a charge it is also imposed a ban, which means that retailers have to be able to offer a big variety of alternatives at reasonable prices.
- Consumers: Neutral. In the beginning they may be negative, since their convenience will be disrupted. Additionally, they do not trust the enforcement mechanisms and the financial recession has made them think that any levy will be used to cover fiscal gaps. However, an extensive awareness campaign could reverse the initially negative reactions and make them allies to this effort. Nevertheless, one of the biggest retailer brands, Lidl Hellas, charges the plastic bags the last years, so a charge is not something completely new for them.
- Environmental NGOs: Positive. NGOs are in favour of a price on plastic bags recognizing that it is a horizontal way to inform all the citizens about the environmental issues associated with plastic bags and that experiences from other countries have proven that this is a highly environmentally effective option. Plus, thicker plastic bags are reused many times, recycled in a better way and are collected easily in the unfortunate case that they will end up in the environment.

*All in all, I consider that this option will meet strongly negative and strongly positive reactions, so the total political and social acceptability will be **MEDIUM**.*

Incentives for improvement

- State: Medium. It is an opportunity to promote waste hierarchy and the prevention targets of waste management in general. In addition to that, the government could invest in R&D projects and give incentives to producers to overcome the difficulties moving towards environmentally friendlier products.
- Producers: Medium. Their production is anticipated to drop significantly and they have to invest in new products and technologies in order to overcome the difficulties. However, if they make changes towards a more environmental friendly direction depends on their personal interest.
- Retailers: High. It is an opportunity to take advantage of this measure and upgrade their environmental profile adopting other environmental actions, as well.

*In total, I consider that this measure can generate **MEDIUM** incentives for improvement, since these incentives are strongly associated with the environmental profile and the personal choices of retailers and producers.*

5.3.4 Tax on producers and charge on lightweight plastic carrier bags paid by consumers at the point of sale

With the term producers I take into account manufacturers and importers (see Appendix I).

Environmental effectiveness

The case of Denmark shows that a tax imposed on producers accompanied by charges paid by consumers at the point of sale can reduce significantly the consumption of plastic bags. Back then, the initial aim of policy makers was to reduce the amount of plastic (raw material) used for the manufacture of the bags and not to reduce the consumption of plastic bags at consumer level. However, producers passed on the cost to retailers and retailers to consumers and, given that these charges have been imposed since 1990s, nowadays the consumption has dropped to only 4 plastic carrier bags per person per year.

In other words, a tax on producers can be used as an extra tool from the government to push producers to give up the production of plastic bags and start exploring other opportunities. Additionally, if it is combined with a charge, it can also lead to the reduction in the plastic bag consumption. Now, if the imposition of a charge is legislated and not voluntary, the effectiveness may be enhanced, since a legislated imposition is accompanied by a national awareness campaign and it is controlled by state's enforcement mechanisms. Finally, if the implementation is horizontal and the charge on bags is standard, all the consumers will receive the same information and the charge will work as an informative tool, as well.

*As a result, I assume that the environmental effectiveness of this measure will be **HIGH**.*

Cost-effectiveness

To mention once again that I assume the parallel establishment of a Fund to manage the collected revenues, since this is the most usual scenario as the lessons learned from other countries have shown. This Fund can be held by a governmental or an independent no-governmental organization. Finally, I assume that retailers have agreed with the government to keep the amount of the charge that equals to the purchase cost of a bag.

- State
 - Advertising costs: Low. It can be even lower if they collaborate with retailers.
 - Administration costs: Large. People and resources responsible for the collection of the revenues and how these revenues will be invested.
 - Enforcement costs: Low. Local authorities (tax office) can take this responsibility.
 - Implementation costs: Medium. High in the beginning, but the maintenance does not demand a lot of money.
 - Incentives to businesses: High. They have to help (subsidies, tax incentives) businesses that are willing to invest in R&D projects in order to explore new opportunities.
 - Savings from reduced clean-up costs: High if the measure is applied successfully.
 - Savings from the management of less waste: Low since plastic bags is a small part of the total waste.
 - Tax revenues
 - Collected money from charges

- Producers
 - Tax: Medium. They are called to pay an extra tax. However, it is almost certain that they will pass on the cost to retailers and the price per bag will increase.
 - Reduced revenues from plastic bags since sales will drop.
 - Investments: Medium
 - Low if they decide to continue producing plastic bags.
 - High if they decide to supplement their lost production with other products. They have to spend a considerable amount of money for R&D and market studies on the potential of new products.
- Retailers
 - Advertising costs: Low
 - Purchase of bags: Zero. In the case that they will agree with the government to keep a share from the revenues to cover their purchase costs.
 - Revenue collection and reporting (book keeping): Low. Especially, if the charge is integrated into the VAT system.
 - Revenues from increased sales of alternatives: Medium, normally after the awareness campaign, more people will get informed and start buying the emerging alternatives.

*This measure is anticipated to be **HIGHLY** cost-effective since most costs can be covered from the collected money or from mechanisms and employees that the government has. Here, I have to mention once again that I assumed the foundation of a Fund run by the government or from a third non-governmental organization, since in most countries around the world this approach has been chosen. However, since here there are tax revenues and revenues from the charges, the government could simplify the procedure and let retailers manage the money. This decision depends though on the height of the charge and government's priorities. Of course, every case is different and only the governmental bodies have all the data in order to decide, but I have mentioned some alternative options in order to show that some tricky technicalities exist and may affect the general process.*

Equity

- State: Financial and managerial costs. The collected money balanced the emerging costs.
- Producers: If the implementation is successful, producers will lose a big part of their revenues and are called to shift their production to other products. The extra tax increases even more the pressure on them. Besides, retailers in order to avoid the increase in the price per bag may search for cheaper bags from black market and this will create unfair competition for producers making them more vulnerable. However, if the measures are accompanied by high incentives for the ones that are more willing to change their production, the transition will be easier. In addition to that, the imposed tax may give to them the excuse to increase a little bit their prices and gain some time to adapt to the new conditions.
- Retailers: They have to change their routines.

The first thought here is that clearly producers are targeted, but I consider that this not the case and producers may be able to take advantage of this option. For that reason I consider *the equity of this measure* **MEDIUM**.

Political and social acceptability

- State: Positive. It will be comparatively easy to support the imposition of a tax if they secure a highly environmental effectiveness. The parallel imposition of a charge can

contribute to that. Plus, a charge is a popular measure at a global level and suits better with the Directive's requirements.

- Producers: Negative. This combination of measures will be considered as a double attack towards producers and will not become accepted positively. However, the imposed tax may give them the excuse to increase a little bit their prices and gain some time to adapt to the new conditions.
- Retailers: Neutral. In general, for retailers it is a good option, since they will get rid of a significant cost. However, large retailers will demand an extensive awareness campaign with clear messages since they do not want to take the blame for the implementation of this charge on consumers. For SMEs this measure will be even better for the same reasons. But for street retailers, kiosks, bakeries (really small retailers) this option is not feasible. Their competitive advantage is their low prices, so they do not want to charge their customers with extra costs. Besides, their business is organized in a different way in comparison with a supermarket; it is much more complicated for them to collect money etc.
- Consumers: Neutral. Only the word tax can make them angry. In the last years the financial recession has made Greeks suspicious about government's intentions. So even if this tax is not directly imposed on them, it will not become easily approvable. As far as the charge paid by them, in the beginning they may be negative, since their convenience will be disrupted. Additionally, they do not trust the enforcement mechanisms and the financial recession has made them think that any levy will be used to cover fiscal gaps. However, an extensive awareness campaign could reverse the initially negative reactions and make them allies to this effort. Nevertheless, one of the biggest retailer brands, Lidl Hellas, charges the plastic bags the last years, so a charge is not something completely new for them.
- Environmental NGOs: Positive. NGOs are in favour of a price on plastic bags recognizing that it is a horizontal way to inform all the citizens about the environmental issues associated with plastic bags and that experiences from other countries have proven that this is a highly environmentally effective option.

*I see that there are many open issues per stakeholder that can lead to a positive or a negative reaction. However, since this combination could be considered as double attack towards producers, I consider that political and social acceptability will be **MEDIUM**.*

Incentives for improvement

- State: Medium. It is an opportunity to promote waste hierarchy and the prevention targets of waste management in general. Plus, the government could invest in R&D projects and give incentives to producers to overcome the difficulties moving towards environmentally friendlier products.
- Producers: High. Their production is anticipated to drop significantly and they have to invest in new products and technologies in order to overcome the difficulties. A tax on plastic bags may be an extra motivation to explore the new trends on sustainable plastics.
- Retailers: High. It is an opportunity to take advantage of this measure and upgrade their environmental profile adopting other environmental actions, as well.

*In total, I consider that this measure can generate **HIGH** incentives for improvement, since these incentives are strongly associated with the environmental profile and the personal choices of the stakeholders.*

5.4 Overview of the Policy Evaluation

According to my evaluation three out of the four examined policy options can be both environmentally sound and cost-effective on the condition that they are applied in a right way (minimization of the possible risks). As a result, which of these options will bring the best results depends on how the affected stakeholders will respond to them. Within the scope of this evaluation I attempted to predict how the affected stakeholders would react in every case but of course I made a series of assumptions since I do not know all the possible challenges and difficulties that each stakeholder could face. I tried though to have a comparatively conservative approach. Despite the fact that the following table compares the alternatives and the reader can understand the winner(s) per criterion, I decided not to end up with the best option based on all the criteria since this is not the aim of this thesis. My goal was to cite and synthesize the collected information through this evaluation so that both the reader would have the opportunity to understand how the situation can be formulated in each scenario and the policy makers would take advantage of the collected information and make the final political decision.

Table 5-1: Comparison of the alternative policy measures under analysis

	Ban on lightweight plastic bags except from bio-based bags (1)	Charge paid by consumers at the point of sale (2)	Ban on bags $\leq 30\mu\text{m}$ and charge at the point of sale(3)	Tax on producers and charge at the point of sale (4)
Environmental effectiveness	MEDIUM	HIGH	VERY HIGH	HIGH
Cost-effectiveness	LOW	HIGH	HIGH	HIGH
Equity	LOW	MEDIUM	MEDIUM	MEDIUM
Political and social acceptability	VERY LOW	MEDIUM	MEDIUM	MEDIUM
Incentives for improvement	VERY HIGH	MEDIUM	MEDIUM	HIGH

Now, the Directive 2015/720 does not give many alternatives to Member States that had not applied measures for the reduction in the plastic bag consumption before, since it sets very ambitious targets and tough timeframes. According to the Directive's targets, a charge paid by consumers at the point of sale seems to be the most straightforward choice for this group of countries. As the policy analysis shows, this option is a comparatively good solution in the case of Greece, as well. Nevertheless, if Greece wants to move the Directive's requirements a step forward, policy makers will have to examine also measures that will give incentives to the different stakeholders to improve over time and tackle the plastic bag issue once and for all. For example, options 1 and 4 seem to help towards this direction. In general, lessons learned from other countries have shown that there is no panacea for the reduction in the plastic bag consumption. The fact that one policy was successfully implemented in one place does not necessarily mean that it will be effective in another place. Each country has its own unique characteristics and they have to take them into account when they design and implement their policy. Finally, I have to point out that in the previous section there are arguments that have been repeated among the different options, since three out of the four examined measures include a charge. I chose to repeat the information in order for the reader to be able to read every case independently and not to go back and forth to formulate a clear picture. Also, in the Appendix V the policy evaluations of two measures that I had excluded in the beginning – limited ban on thinner plastic bags and tax on producers – are cited for a better understanding of the options 3 and 4 respectively.

6 Conclusions

6.1 Concluding Remarks

The aim of this thesis is to examine whether or not there are both environmentally sound and efficient measures for the reduction in the consumption of plastic bags in Greece within the scope of the Directive 2015/720, having in mind though that it is an extra advantage if these measures give incentives for improvements beyond the targets of the Directive. So taking into account the requirements of the Directive, the priorities of Greece regarding the waste management in the next years and external factors such as market signals and technological changes, alternative policy measures got evaluated using the following policy evaluation criteria: environmental effectiveness, cost-effectiveness, equity, political and social acceptability and incentives for improvement.

In order for this policy evaluation to be held, data regarding the waste management of plastic bags in Greece the previous years, the readiness of the market for changes and lessons learned from other countries were demanded. As a result, the following research questions were addressed:

- RQ1: What is the current status of the management of waste plastic bags in Greece?

In Greece most of the retailers offer lightweight plastic carrier bags (less than 20µm) for free. Every Greek consumes on average 363 plastic carrier bags per year and in most cases he also uses these bags as bin liners (interviews, personal observation), so the majority of them end up in landfills. According to the collected and analysed data (chapter 2.3.1) the majority of plastic bags end up indeed in landfills (about 66%), 24% of them is estimated to be recycled and the rest 10% ends up in the environment (littering) resulting in environmental and other problems (chapter 2.3.2). Examining the waste management of plastic bags a nodal point was that only about 100 large retailers pay a fee in HE.R.R.Co. for the quantities of plastic bags placed on the market. It is believed that the majority of SMEs that operate at local level either do not know their obligation to be part of a PRO or they do not participate in a system since they know that they are unlikely to be caught. It is indicative that according to data from IELKA (2011) there are 57 000 retailing points in Greece and only 4 400 of them are supermarkets, so it is very difficult for the enforcement mechanisms to control all these points. However, the last year five programs for the reduction in the consumption of lightweight plastic carrier bags have been applied at local level proving that the situation has started to change (chapter 2.3.3).

- RQ2: Which are the factors that can secure the successful implementation of a policy on the plastic bag issue in Greece?

Measures for the reduction in the consumption of plastic carrier bags have been applied in countries around the world the last two decades, so a country that attempts nowadays to implement a related policy has to take advantage of the lessons learned from other countries in order to avoid making the same mistakes. Studying some case studies from countries around the world, I found out that there are some factors that seem to secure the successful implementation of a policy on plastic bags (chapter 2.5.2.4). However, every case is different and so the lessons learned from others are not always sufficient. For that reason, via the interviews with the stakeholders I monitored factors that are thought to be able to affect the implementation of policy measures on plastic bags in the Greek context (chapter 4). In the end I summarized all these factors in Table 4-5.

- RQ3: Which are the policy measures that can reduce the plastic bag consumption in Greece?
 - RQ3(a): Are there alternatives that can be discarded because they do not have a chance to reach the goals or because they are impossible to enforce?
 - RQ3(b): Can any measures be both environmentally sound and efficient in the case of Greece?
 - RQ3(c): How will the affected stakeholders respond to these measures (political acceptability and equity)?

There was no point in examining all the alternative policy measures for the reduction in the consumption of plastic carrier bags, since some of them have much fewer chances of reaching the goals. For that reason, first of all, I excluded these measures (chapter 5.2) and I ended up examining four alternative policy options (chapter 5.3):

- Limited ban on lightweight plastic bags other than 100% bio-based bags (Option1)
- Charge paid by consumers at the point of sale (Option 2)
- Limited ban on thinner than 30 μ m plastic carrier bags and a charge on thicker bags paid by consumers at the point of sale (Option 3)
- Tax on producers and charge on lightweight plastic carrier bags paid by consumers at the point of sale (Option 4)

I examined each option independently, but in the end I created a common table (see Table 5-1). On this table one can see a comparison of the alternative policy options per criterion, but not the best option based on all the criteria. My goal through this evaluation was to synthesize the collected data (literature review and interviews) in order for the reader to have the opportunity to understand how the situation may be formulated in the different scenarios. According to my evaluation three out of the four examined policy options (options 2, 3, 4) can be both environmentally and cost-effective on the condition that they are applied in a right way (minimization of the possible risks). As a result, which of these options will bring the best results depends on how the affected stakeholders will respond to them. Within the scope of this evaluation I attempted to predict how the affected stakeholders would react in every case but of course I made a series of assumptions since I do not know all the possible challenges that a stakeholder faces. I tried though to have a comparatively conservative approach. Of course, the policy evaluation is a partly subjective process, since the final outcome depends on how I interpreted the collected information. For that reason, I do not aim to propose policy measures but to present risks, costs, benefits, challenges and opportunities per measure in an organized and easy-to-follow way in order for the policy makers to take advantage of this information.

All in all, I have to say that while I was writing this thesis I faced some challenges, but I tried to overcome them on time, so I strongly believe that they did not affect the outcome of my work. For example, I admit that the interview guide that initially I sent out to the interviewees was impractical and I had to change my approach as the work developed. In particular, the initial idea was to make them evaluate the alternative options using a numerical scale in order for me to have a direct way to compare them in the end. However, soon after the first interviews I realized that it was much more useful to conduct interviews in a less constructed way and monitor risks, costs and success factors that each stakeholder foresees for each measure according to his/her own experience, instead of stakeholders' direct positions on the alternative measures.

Finally, this thesis coincides with a period when the official discussions between the government and the affected stakeholders have just started and for that reason the next

months will be crucial. I strongly believe that this thesis brought together information that can help policy makers decide which policy measure has to be applied in the case of Greece and the rest stakeholders acquire a better understanding of the situation.

6.2 Recommendations

Taking into account the collected information and the outcome of the policy evaluation, I have made some recommendations to the main audience of this thesis: policy makers, producers and retailers.

For policy makers: a) Transfer the obligation of being part of a PRO from retailers to producers: As I mentioned above, the retailing points are too many and it is difficult for the enforcement mechanisms to control them. It is indicative that only about 100 large businesses pay a fee to HE.R.R.Co. for the quantities of plastic bags placed on the market. In practice these issues can be solved if the obligation passes from retailers to producers that are much fewer³⁴. Doing that the government secures not only PROs' levies, but also moves a step closer to the Directive, since it is highly possible for producers to pass the extra cost to retailers increasing the price per bag and retailers to pass on the cost to consumers. However, as I have already mentioned a non-horizontal implementation of a charge at the point of sale can create misunderstandings among consumers and for that reason I suggest there be a legislation of a minimum charge to avoid this possibility. **b) Take into account success factors and risks:** Policy makers should take the monitored success factors and emerged risks into account when they design a policy for the reduction in the consumption of plastic bags in order to ensure the smooth implementation of the measures. Especially, in the case of Greece I consider that the most crucial factors are two: how the enforcement mechanisms will operate and how supportive the key stakeholders (producers and retailers) will be. In particular, enforcement mechanisms should work properly and catch the offenders; Greece cannot stand the establishment of a black market resulting in loss flows of money for the state and unfair competition for the producers. Police and tax office can play a supporting role here. Additionally, an automatic way (online system) of monitoring the quantities placed on the market and the ones that retailers sell is necessary. Furthermore, the government should give incentives to retailers to enforce the measures in a right way. It is very important for the retailers to get rid of the purchase costs, so especially in the case of a charge retailers should keep a share from the levies in order to cover the purchase cost. Here, it is important not to forget very small enterprises (kiosks, bakeries etc.) and street salesmen that want to keep their prices low and may object to adding an extra cost to their customers. A straightforward way to engage smaller retailers is to give them special incentives (e.g. tax credits), but given the financial recession this is quite difficult, so the government should have consultations with their representatives and see together how they should proceed. As far as producers are concerned, they need time and incentives to replace plastic bags with other products. Let's keep in mind that the last years the competition from third countries has increased, so the implemented measures should not concern only Greek manufacturers, but also imports from third countries. **c) Give a try to the alternative policy measures:** The obvious choice for the government is to impose a charge paid by consumers at the point of sale; in doing so they will implement a measure which is anticipated to have a good performance given the lessons learned from other countries and is aligned with the Directive's requirements. However, the evaluation proved that there are also other policy options that can not only reach the Directive's targets but also give incentives for long-term improvements. It is given that it is difficult to implement a more complex policy option at a national level because of the

³⁴ Manufacturers are around 200. However, with the term producers I refer to importers, as well. All in all, I assume that manufacturers and importers are some hundreds and for sure less than retailers.

anticipated negative reactions from some stakeholders, but the government could try some of them at local level. Nevertheless, the successful implementation of an option in an area can create a positive precedent for other areas with similar characteristics. **d) Keep in mind the bio-based bags:** Throughout the text I pointed out how challenging the bio-based market is nowadays and that it is highly likely to evolve to a huge market in the near future. I believe that for Greece it is not feasible to get involved in this market right now. On the one hand the Greek government has to invest a lot of money in the establishment of a sector, where other countries have already made huge investments (no competitive advantage). Besides, Greece does not have the infrastructure to treat big amounts of bio-based products, so this is a step that should precede the establishment of the market. On the other hand the cost for Greek producers to invest right now in this market is too high, so no one is willing to move forward if government's support is not secured. However, the government and producers should keep in mind that this sector has the potential to boom within the next years and stay tuned with the technological news.

For producers: **a) Replace the production of plastic bags as soon as possible:** The objective of this Directive is clear: the consumption of plastic bags has to be reduced significantly within the next years and so it is highly likely that this reduction will lead to the reduction in the production of plastic bags, as well. The faster producers realize that and replace plastic bags with other products, the fewer impacts they will face. Undeniably, they have to demand time and incentives from the government in order to adapt successfully in the new conditions. **b) Innovate:** The ones that want to be frontrunners not only at national but also at EU level should engage in R&D projects in the field of sustainable plastics.

For retailers: **a) Get prepared for the upcoming changes:** Retailers cannot risk losing consumers' trust, for that reason they should push the government for an awareness campaign prior to and during the implementation of the measures. Besides, they should inform their own customers for the upcoming changes and place as many alternatives as possible on the market. **b) Offering incentives to consumers:** The concept behind the deposit-refund system can be used in the pre-consumer phase, as well, since supermarkets can incentivize consumers to give up plastic carrier bags offering them discounts, gifts etc. Some large retailers have already applied similar practices but they have not accompanied them with an extensive awareness campaign and so the majority of consumers are not informed.

6.3 Future Research

There is a series of open issues that can be examined in the future and enrich this research. First of all, it will be really useful, if the costs and benefits related to the alternative policy options are estimated in monetary terms. This is a very difficult task, since it demands a lot of data that currently may not exist or the responsible bodies are not willing to share, so it should have a long timeframe and engage public authorities. Secondly, an analysis of the behavioural changes in consumer patterns can give really interesting results for policy makers and retailers. In the chapter 2.4.1.3 I cited a study from IELKA that separates consumers into 4 groups and only from some basic characteristics I made a rough estimation about how consumers could react in the upcoming changes. This is just an indication about how a study like that can result in really useful outcomes. Third, a national-scale consumer survey about the predominant policy measures could give a clear picture about how consumers will react. Finally, the application of the measures, which I examined here, at local level (under similar conditions) can give real data and evaluate in practice which option is better.

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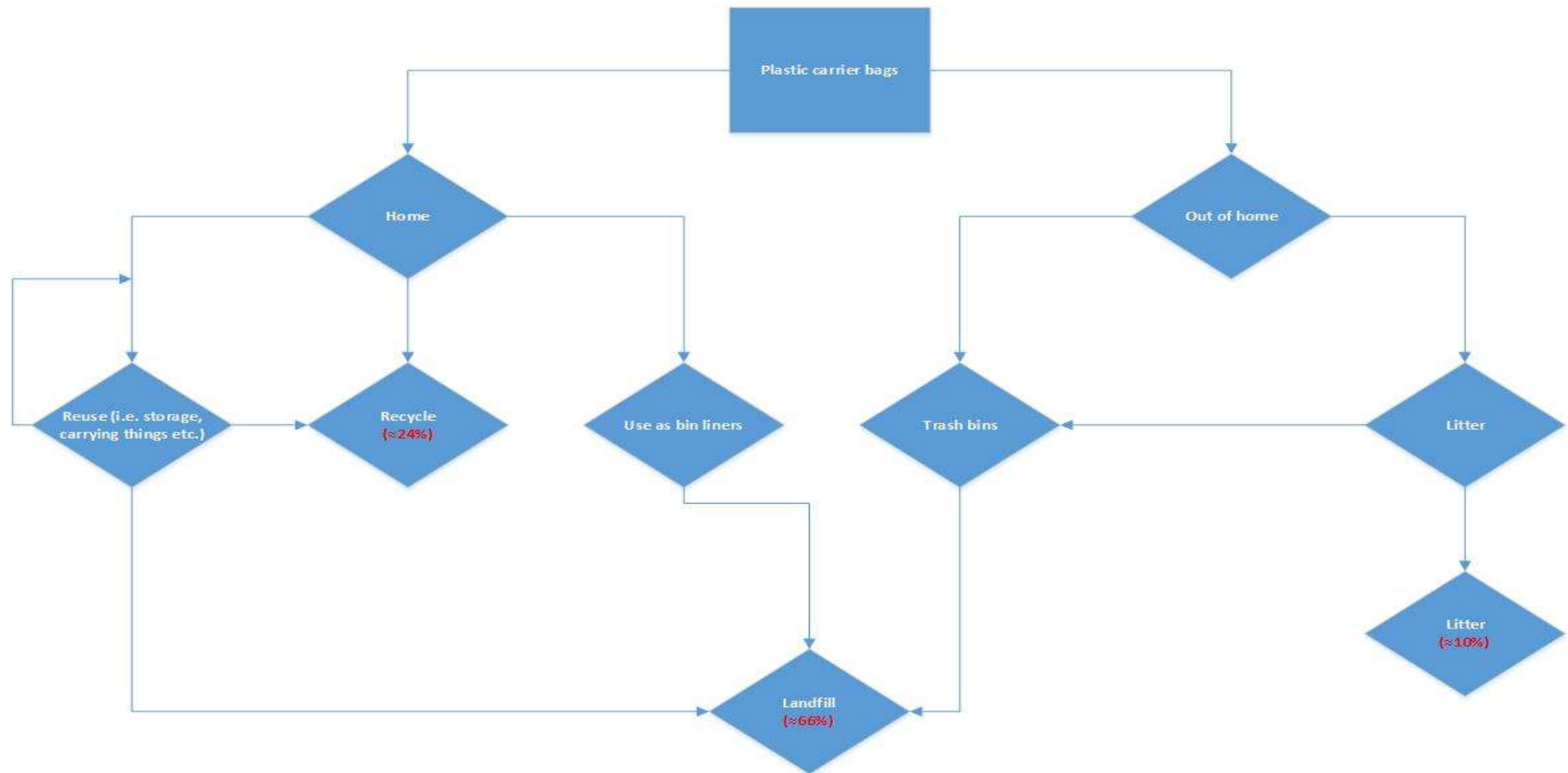
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Appendix I: Definitions of key terms

Bio-based plastics	Bio-based are the plastics made from renewable sources. Bio-based plastics may be or not biodegradable. They can be composed since they are made from plant-based starch, or starch made from renewable sources such as corn, potato, tapioca or wheat combined with polyesters manufactured from hydrocarbons. However, it depends on their properties if they are industrially compostable, home compostable, water compostable etc. (Commission Proposal COM(2013) 123 final, pg. 18)
Biodegradable plastic	“the large majority of biodegradable plastics can only biodegrade under very specific conditions of constantly high temperature and humidity in industrial composting installations and are neither fit for home composting nor do they decompose in reasonable time when littered”, (Commission Proposal COM(2013) 123 final, pg. 16)
Compostable plastic packaging	According to the standard EN 13432:2000 plastic packaging can be industrially compostable if “it can be recycled through a process of organic recovery comprised of composting and anaerobic digestion”. Currently, there is no standard for home compostable packaging. (DIRECTIVE (EU) 2015/720). EN 13432 has been identified by the Greek legislation, as well (MD Z3–1531).
Lightweight plastic carrier bags	“shall mean plastic carrier bags with a wall thickness below 50 microns”, (EU Parliament and Council Directive 94/62/EC, pg. 9)
Marine debris / marine litter	“any persistent, manufactured or processed solid material discarded, disposed of or abandoned in the marine and coastal environment”, (Jefic, Sheavly, Adler, & Meith, 2009, pg.13)
Micro-plastics	Here, secondary micro-plastics, to wit tiny plastic fragments resulted from physical, biological or chemical breakdown of larger pieces of plastic both at sea or on land (Cole, Lindeque, Halsband, & Galloway, 2011)
Oxo-degradable plastic carrier bags	“shall mean plastic carrier bags made of plastic materials that include additives which catalyse the fragmentation of the plastic material into micro-fragments”, (EU Parliament and Council Directive 94/62/EC, pg. 9)
Plastic	“shall mean a polymer within the meaning of Article 3(5) of Regulation (EC) No 1907/2006 of the European Parliament and of the Council (1), to which additives or other substances may have been added, and which is capable of functioning as a main structural component of carrier bags”, (EU Parliament and Council Directive 94/62/EC, pg. 8)
Plastic carrier bags	“shall mean carrier bags, with or without handle, made of plastic, which are supplied to consumers at the point of sale of goods or products”, (EU Parliament and Council Directive 94/62/EC, pg. 9)
Producer of a product	“any natural or legal person who professionally develops, manufactures, processes, treats, sells or imports products”, (EU Parliament and Council Directive 2008/98/EC, pg. 12)
Transport packaging	“transport packaging or tertiary packaging, i. e. packaging conceived so as to facilitate handling and transport of a number of sales units or grouped packagings in order to prevent physical handling and transport damage.”, (EU Parliament and Council Directive 94/62/EC, pg. 7)
Very lightweight plastic carrier bags	“shall mean plastic carrier bags with a wall thickness below 15 microns which are required for hygiene purposes or provided as primary packaging for loose food when this helps to prevent food wastage”, (EU Parliament and Council Directive 94/62/EC, pg. 9)

Appendix II: The pathways of single-use plastic carrier bags in Greece



Appendix III: Monitoring studies on marine debris distribution in Greece

Source	Published year	General information	Marine debris	Plastics (% of marine debris)	Bags (% of plastic debris)
Stefatos et. al	1999	Benthic marine debris in the Patras Gulf (PG) (1997) & in the Echinades Gulf (EG) (1998)	(PG): 240 items/km ² (EG): 89 items/ km ²	(PG): 83% (EG): 79%	(PG): 45.5% (EG): 43% Note: general packaging (incl. bags).
Katsanevakis & Katsarou	2004	Benthic marine debris in 59 sites in the Saronikos Gulf, Santorini, Vreta, South Peloponnisos and Kithira (2003)	[0-250] items/ km ²	55.7%	6.40%
Koutsodendris et. al	2008	Benthic marine litter in the Patras Gulf, Corinth Gulf, Echinades Gulf and Lakonikos Gulf (2000-2003)	[72-437] items/ km ²	56%	28% Note: general packaging (incl. bags).
Kordella et. al	2013	Beaches' cleanups (2006 & 2007) organized by MedSOS in all over Greece	10 423 items (in total)	[43-51]%	-
Ioakeimidis et. al	2014	Benthic marine litter in Saronikos Gulf (SG), the Patras Gulf (PG) and the Echinades Gulf (EG) (2013)	[24-1211] items/ km ²	(SG): 95% (PG): 60% (EG): 67%	(SG): 36.5% (PG): 34% (EG): 27.1%
HELMEPA	2014	169 coastal cleanups (incl. beaches, rivers, lakes) and 30 scuba diving cleanup in all over Greece (2014)	225.665 items (in total)	-	5 728 pieces (among the 10 most monitored debris)
HCMR – DeFishGear (kathimerini.gr, 2016)	2016	Benthic marine litter in the North Ionion Pelagos and Kerkira (2015 & 2016)	900 items/ km ²	-	-

Appendix IV: A trip around the world – applied measures

Country	Short description	Applied measures
Australia	2002. Voluntary measures included charge, promotion of alternatives, promotion of recycling, awareness campaigns.	Informative measures. Charge paid by consumers.
Austria ³⁵	Last years. Retailers' initiatives: Ban on single-use plastic carrier bags and charge for paper and reusable plastic bags, charge on plastic carrier bags at the point of sale.	Voluntary approach. A variety of measures.
Bangladesh	2002. Ban on the use and manufacture of plastic bags.	Outright ban
Belgium	2007. Tax on plastic bags paid by consumers. Most of them passed the charge onto retailers and finally to consumers.	Tax paid by producers. Charge paid by consumers at the point of sale.
Botswana	2007. Ban on thinner plastic bags and a levy on thicker bags paid by consumers. Collected money used for environmental projects.	Ban on thinner than xµm plastic bags. Tax paid by consumers.
Bulgaria	2011. Tax on plastic bags paid by producers. Most of them passed the charge onto retailers and finally to consumers.	Tax paid by producers. Charge paid by consumers at the point of sale.
Canada	They highly support product stewardship (their own EPR scheme). They collect bags in special bins and they have take-back- to retail systems.	Take-back systems
China	2008. Ban on ultra-thin plastic bags and charge on thicker bags. Compliance though is an issue – many offenders in rural areas and open markets.	(Limited) ban on thinner than xµm plastic bags. Charge on thicker plastic bags paid by consumers.
Denmark	1994. Tax on plastic bags paid by producers. Most of them passed the charge onto retailers and finally to consumers.	Tax paid by producers. Charge paid by consumers at the point of sale.
England ³⁶	2015. 5p charge at the point of sale. Collected money managed by retailers.	Charge paid by consumers at the point of sale.
France ³⁷	2016. Ban on non-biodegradable plastic bags and promotion of bio-based plastic bags.	(Limited) ban on non-biodegradable plastic bags.
Germany ³⁸	Last years. Charge at point of	Charge paid by consumers at the

³⁵ Extra source: (thelocal.at, 2016)

³⁶ Extra sources: (DEFRA, 2015; theguardian, 2016)

³⁷ Extra source: (france24.com, 2016)

³⁸ Extra source: (dw.com, 2016)

Country	Short description	Applied measures
	sale. Imposed by retailers voluntarily. 2016 – Official agreement between government and retailers.	point of sale.
India ³⁹	2016. Outright ban on plastic carrier bags. At the same time manufacturers are called to pay for the post-use disposal. Ban on other plastic products as well. But many offenders (black market, smugglers), loose enforcement mechanisms. (2002. India took the first measures on plastic bag issue.)	Outright ban.
Ireland	2002. Product tax on plastic bag paid by consumers at the point of sale. In 2007 the charge reaches 0.22 euro. Collected money managed by a special Fund.	Tax paid by consumers at the point of sale.
Italy	2011. Ban on non-biodegradable plastic bags and promotion of bio-based plastic bags.	(Limited) ban on non-biodegradable plastic bags.
Japan	Decentralized EPR system run by municipalities. High recycling rates.	Take-back systems.
Mexico	2009. Plastic bag ban was announced but was not applied. Instead of that promotion of alternatives.	Informative measures.
The Netherlands ⁴⁰	2016. Ban on free plastic bags. The first encouraging results were announced – 83% of Dutch go for shopping taking their own bag.	Charges on plastic bags paid by consumers.
Portugal ⁴¹	2015. Tax on plastic bags paid by producers. Most of them passed the charge onto retailers and finally to consumers.	Tax paid by producers. Charge paid by consumers at the point of sale.
Rwanda	2008. Ban on non-biodegradable plastic bags thinner than 100µm.	(Limited) ban on thinner than xµm plastic bags.
South Africa	2003. Ban on plastic bags thinner than 24µm and tax on thicker plastic bags. Collected money managed by a special Fund.	(Limited) ban on thinner than xµm plastic bags. Tax paid by consumers at the point of sales.
Taiwan	2003. Ban on lightweight plastic carrier bags. In 2006 they decided to exempt food retailers since they had switched to paper	(Limited) ban on plastic bags thinner than xµm.

³⁹ Extra sources: (newindianexpress.com, 2016; timesofindia.com, 2016)

⁴⁰ Extra sources: (nltimes.nl, 2016; Zaken, 2016)

⁴¹ Extra source: (theportugalnews.com, 2016)

Country	Short description	Applied measures
	bags and the amount of waste had increased significantly.	
Tanzania	2006. Ban on ultra-thin plastic bags.	(Limited) ban on plastic bags thinner than μm .
United States	Last years. 132 cities and countries have already imposed bans and fees on plastic bags. Sometimes measures applied on paper bags, as well. Large national retailers have introduced charges.	A combination of measures applied at local level. Not a national effort.

Sources: (allaboutbags.ca, 2012; Kasidoni et al., 2015; Larsen & Venkova, 2014; UNEP, 2005)

Appendix V: Analysis of alternative policy measures (some extra options)

A limited ban on thinner than 30µm plastic carrier bags - I chose this thickness since the plastic bags used by the majority of supermarkets are thinner than 20µm.

Environmental effectiveness

Right now in Greece supermarkets offer plastic bags thinner than 20µm and the majority of smaller retailers offer even thinner bags in order to save money. These bags are very light, difficult to be collected and recycled, having a significant share to littering. As a result, a ban on them accompanied with an awareness campaign, the promotion of alternatives and the reuse of the thicker bags could improve rapidly the current situation.

However, some risks should be counted:

- Producers can just shift their production to thicker bags and consumers will not understand any difference.
- Black market for the banned products may be created, especially if the alternatives are expensive.
- Retailers may violate the law if they are obliged to offer thicker plastic bags that are more expensive.

*If the government managed to control the risks, the environmental effectiveness of this measure will be HIGH. However, the lesson-learned from other countries have shown that it is extremely difficult to control these risks over time and for that reason I will consider a **MEDIUM** environmental effectiveness.*

Cost-effectiveness

- State
 - Advertising costs: Low. It can be even lower if they collaborate with retailers.
 - Administration costs: Low - straightforward process.
 - Enforcement costs: Very low. This responsibility can be taken by local authorities (police), so existing employees can do it.
 - Implementation costs: Medium. They will be high in the beginning since the development of computer programs is demanded, but the maintenance of them does not cost a lot.
 - Savings from reduced clean-up costs: High if the measure is applied successfully.
 - Savings from the management of less waste: Low since plastic bags is a small part of the total waste.
- Producers
 - Investments: Low
 - No difference in the way producing the bags – no need to buy machines
 - They will have the necessary time to adapt to the new reality and replace steadily the plastic bags with other products
 - Revenues: No big difference
 - They will sell fewer bags but each bag will be more expensive so they may not have a big loss of revenues
- Retailers
 - Advertising costs: Low

- Purchase of bags: High, if they continue to offer thicker bags for free.
- Revenues from increased sales of alternatives: Medium, normally after the awareness campaign, more people will get informed and start buying the emerging alternatives.

*This measure seems to be cost-effective since state and producers do not have to spend a lot of money in order to adapt to the new conditions. The only considerable cost seems to be on the side of retailers, the purchase of thicker bags. This cost will be devastating for them if the desired reduction does not happen, since then they will have to buy the same amount of bags but thicker ones. In total I consider that the total cost-effectiveness of this measure will be **HIGH**.*

Equity

State, producers and retailers are called to make few changes in comparison with a business-as-usual scenario.

- State: The deduction gains minus costs will give a positive result if the implementation of the measure is successful.
- Producers: If the measure is successful, their production will be reduced, but this measure gives them time to adapt to the new conditions.
- Retailers are the ones that may face higher costs in comparison with the other stakeholders, as I mentioned above.

*In total I consider that the equity of this measure will be **MEDIUM**.*

Political and social acceptability

- State: Positive. This option gives them the opportunity to gain some time. It is a compromise with the industry. But they need to accompany it with another measure because the outcome is uncertain and the Directive's targets are really demanding. From the interviews, this option was considered good only under certain circumstances, i.e. at local level.
- Producers: They may be positive. They consider that it gives them the necessary time to adapt to the new conditions and they do not need to change soon their way of doing business. Besides, this option is near the position of the plastic industry association for a gradual replacement of lightweight plastic bags from alternatives (in the beginning thicker plastic bags, later on bio-based bags) accompanied by an extensive awareness campaign.
- Retailers: Negative. This may increase their cost, so if it is not accompanied by a charge on plastic bags paid by consumers, it's difficult for them to accept it. Smaller retailers and street salesmen will be very negative they do not want to increase in any way the shopping bill of their customers and they cannot afford purchasing and offering thicker plastic bags or other alternatives.
- NGOs: Partially positive. On the one hand thicker plastic bags are reused many times, recycled in a better way and are collected easily even if they end up in the environment. But lessons learned from other countries have shown that this measure has a medium environmental effectiveness so they will prefer another option.
- Consumers: Negative, since their convenience will be disrupted. In the case that retailers start charging them for a bag, they will have to pay or find and buy alternatives. Besides, they do not trust the enforcement mechanisms.

*In total it is not easy for me to conclude to a clear outcome. However, I consider that there are many open issues here, so I believe that the acceptability of the total of the society will be **MEDIUM**.*

Incentives for improvements

This option does not demand significant changes. It is a similar approach to a business-as-usual scenario.

*As a result, there is no incentive for improvement as far as the environmental performance of the involved stakeholders is concerned. So I consider that the incentives for improvements are **VERY LOW**.*

A tax on producers

Environmental effectiveness

The case of Denmark shows that a tax on producers is imposed when the policy makers aim firstly to reduce the amount of raw material used for the manufacture of the bags. In most cases though producers pass on the cost to retailers and retailers to consumers so finally a charge is imposed on plastic bags at the point of sale, as well. However, this charge does not necessarily happen in a homogenous way since it is not legislated and it depends on retailers' marketing strategy; as a result consumers may get confused.

*Since the environmental objective of the examined policy is not to reduce the material used per bag, but to reduce the consumption of the already lightweight plastic carrier bags, the effectiveness of this measure is considered **LOW**, especially in the case that it does not end up in a charge at the point of sale. Whereas, even if a charge is imposed voluntarily by the retailers, the final outcome will be uncertain.*

Cost-effectiveness

- State
 - Advertising costs: Low. The awareness campaign will be shorter, since it does not have to explain to consumers a change (ban, charge) in their everyday life, but only to present the environmental impacts associated with plastic bags. They should though organize a campaign in order for producers to get informed about the tax and the motive behind it.
 - Administration costs: Low – a straightforward procedure.
 - Enforcement costs: Low. Local authorities (tax office) can take this responsibility.
 - Implementation costs: Medium. High in the beginning (development of a record for the producers and one for retailers), but the maintenance does not demand a lot of money.
 - Savings from reduced clean-up costs: Low. The environmental effectiveness was considered low.
 - Reduced waste management costs: Low. No big difference in the waste stream.
- Producers
 - Tax: Low. They are called to pay an extra tax. However, it is almost certain that they will pass on the cost to retailers and the price per bag will increase.
 - Investments: Medium. Producers will realize that plastic bag production is targeted and it is anticipated to drop, so normally they will invest in market studies for alternatives to substitute them. This measure though gives them time to adapt to the new reality, since their production is not anticipated to drop

dramatically from one day to another, so the majority of them may not need to proceed to huge investments.

- Retailers
 - Advertising costs: Low. However, if they impose a charge at the point of sale, they will have to organise a more extensive campaign in order to inform their customers.
 - Increased costs from the purchase of bags: Medium. The price per bag will increase since producers will include the cost from the tax in it. Some producers will pass on this cost to their customers and others will continue offering bags for free.

*This measure generates some costs that in total are not very high but still are significant, especially if the environmental effectiveness is low. So I consider the cost-effectiveness of this measure **MEDIUM**.*

Equity

In the beginning it seems that this measure targets mainly producers, but the fact that the cost usually passes onto retailers and finally to consumers shows that there is a relative balance among the affected stakeholders. Whereas, in comparison with a business-as-usual-scenario, the state is not called to make significant changes.

*In total I consider the equity of this measure **HIGH**.*

Political and social acceptability

- State: Negative. It will be difficult to support the imposition of another tax on a profitable business sector if they do not secure the environmental effectiveness of the measure. They need arguments to persuade the other political parties.
- Producers: Neutral. Normally, they will not welcome the imposition of an extra tax on them. However, if this tax does not affect their production, then they will accept this measure as a good settlement.
- Retailers: Neutral. The purchase of plastic bags is a considerable cost for retailers. Right now, in Greece the majority of them offer plastic bags for free and it is very difficult to start charging them since this situation has been established as normal. However, if a tax is imposed on producers and the price per bag increases, most of them will be obliged to pass on the cost to consumers, since their cost will be much higher. This measure will give them the chance to impose a charge on plastic bags and cover their expenses saying that the government does not let them other choice. However, this is not the case for street retailers, kiosks, bakeries (really small retailers) that do not want to charge their customers with extra costs and cannot afford purchasing bags at higher prices.
- Consumers: Negative. Only the word tax can make them angry. In the last years the financial recession has made Greeks suspicious about government's intentions. So even if this tax is not directly imposed on them, it will not become easily approvable. Their reactions will be even worse in the case of a charge paid by them.
- Environmental NGOs: Neutral. Lessons learned from other countries have shown that this measure does not fulfil policy's environmental objective. Normally NGOs will push for accompanying measures that will secure the accomplishment of the objective.

In total I am not sure how this measure will be received by the majority of the stakeholders, because I see that there are many open issues per stakeholder that can lead to a positive or a negative reaction. For that reason, I

*will assume here a **MEDIUM** political and social acceptability trying to point out once again that the outcome of this measure is uncertain.*

Incentives for improvement

*This measure does not demand significant changes to a business-as-usual scenario, so I consider that the incentives for improvement are **LOW**.*

Appendix VI: A sample of the interview guide

The following interview guide presents the outline that I followed during the interviews with the supermarkets. The interview guide that I sent out before the interview was slightly different, since the initial idea behind the guide was to make stakeholders evaluate the alternative options using a numerical scale in order for me to have a direct way to compare them in the end. However, soon after the first interviews I realized that it was much more useful to conduct interviews in a less constructed way and monitor risks, costs and success factors that each stakeholder foresees for each measure according to his/her own experience, instead of stakeholders' direct positions on the alternative measures. So, finally, I ended up using the following guide.

General questions

1. Do you believe that plastic bags is one of the significant environmental aspects of your business?
2. Have you calculated how many plastic bags are consumed by your customers each year?
3. Was the reduction in the consumption of plastic bags one of your priorities the previous years?
 - i. If yes: What actions have you implemented? Have you noticed any reduction in the consumption after the implementation of these actions?
 - ii. If not: Why not?
4. Have you noticed if consumers care more about environmental issues the last years?

Questions regarding the Directive 2015/720

1. Which is your general position on the Directive 2015/720? (negative/positive)
2. I chose to study the following policy measures for the reduction in the consumption of plastic carrier bags:
 - i. Limited ban (e.g. on plastic bags less than 30µm, on non-biodegradable plastic carrier bags except from bio-based bags)
 - ii. Economic instruments (e.g. tax / charge paid by consumers at the point of sale)
 - iii. Awareness campaign

Which of these measures do you believe that it is the best alternative and why?

3. For each of the aforementioned policy measures (measure x) answer the following questions:
 - i. Is the measure x possible to reach the environmental objective of the Directive?
 - ii. Which are the costs and benefits emerged by the measure x for your business?
 - iii. How easy is for your business to implement the measure x?
 - iv. Is the measure x going to give you incentive to improve the environmental performance of your business?
 - v. Do you believe that consumers are going to accept positively the measure x?
 - vi. Answer the questions (ii) to (v) having in mind the possibility of the establishment of a deposit-refund system for plastic bags.
4. Is there any measure that I did not mention and you consider as a good alternative?
5. Are you in favour of the horizontal implementation of the upcoming measures? Or do you believe that exemptions should exist? Any examples?
6. Have you started to get prepared for the introduction of the upcoming measures?
7. Are you going to participate in the public discussion for the transition of the Directive into the Greek law? Have you already expressed your positions on a public discussion?

Appendix VII: List of interviewees

	Informant	Position	Method of interviewing
1	Alevritou Eleni	Doctor, President of Consumers' association EKPIZO (Ε.Κ.ΠΟΙ.Ζ.Ω.)	Personal meeting: 26/06
2	Arvanitis Tassos	Quality and Control Department, HE.R.R.Co.	Personal meeting: 15/06
	Dimou Evripidis	Manager – Fillers & Importers Department, HE.R.R.Co.	
3	Domperts Louiza	Quality Management Department, Sklavenitis	Personal meeting: 18/07
	Kamarinakis Apostolos	Recycling Supervisor, Sklavenitis	
4	Garoufalia Christina	Project manager, MedSOS	Personal meeting: 23/06
	Koukiasas Evaggelos	President, MedSOS	
5	Georgiou Georgios	Owner, Georgiou A.E.	Personal meeting: 02/06
6	Kakaratzas Konstantinos	President, Panhellenic Confederation of smaller unions of salesmen at street markets (Πανελλήνια Ομοσπονδία Σωματείων Πωλητών Λαϊκών Αγορών (Π.Ο.Σ.Π.Λ.Α))	Personal meeting: 27/06
7	Kalofonos Panagiotis	Research associate, Union of Working Consumers of Greece (Ενωση Εργαζομένων Καταναλωτών Ελλάδας (ΕΕΚΕ))	Personal meeting: 06/07
8	Karpodini Alexandra	Department of Recycling and Alternative Management, Ministry of Environment and Energy	Personal meeting: 06/06
9	Kaselimis Ioannis	Owner, Civil EPE	Personal meeting: 02/07
10	Machera Alexia	Communication & Sustainability Manager, AB Vassilopoulos S.A.	Personal meeting: 17/06
11	Oikonomidis Nikos	Owner, Peiraika Plastika	Personal meeting: 07/06
12	Papadopoulos Christoforos	Export Department, Achaika Plastika	Personal meeting: 30/06
13	Sargologos Nikos	Owner, Plastika Syrou	Skype meeting: 09/06
14	Sotiropoulou Giolanta	Owner, Naturesse Hellas	Skype meeting: 08/06
15	Talountzis Dimitris	Lawyer, associate, Consumers' Protection Association in Serres (Ενωση Προστασίας Καταναλωτών Σερρών (ΕΠΚΑΣ))	Skype meeting: 06/07
16	Tounta Eleni	Manager of Local Activities, Allonnisos, MOm	Skype meeting: 12/07
17	Tritopoulou Efi	Chemical Engineer, Phd, HRA	Personal meeting: 08/07
18	Tseberlidis Nikolaos	President, Consumers' Protection Center (Κέντρο Προστασίας Καταναλωτών (ΚΕΠΙΚΑ))	Skype meeting: 16/06