Applying Deposit-Refund Systems in Tbilisi, Georgia for PET Bottles Management Based on Foreign Models

A Policy Analysis

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Thesis for the fulfilment of the Master of Science in Environmental Sciences, Policy & Management Lund, Sweden, June 2015

MESPOM Programme:

Lund University – University of Manchester - University of the Aegean – Central European University



Erasmus Mundus Masters Course in Environmental Sciences, Policy and Management





This thesis is submitted in fulfilment of the Master of Science degree awarded as a result of successful completion of the Erasmus Mundus Masters course in Environmental Sciences, Policy and Management (MESPOM) jointly operated by the University of the Aegean (Greece), Central European University (Hungary), Lund University (Sweden) and the University of Manchester (United Kingdom).

Supported by the European Commission's Erasmus Mundus Programme



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Published in 2011 by IIIEE, Lund University, P.O. Box 196, S-221 00 LUND, Sweden, Tel: +46 - 46 222 02 00, Fax: +46 - 46 222 02 10, e-mail: iiie@iiiee.lu.se.

ISSN 1401-9191



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Acknowledgements

First and foremost, I would like to mention the extent of gratitude I have to everyone who stood by my side in any particular way that helped me get to the finish line of this thesis. As probably all graduates stress the pleasure of yet another thesis completion on their behalf, yet another relief has joined in the queue of such joy from my side. It is worth noting the utter experience one receives after achieving this destination, though the essence is not fundamentally the knowledge you have gained in your respective sphere, but rather the challenges you have overcome and yet another journey you have gone through.

However, it cannot go without saying, as to how much thankful I am to my supervisor, Prof. Thomas Lindhqvist, who supported my research in every reasonable way, both by advice and positive energy, laying out realistic goals and professional attitude and approach that in overall had great positive impact on my paper. In this sense, it is important to have a supervisor that understands you, while you understand him / her. Thus, I am also thankful for this mutual understanding.

Furthermore, I would like to express my gratitude as well to my wife, Natia Zotikishvili, who was by my side during every moment of the thesis process. She helped me out a great deal and I would like to say thank you for your support and as well to my parents Badri and Mediko and also friends, who never stepped back and always offered help. It can be said that without family and friends, I would not have ever reached any point whatsoever of the definition of the term happiness, achievement, or freedom.

Finally, I would also like to thank all the people who I had to contact, interview or approach. The steps that had to be taken regarding this thesis had to happen through the people that I had to address, thus thank you all for being there and providing your time, attention and insight.

On this note, I am honored to have had the relief of the two year academic and lively voyage of 2013-2015, with everyone I interacted, met, worked and spent time with. The MESPOM experience, will never be forgotten.

"Let your passion guide you forward, for it will be none that you regret in your life, except the ones you did not follow" – G. Kochoradze

Abstract

Polyethylene terephthalate (PET) is known to be the most optimal type of plastic for producing beverage bottles and food packaging in terms of its effectiveness of wide commercial production and recyclability. Although, its other side is the negative impact it has on the environment and human health, being discussed and perceived as a global epidemic in different parts of the world. The same applies to Georgia, a developing country which requires initiating effective management of this particular waste and seeks reasonable solutions that exemplary countries have already applied. Although, deriving from socio-economic indicators and various other factors that the country faces, it is most logical to analyze and compare the models of countries that are of more or less similar economic capacity and contextual background as Georgia, in the case of the capital city Tbilisi.

One the most common practice and system that is at hand is the deposit refund system (DRS), which is uniformly proving its relative effectiveness in terms of treating beverage containers, including PET bottles. Estonia and Croatia are one of the two countries that have applied these systems within their waste management policies, of which both are diverse from each other to a certain degree and application extent but show a positive example for Georgia to consider its application. In this regard, different policy options entailing DRS models will be discussed and analyzed for compatibility to the current waste management scheme in Georgia concerning PET bottles. Reverse vending machines and the take-back principle will also be portrayed so as to envisage the parts that can lead to a greater sum and opportunity.

Keywords: PET bottles, deposit refund system, waste management, alternative models.

Executive Summary

Meeting environmental challenges are usually relatively higher in developing countries like Georgia as opposed to the first-world, as primary national targets are usually oriented at economic growth and poverty eradication. In this context, environmental issues such as waste management are set back to secondary priorities, however, as the social stratum develops more and a middle-class emerges, so does the awareness levels increase concerning urgent issues such as proper waste management.

After the dissolution of the Soviet Union in 1991, Georgia faced meager times to come. However, owing to past and on-going reforms and international support, the Georgian economy slowly prospered. The industry in particular, also started thriving to a certain degree, at least to the point in which the local market has been supplied according to demand, e.g. by beverages and likewise products. But the development of the industry also saw rise of waste inventory generation, including polyethylene terephthalate (PET) bottles, which has not been addressed adequately according to environmental regulations and permits.

Environmental and specifically waste management issues are regarded as a lower priority in the country, which lacks necessary applications and relevant resources for its implementation; currently waste management is on a landfilling 'disposal' level as defined by the priority order of the EU waste management hierarchy. Though aside from this, a new waste management code has been recently adopted that goes in line with the EU Waste Framework Directive, of which the new code addresses modern approaches for managing waste issues incorporating concepts such as prevention, reuse and recycling, extended producer responsibility (EPR) and others.

The study is largely of qualitative nature, addressing why PET packaging is a problem in the capital and generally in the country and what the realistic solutions are to addressing the problem. Deriving from the existing circumstances of Georgia, one of the main question that is also asked is the feasibility of undertaking foreign models that have been applied for similar purposes. The examples of foreign models are given according to their rather similar socioeconomic conditions to Georgia, which makes the discussion more realistic.

The main solutions that are discussed is the deposit-refund system that has been applied in Estonia, adopting a Packaging Act that highly affects the performance of practicing a mandatory deposit-refund scheme in the country, and Croatia, adopting a rather untraditional deposit-refund model, but works largely in relevance with the policy basis of a traditional deposit-refund system and their Ordinance on Packaging and Packaging Waste respectively.

The two EU member states provide valuable input and examples of how packaging waste in general can be managed (including PET bottles) with additional takes and experiences for a country that needs to address a growing problem of the same nature. In addition, a brief case-study of Belarus on extended producer responsibility is given, which addresses the same problem of packaging including PET containers, by the means of incorporating an EPR program on a legislative basis, which is also an example for Georgian policy makers to consider alternatively. The latter adds spark to the newly established waste management code of Georgia that has included an EPR but will be enforced in 2019.

The analysis and conclusions that are given are derived from the given findings on the overview of Georgian conditions and the compatibility of the provided case studies, which in overall sets subsequent remarks and analytical evaluations and future study recommendations for individuals / stakeholders interested in the subject.

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Abbreviations

BP	British Petroleum
CBA	Cost-benefit analysis
CIS	Commonwealth of Independent States
CEA	Cost-effectiveness analysis
DRS	Deposit Refund System
EAN	International Article Number
EBRD	European Bank for Reconstruction and Development
EC	European Commission
EPR	Extended Producer Responsibility
EU	European Union
GDP	Gross Domestic Product
GEL	Georgian Lari
HRK	Croatian Kuna
JSC	Joint Stock Company
LCA	Life-cycle assessment
LLC	Limited Liability Company
LTD	Limited Company
MBIs	Market-based Instruments
NGO	Non-governmental organization
OSCE	Organization for Security and Co-operation in Europe

PE Polyethylene

- PET Polyethylene terephthalate
- PP Polypropylene
- PLC Public Limited Company
- R&D Research and Development
- RVM Reverse Vending Machine
- SMEs Small and medium-sized enterprises
- UN United Nations
- WMC Waste Management Code

1 Introduction

As far as waste management encompasses a wide variety of practices and issues in different contexts of the planet, along with its diverse applications, so does its 'sub-branch' problem – plastics. Plastics on its own stand out as a major environmental setback once discussing waste streams, bearing an impact on human health as well if treated in an unsound manner (insert source). The latter may not stand out as a major environmental crisis owing to the lack of awareness building in areas where priorities are aimed at economic growth, which can be more than debatable whether it is or is not, but quite frequently, dispersed plastic content heavily and quite plainly have an impact on communities and its surrounding habitats (insert source).

This happens to be the case in Georgia, in a country where socioeconomic concerns outweigh environmental issues and other adversary circumstances that require attention for management. Discussing specific waste stream management issues in Georgia on a policy level is challenging for policy makers, since the prime devotion and financial resources are aimed at further satisfying social needs and developing economic conditions, along with maintaining national security. As of 2013, the unemployment rate in Tbilisi, showing the highest economic activities in the country, is estimated to be 14.6%-15% (geostat.ge), whereas economic growth of Georgia is largely dependent on foreign investments and reforms concerning easement to SMEs and development of taxation compliance (World Bank, 2012).

Deriving from the socioeconomic context of Georgia, environmental aspects and namely waste management perspectives have been largely out of focus. Owing to this, there is a gap in identifying sound and adequate policy options for addressing specific waste streams generated in the industrial sector.

1.1 **Problem Definition**

The reforms have facilitated maneuvering for beverage producer companies, increasing the capacity for manufacturing new and more products for the local and regional market. However, there have been very low tendencies for increasing environmental efforts from the government to address the increased industrial activities (Interview, Abramia, Geladze, 2015). According to existing documents and qualitative data, the highest use of packaging types in the Georgian beverage industry are polyethylene terephthalate (PET) bottles, used for packaging a variety of soft drinks, mineral waters and alcoholic beverages.

Merging socioeconomic goals with environmental goals is an objective that developed countries should aspire to, but achieving the latter can mostly be a challenge, due to the complexity in nature of different variables involved that carry their own interests (OECD, 2008). Amongst the environmental goals, the elimination of PET bottles from the main waste stream is of high importance: removing PET packaging from the traditional curbside collection system (which mostly ends up in landfills), its reuse, recycling and prevention of further raw material extraction can be regarded as primary goals.

Achieving the environmental goals that concern PET waste can be determined and solved by introducing modern effective mechanisms, incentives and environmental policies that focus on addressing negative environmental externalities (Hansson et al, 2014). An example of this and a concrete solution to managing this kind of specific market failures are market-based instruments (MBIs) (Stavins, 2003). A deposit-refund system is an example of an MBI (Walls, 2011), which is given as an alternative solution for managing PET bottle waste issues in Tbilisi, Georgia.

1.2 Aim of the Study

The contribution of this thesis is aimed at providing a detailed analysis concerning a certain waste topic that is at hand in a site-specific location. By identifying this issue (topic), existing findings and qualitative research are provided, for which subsequent studies are analyzed offering alternative solutions to the problem that have been applied abroad. Consequently, the aim of this study is to understand the experiences that are portrayed and the related factors that can be learned from. In this manner, the study does not seek to offer optimal or customized solutions that are applicable in various contexts, but rather the alternative policy options that are more realistic to consider in terms of Georgia. Thus, a wide range of effective mechanisms can be theoretically analyzed in regards to the site-specific area by seeking the best solutions, but then the compatibility of a certain analytical framework can be irrelevant.

Accordingly, the study poses two primary questions as given below.

1.2.1 Research Questions

Deriving from the aim of the study, two research questions are given that is examined throughout the paper:

- 1. a) Why are PET bottles a problem in Thilisi, Georgia and b) what are the circumstances behind it?
- 2. a) How can the problem be solved and b) what methods can be applied realistically, thus how feasible is it?

In order to answer these questions in a comprehensive way, a wide range of literature was used and a number of interviews were conducted to grasp the objective and overall evaluation of the findings, from which both sources of data collection were highly valuable.

1.3 Methodology

1.3.1 General Overview

Inasmuch as the aim of this research is to identify a specific waste type as an existing issue in Georgia, followed by other findings that focus on the alternative solution that is able to address the problem qualitatively and surveys and consequently two case studies that have applied the specific solution, a triangulation approach was used.

Firstly, a variety of data sources entailed in the findings were examined separately that resulted in adequate data collection methods addressing the research questions of this thesis. For this a thorough research was conducted concerning existing literature, research and knowledge relevant to both of the addressed research questions

Secondly, research highly employed qualitative methods for data collection, of which case studies were undertaken on three separate countries – Estonia, Croatia and Belarus, and a number of interviews were conducted for gaining in-depth knowledge and personal observations and experiences were also included.

The interviews were semi-structured and based on pre-prepared questions (see Appendix B) for all individuals, but most of the time open discussions would follow after each question or towards the end of the interview. In total, nine various interviews were held, from which four individuals were from the governmental sector, two from the private sector (business), one from an NGO and two of which are individual experts (see Appendix A). Five out of nine were personal interviews, three via e-mail and one was reached through a phone call.

Quantitative methods were also used for developing realistic views and input from certain stakeholders, also assisting the formulation of relevant data. Namely, an onlinequestionnaire / survey was conducted engaging Georgian citizens for their views and responses towards a deposit-refund system.

Lastly, the Policy Analysis (Chapter 5) analyzed the findings obtained from these methodologies, acting as a result of the triangulation method as it evaluates the questions asked in 1.2.1 Research Questions.

1.3.2 Literature Review Method

All the necessary literature that was reviewed was obtained through the internet, largely from which significant proportions were academic and news agency articles, governmental / administrative reports and also legislations / publications of countries and international organizations. In addition, certain unpublished materials were reviewed, which had to be translated solely by the author, by further support of dictionaries (including online google dictionary) and an anonymous linguist too for Russian-based material. The literature review is incorporated within the various chapters of this thesis.

1.4 Scope and Limitations

1.4.1 Scope

As there are a number of variables and necessary preconditions as well to fully envisage a functional deposit-refund system (DRS) and its management of PET bottles, the scope of this study focused on the mere problem of PETs in Georgia, addressing more why it is such a problem, what the current conditions are and the impact it has.

Also, the scope entailed several case studies concerning an applied model of DRS that plays a role in managing the issue with PET's. But the study focuses more on evaluating policy options and not making a cost-effectiveness analysis of two or more different policy alternatives.

Recycling opportunities and anticipated projects were also covered, which plays a fundamental part for having an operational and purposeful DRS in place.

The scope also touches upon the policy initiatives and its applicability, though until the point when and if a DRS is implemented and discussed by policy makers, a PET bottle shifts from old practices through a DRS and into recycling and the assessments concerning these values.

1.4.2 Limitations

First and foremost, one of the biggest limitations was the lack of feedback from Georgian beverage companies, which to the author's mind could have given more qualitative knowledge about the topic. The other point concerning this is the potential interviews that could have been conducted with foreign beverage suppliers and relevantly with the immediate practitioners of a DRS in foreign countries such as Estonia or Croatia.

Another limitation was the lack of data sheets, facts and documentation on the existing PET bottle types (e.g. refillable or non-refillable types), the quantities produced and landfilled / disposed of and procedures as to how they are processed in Georgia. A primary asset was using Georgian language (the author's native language) as a means for communication during the interviews, which compensated for the large gap of missing literature and data that needed to be obtained.

Also, bilateral negotiations regarding financial dimensions of placing RVMs in retailers and the practical processes that are needed to be undertaken. Further feedback from Georgian retailers and beverage manufacturers concerning the latter would have also been advantageous but lack of awareness in this regard was also a limitation.

Discussion on general applicability of MBIs as policy instruments and economic instruments such as the DRS in Georgia is not anticipated by various stakeholders and the awareness concerning it is also low, thus this aspect had a negative impact on the study's overall evaluation. The main data collection was based on Tbilisi, because of the time constraint to visit other regions / cities of Georgia.

1.5 Target Audience

The thesis primarily targets stakeholders, policy makers and scholars. Interested stakeholders can see benefit and advantages that the provided information observes. These stakeholders include beverage producers in Georgia, as well as policy makers and governmental representatives, retailers and citizens.

The study is based on a particular phenomenon in which a certain practice has not yet been applied, due to which other country representatives or stakeholders could also find value.

All related stakeholders and scholars as well may learn or better interpret the policy options that can be applied in a context where there is an actual gap, worth administering.

Finally, this study can also raise situational awareness to regular consumers, who can better understand the purpose and significance of an effective waste mechanism and the relative problem of a specific waste stream.

1.6 Disposition

Chapter 1 – The Introductory part that presents the topicality of this thesis, describing the problem, the aims and deriving research questions that have been put, followed by the methodology of how the study was shaped, delimitation of the scope of the study including the relevant limitations and finally the target audience, describing the specific audience for this thesis.

Chapter 2 – Describes the issue with plastic in general, introducing discussions as to how PETs are overviewed in various parts of the world including the European Union, also touching base on discussing deposit-refund systems in general. The chapter is a commencement of general findings and observations.

Chapter 3 – Overview on Georgia – Provides findings concerning what the problem is in Georgia concerning PET bottles and why it is an issue worth addressing. It starts by an overview on the topic, after which a new waste management code is discussed, followed by current trends and anticipated projects in regard to the subject topic and further reflections from stakeholders / interviewees is given.

Chapter 4 – Focuses on the three case studies of Estonia, in which a traditional and quite successful DRS was adopted, followed by Croatia, in which a more untraditional DRS is described along with other relevant findings and lastly, Belarus, which does not discuss a DRS but is given as an example of introducing PET bottles management within an extended producer responsibility program.

Chapter 5 – Policy Analysis – This is the part where the findings are summarized and the compatibility issue is addressed, evaluating realistic aspects of how a DRS can be potentially applied in the context of Georgia, featuring relevant points: administrative feasibility, economic aspects, social and political acceptance and necessary conditions to promote DRS, ending with a SWOT analysis.

Chapter 6 – Discussion – Steps back from the immediate discussion of the subject topic and focuses on the legitimacy and adequateness of the given research questions, findings and policy evaluations.

Chapter 7 - The final chapter, giving a conclusion with according remarks and observations and the contribution that the thesis has. The chapter also provides future research recommendations that can be addressed.

2 The Issue with PET Bottles

2.1 Global

To understand the significance of this particular waste, one must interpret the content, environmental impact and applied use of the polyethylene terephthalate (PET) bottle that is the subject matter of this paper, so that the observer understands the way we come across plastic as such and the necessity of its proper disposal. Doing this so requires a provision of a life-cycle assessment (LCA) study, however, this section will be covered briefly as the aim of this thesis is not identifying an LCA of PET bottles, but rather reflecting on how PETs are discussed globally.

The PET bottle is a petroleum or gas-based long-chain polymer that belongs to the polyester family, made from terephthalic acid and ethylene glycol, invented by an American chemist called Nathaniel Wyeth in 1973 (PET Resin Association, 2015). PET bottles account to over 30% of global demand from the PET-based production range, constituting an 18% of world polymer production and is considered as one of the most preferable packaging source owing to its lightweight, recyclability and unbreakable traits, thus making it an optimal packaging material for beverage companies, of which major companies also strive to incorporate the most efficient environmental tools for decreasing their footprint (Franklin Associates, 2014). Consequently, there is an increased demand of PET bottles recycling efforts on the global market, backed up by conventional environmental regulations, standards and norms (Franklin Associates, 2014); (OECD, 2008).

The life-span of a PET-based material can practically be in a constant cycle unless it is removed from an efficient reuse management scheme, of which the process includes: extraction of raw materials (oil feedstock and formation of chemical compounds), the manufacturing process (melt polymerization, further processing and blow-stretch-molding of preforms), then distribution to retailers, post-consumption practices (collection through recovery bodies, transferring to recycling operators, etc.) and finally sorting and recycling of PETs into new bottles or other products, resuming the cycle (Welle, 2011).

According to the UN statistics division – Department for economic and social information and policy analysis, improper disposal of PETs creates an environmental issue: the disposal of plastic material content "poses an environmental problem because they are not biodegradable and the incineration of some plastics releases hazardous chemicals" (UN, 1997).

Managing PET-based products by the means of a traditional waste management scheme is ineffective, has an overall negative impact on the environment and is costly to redirect to a recycling stream (Welle, 2011). Burning PET material creates admixtures that is hazardous to both the environment and human health, of which it is almost impossible to treat and neutralize by the means of existing modern technologies (Franklin Associates, 2014). PET containers emit a carcinogenic chemical called dioxin that is dangerous for human health, thus burning PETs is detrimental, however, PETs do not contain the hazardous chemical bisphenol-A (BPA) (Facts on PET).

Discarding PET waste with a traditional landfilling approach does not eradicate the problem, as these polymeric chains never degrade, unless thermal oxidation occurs (Franklin Associates, 2014). It is also to mention that globally, these forms of waste constitute around 25% of the volume of all different types of generated waste and 12.7% of all the municipal waste generated in the US (Facts on PET); (EPA, 2014). In line with the latter, the original weight (empty containers with or without caps) of typical PET bottles range from 10.01 to 12.81 grams

(American Samoa Power Authority), while its weight has decreased over 32.6% over the past 8 years, i.e. from around 18.9 to 12.7 grams, "saving 1.3 billion pounds of plastic resin" during this time (IBWA, 2010).

In today's conditions, PET bottle waste issues are a growing concern, with doubling of PETbased packaging use in every decade, subsequently resulting in large accumulation and generation of polymeric waste as a whole, from which only 5% of total amount of plastics produced are recovered (EcoWatch, 2014). From this, it has been reported that 35 billion plastic <u>water</u> bottles and 14 million tons of plastic containers and packaging are discarded per year in the US (EPA, 2014).

At certain instances, the management of municipal solid waste including PETs in terms of recycling programs, can prove to be less efficient (Ashenmiller, 2006) as opposed to other mechanism such as the DRS (Palmer et al, 1997). Research has showed that the two concepts are rather interdependent, as a DRS entails higher percentages of packaging returns while recycling manages the returned materials (Walls, 2011). In the US, where there is no DRS applied, recovery rates of packaging show lower percentages than the states that operate a DRS, from which "the largest user of recycled PETs" reported that over 90% of PET that it acquired "came from states with deposit schemes" (Walls, 2011). In addition, a survey showed that 87% of the survey participators are engaged in recycling, having over 80% of the consumed plastic bottles recycled in states where a DRS is applied, as opposed to states without a DRS recycling 53% (EPA, 2015).

PET bottles are accredited for being highly recyclable, with the recycling code number 1, by melting them down and turning it into its original chemical state, fit for being remade into a PET container or recycling it into other products such as clothing (e.g. a jumper which needs 27 recycled PET bottles), furniture, fences, pavement bricks and various other applications (Welle, 2011); (Recycle Now, 2015). In this regard, PET bottles are believed to be "the second most easily recyclable plastic product" and "second most valuable waste flow material after aluminum" (Lavijas Zalais Punkts, 2011).

Correspondingly, PET bottles have become increasingly important to collect and recycle, for which a DRS and recycling opportunities administer the question with beneficial outcomes. As PETs are 100% recyclable, as opposed to the relatively less recyclable ones such as High density polyethylene (HDPE), the container's recyclability issue is determined according to the level of demand on the market in relation to the specific type of packaging material (Walls, 2011). Deriving from this, as there is a doubled tendency of PET bottle packaging for various beverages, so does the recyclability factor increase, making it more cost-effective for producers to reuse secondary raw materials rather than invest in further sales or extraction of first hand raw materials (ILSI, 2000).

Thus, using efficient waste management mechanisms and incentives such as a DRS in this regard, it helps meet the waste recovery targets of specific country's national waste management objectives or the targets set by the industry (Gradmann et al, 2013). The latter results in "roughly half the marginal social costs of a recycling subsidy or an advance disposal fee", in which the latter does not practice incentivizing and the former lowers production costs (Palmer et al. 1997). Even though there has not been a significant amount of studies concerning DRS schemes, it proves to address both source prevention / minimization and recycling in terms of providing incentives (EPA, 2015).

2.2 EU

PET-based packaging is known to be the most recycled plastic type in Europe, with a collection rate of 1.68 million tons of PET bottles as of 2012 designated for recycling, whereas the recycling rate as of the same year, accounts to 52.3% (EC, 2014). The remainder large proportion of the generated PET bottles are utilized for energy recovery via incineration or modern landfilling techniques, but are not returned back for further reuse (EC, 2014). Despite this, the collection rate of PET bottles increased by 5.6% compared to its previous year (EC, 2014).

Re-utilization of different waste streams such as PETs are viewed as beneficial and advantageous means, reducing energy consumption via efficient policy mechanisms and reducing CO₂ emissions as well via cleaner technologies included in the recycling processes and less transportation routes of waste (EFTA, 2011).

What must be highlighted as well is the Waste Framework Directive of the EU (Directive 2008/98/EC) that sets concrete directives for member states (MS) concerning recycling, from which the requirement for recycling plastic beverage packaging by 2020-2030 is 60%, from the total amount of generated plastic waste i.e. (EC, 2014). Largely owing to this, MSs adopted according packaging acts and legislations concerning the methodology of meeting the set EU targets, by the means of adopting DRS schemes from which countries like Estonia, Germany and Sweden reached collection rates of over 80%, ensuring the accomplishment of the directive (EFTA, 2011).

As for the increase of PET bottles, the rates during the last decade have shown a 10 to 20% rise, from which a total amount of 1.363 m tons of PET container packaging were collected in Europe in 2009 (Petcore, 2011) and around 20-30% of PET bottles were collected (in certain EU countries) by the use of reverse vending machines (RVMs), being the primary instrument of the DRS (Walls, 2011). The EU MSs experience also shows that the placement of RVMs is mostly useful at supermarkets / retailers, thus making it obligatory in some instances to have the vended packaging returned to the point of sale where RVMs are situated (retailers) (Walls, 2011).

It is also known that as of 2009, 17% of the total amount of collected PET bottles were mainly exported to China, i.e. 223,000 t, while 67,000 t of plastic bottles were imported in the EU from abroad. In the EU, one of the highest PET bottle collection indicators are in Germany, owing to the established DRS that operates on both refillable and non-refillable PET bottles, having a collection rate of 93.5% of the indicated packaging material.

In regards to these general findings, DRS schemes are efficient means for collecting postconsumer packaging (Bohm, 1981), thus increasing the capacity for reusing the packaging containers and granting more a more productive approach to recycling. As the DRS works on incentivizing people to return the purchased packaging, offering a rebate on the empty container, the operational value increases as society complies (ILSI, 2000).

The DRS role in reducing the amount of generated waste and contributing to recollection initiatives is increasingly predominant (EC, 2009), having 7 MSs already practicing DRS with a mandatory deposit and 19 others are in a process of evaluating and have voluntary practice (EFTA, 2011). It is understood quite well amongst EU MSs that DRSs increase resource efficiency and decreases the life cycle impact of beverage containers, which in overall is reflected

as a positive environmental performance (EFTA, 2011). According to the organization Zero Waste Europe, EU MSs show better environmental performance levels such as lower impact on resource and energy flow when they recycle refillable packaging as opposed to one-way packaging, though the increased recycling of non-refillable containers is also frequently practiced that still outweighs traditional curbside collection schemes (Zero Waste Europe, 2011).

3 Overview on Georgia

The objectives of Georgia for achieving higher standards of livelihood, encompassing both socio-economic and political aspects, have been underway since the dissolution of the Soviet Union and gaining independence in 1991. The elapsed last decade of the 20th century was characteristically meager for the country, due to the number of challenges that were at hand in terms of re-establishing the country's political and economic profile, entailing armed regional conflicts, foreign loans, international recognition, the social poverty index, etc. However, major shifts took place in the government that altered the status quo of endless corruption and instability by the means of the "Rose Revolution" occurring in 2003, which stimulated sowing the seeds of democracy and Western values.

These changes rooted directions towards applying and collaborating with western foreign policies and incorporating respective prosperous models in various sectors of the country to enhance and reach results that would guarantee relatively higher standards compared to the meager circumstances that presided. In this regard, this paper aims to mediate successfully applied DRS mechanisms in Europe for managing PET bottles and envisaging it in Georgia.

Though it must be mentioned that Georgia's national security is still being undermined, especially after the 5-day Russia – Georgia war in 2008 and therefore the country is still insecure to fully engage its potential capacity into R&D and innovations, thus there is low headroom for investments to boom at peace of mind. Alongside this, current political and economic issues – both internally and externally, influence Georgia's output and socio-economic activity. The latter disposition is expressed very frequently amongst politicians, experts, businessmen and society, which will also be briefly discussed in this chapter.

Understanding the recent historic background and current aspirations of Georgia towards western values is essential for the reader to fully grasp the discussion and findings of this thesis, as it draws a holistic picture of attaining conclusions from the study, though it is more important to comprehend the existing circumstances in the country. Also, a new political party came to power after the Georgian parliamentary elections took place in 2012, of which during their succession have achieved signing the Association Agreement with the EU.

But going back to Georgia - incorporating successful models from abroad - is a resemblance to the approach of how this thesis was shaped with the axiom of finding specific solutions to PET bottles that have been applied elsewhere and suiting these applications in a realistic context to Georgia. Accordingly, first the current conditions and status of the Georgian legislation, processes and projects will be discussed, including qualitative analysis and feedback from various stakeholders.

PET Bottles

Managing PET bottles in Georgia is seen as one of the most challenging aspects of waste management in Tbilisi. Consumed PETs usually come across every part of the country, in the streets, wilderness, rivers and streams (feedback from all interviewees, 2015). In many cases,

once these plastic waste end up in river flows, streams, forests and residential areas, it harshly impacts the local environment, indigenous species and the health of general public.

Governments of developing countries usually stress the importance for solely dealing with hazardous waste, but often leave out other specific waste types such as PET bottles that also have a significant environmental and health impact, thus being a threat. There is no whatsoever tangible data related to this specific waste in the country, whether the amount of generated PET waste, its type, whether they are one-way PET bottles or reusable, etc. (Interviewees, 2015).

Finding solutions such as market-based instruments, recycling and reuse, etc. have been discussed to a limited degree in Georgia among various sectors, favoring landfilling and dumpsites instead, however, the adoption of a new Waste Management Code (WMC) has sparked the foundation of making a new shift in terms of developing the existing status quo.

The Reasons *why* PET bottles are a systematic and growing waste problem in Georgia are summarized below, according to the feedback of interviewees and relevant documentation:

- Plastic bottles of all type are usually burnt in the wilderness or directly in the litter containers (from which a significant proportion of general waste consists of plastic). This also occurs in Tbilisi (especially in the outskirts of the city), where the collection of these litter containers is undertaken quite seldom. The same applies to the countryside and various regions of Georgia, from which some municipalities have not even designated litter containers for waste management
- Health issues and pollution of ambient air from burning PET waste and other waste products
- Illegal disposal and scattering (in the environment and cities and on unregistered dumpsites in various regions of Georgia)
- Expensive to redirect this specific waste back to the main waste stream
- No monitoring and control
- No interest in managing it
- Discharge into river flows
- Biodegradability issue
- Increased consumption of beverages, which increases waste
- Almost all beverages (60%) that are produced are made of PET bottles, including 2L beers, wines, lemonades, mineral water, soft drinks. Companies' main sales are mostly of PET bottles, because it costs less to manufacture, transport and is more portable, less fragile
- No current solution to these problems, almost no recycling (around 1%).

3.1. The Waste Management Code

The Georgian environmental protection law is comprised of the constitution, environmental legislations, international agreements, subordinate legislation (normative acts), presidential and ministerial decrees, resolutions of the cabinet of ministers, instructions, regulations, etc. Georgia is a party member to a number of international environmental conventions.

Providing the Georgian national legislation, under which modern approaches have been contained and synchronized with the EU Directive 2008/98/EC (Waste Framework Directive), is necessary to outline, while also looking at the preexisting laws that was poor in its 'construct' and lacked satisfactory requirements for meeting ends with proper waste management schemes. In addition, the current legislation was largely referred to by the interviewees who stressed its

importance (see section 3.3 Reflections on DRS) and is an elevation point for discussing the feasibility of introducing a DRS in Tbilisi.

As of January 15th 2015, a new Waste Management Code (WMC) was adopted by the Georgian government (Law of Georgia Waste Management Code, 2015) that is in resonance with European norms and standards. The given development was formulated under the provision and in fulfillment of the EU-Georgia Association Agreement, signed in June 2014 (Association Agreement, 2014). The Code itself was developed by the Austrian-Bulgarian Association and prepared by joint collaboration of Austrian, Bulgarian, German and Georgian experts.

The WMC clearly identifies the EU targets that are to be met and takes a modern approach for managing the generated waste in the scope of Georgia, which is why it is also essential to cover in this paper. The recent development provides positive features that in realization of the general provisions would bestow an array of convenient environmental and economic results (Khokrishvili, 2015).

In this regard, the WMC is highly relevant to mention in this paper as it gives ground for introducing foreign applied practices and a comprehensive national law on waste management that has not been determined before on a national policy level. The WMC is now an approved law in Georgia that clearly depicts the Georgian national policy regarding waste management; though for now, there are a number of preexisting waste regulations and ordinances in place (that were the only major waste laws until now) such as the following shown in Table 3-1:

Name of Law / Regulation	Description
Law on Environmental Impact Permit	Waste disposal and incineration, including hazardous waste treatment and disposal
The Law of Georgia on the Transit and Import of Wastes into and out of the Territory of Georgia	Prohibition of importing and transit of hazardous and radioactive municipal, industrial or other wastes and import or transit of non-hazardous and non-radioactive wastes
An administrative framework for municipal waste management	Management rules on local waste; uniting all responsibilities relating to municipal waste management
The Ordinance № 36/n of the Ministry of Labor, Health and Social Affairs of Georgia on establishment of sanitary rules and norms concerning municipal solid waste landfill construction and exploitation	Sanitary rules and requirements for construction, exploitation, monitoring and conservation of municipal solid waste landfills
The Ordinance № 91 of the Ministry of Environment Protection and Natural Resources on legalization of the instructions concerning rules on atmospheric air protection during landfill exploitation	Prohibition of open burning of waste on landfills (Article 9); defining rules for temporary disposal of harmful solid waste on a landfill (Articles 11, 13)

Table 3-1	. Pre-2015	laws and	regulations
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The Ordinance № 300/n of the Ministry of Labor, Health and Social Affairs of Georgia on legalization of rules for collection, storage and treatment of waste from medical establishments Sanitary-hygienic epidemiological standards for collection, storage and treatment of waste from medical establishments. ¹

Source: Adapted from Geo-Cities Tbilisi: An Integrated Environmental Assessment of State and Trends for Georgia's Capital City (2011)

There is also an Environmental Inspectorate established under the Ministry of Environment and Natural Resources Protection of Georgia, which is currently being granted functions to check and monitor environmental compliance issues in various sectors of Georgia (MoE, 2015).

Drawing from the older waste management regulations (as shown in Table 3-1), it can be seen that there was no policy whatsoever or national law adopted to complement contemporary approaches such as reuse and recycling initiatives, extended producer responsibility or any alternative waste treatment mechanisms other than landfilling.

The latter issue of landfilling will be further discussed in the following section 3.2.

The new WMC complies with the basic concepts of the Directive 2008/98/EC, also known as the Waste Framework Directive (European Parliament and of the Council of 19 November, 2008) and includes the following provisions / articles within that meet the reasonable preference for introducing a DRS into the country's legislation; these articles will be given below step-by-step to have a thorough analysis of what the Code covers that is relevant for considering a DRS in Tbilisi, whereas Figure 3-1 illustrates the waste legislation and policy for the EU Member States.

Figure 3-1. Priority order of the EU waste management hierarchy



Prevention is a concept that implies the elimination of waste through a design principle that actually goes beyond recycling, which is also referred to as the zero-waste principle (Spiegelman,

¹ This law was known to be in practice mostly during the late soviet-era; according to Dr. Tinatin Bukia, all medical waste including PET-based packaging had to be cleansed and treated with sanitary norms at the time in any medical facility, however, this practice is no longer under compliance.

2006). Therefore, waste prevention is widely anticipated as the most optimal approach for managing waste issues, exploiting eco-design, waste prevention techniques on the industrial level, deposit refund systems or other economic instruments, etc. (Directive 2008/98/EC) while the rest of the practices in figure 2-1 generate a relative amount of excess waste (Ekvall et al, 2007).

The paragraphs of the WMC that are given below, show the current status of the Georgian legislation on waste management that is in line with the EC directives.

Chapter I - General Provisions - Article 1 - Purpose and Objective of this Law

(1) "The purpose of this law is to provide for the legal conditions for implementation of measures aiming at prevention of generation of waste and increased re-use, environmentally-sound treatment of waste (including recycling and extraction of secondary raw materials, energy recovery from waste, as well as safe disposal)."

Up-to date, this is the first legislative statement of the Georgian government that mentions terms such as <u>prevention</u>, <u>re-use</u>, <u>recycling</u> and <u>energy recovery</u>. There have been discussions about these concepts before having the new WMC introduced, namely by a consortium of NGOs ("Greens Movement of Georgia / Friends of the Earth-Georgia", the "Union for Sustainable Development Ecovision" and the "Georgian Society of Nature Explorers Orchis") who started a project called "Clean Up Georgia" (Clean Up Georgia Report, 2012).

Apart from this, paragraph 2 of Article 1 defines the law as such:

(2) "The objective of this law is to protect the environment and human health:

- a) By preventing and reducing the adverse impacts of the generation of waste;
- b) <u>By introducing effective mechanisms of management of waste;</u>
- c) By reducing damage caused by resource use and improving the efficiency of such use."

Point b) directly implies the need and requirement for applying effective mechanisms such as a DRS into use, which will certainly be of interest to various stakeholders in Georgia. This consideration has also been expressed by experts (Interview, Chikviladze; Kalandadze; Kirvalidze;). This aspect will be further covered in Chapter -5 Analysis.

The following article provides definitions of terms that constitute a foundation for modern approaches to waste management as set out by Directive 2008/98/EC:

Article 3 – Definitions

For the purposes of the present law

- (w) **""prevention**" means that measures are taken before a substance, material or product has become waste, that reduce
 - a) The quantity of waste, including through the re-use of products or the extension of the life span of products;

- b) The adverse impacts of the generated waste on the environment and human health; or
- c) The content of harmful substances in materials and products;"
- (x) ""**recovery**" means any activity the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function...recovery includes recycling;"
- (y) **""re-use**" means re-use of products and/or components before they become waste for the same purpose for which they were conceived;"
- (z) ""**preparation for re-use**" means recovery operation (namely checking, cleaning or repairing), by which products or components of products that have become waste are prepared so that they can be re-used without any other impact;"
- (aa) ""**recycling**" means any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations;"

The above listed concepts will enter into force according to different timeframes of the National Waste Management action plan and in consideration of Chapter 2 of the WMC "competences and general obligations in the field of waste management" and Article 50 – Entry Into Force, of which the articles concisely define planned requirements and legislative initiatives.

Subsequently, a number of additional provisions are to be mentioned here in this chapter to get hold of the legislative basis that Georgia has to further consider adopting an economic instrument such as the DRS. Having this said, it is important to also highlight the following articles from the WMC:

Paragraph 1 of Article 4 of Chapter 1 provides a hierarchy of waste management policies that has been established and prioritized based on the conceptual criteria laid out in paragraph 2 of the same article, stating that the lower three aspects are to be taken into account in the following manner in order to determine the waste management hierarchy:

- a) Ecological benefits;
- b) Technical feasibility, using best available techniques as appropriate; and
- c) Economic feasibility.

These criteria in turn shaped the priorities that are to be addressed in the following order to carry out a sound waste management policy:

- a) Prevention;
- b) Preparation for re-use
- c) Recycling;
- d) Other recovery, including energy recovery;
- e) Disposal.

The above listed criteria and waste management hierarchy are all taken from Law of Georgia - the Waste Management Code. This priority order matches the one of the EU waste management hierarchy (see figure 2-1). In addition Article 5 – Principles of Waste Management, paragraph 2, point b expresses the Polluter Pays Principle:

b) **"Polluter pays** means that the producer or holder of waste, shall cover the costs of waste management."

Furthermore, paragraph 1 of Article 7 on general waste management requirements of "Chapter 2 - Competences and general obligations in the field of waste management", adheres and gives foundation to the proceeding Article 9, which deals with the extended producer responsibility. Therefore, three paragraphs of Article 7 are to be given here as well prior to moving on to Article 9.

Chapter 2. Article 7 – General waste management requirements

(1) "Waste, depending on its type, properties and composition, shall be collected, transported and treated in a manner not impeding its further recovery."

In addition, paragraphs 4 & 5 of the same Article are also to be mentioned:

- (4) "The producer and holder of waste is obliged to treat their waste on their own or hand it over for collection, transport and treatment to persons entitled to carry out such operations in accordance with this Law and legislation of Georgia."
- (5) "Where waste has been submitted for recovery or disposal, the original producer's and / or holder's responsibility shall remain until recovery or disposal is completed."

It is to be mentioned here that there is no specific law or legal provision specifically for PET bottles, however, according to paragraph (1) of Article 7 (as given above) and paragraph (6) point a) of Article 12 – National Waste Management Action Plan -

(6) The plan shall contain the following:

a) "The type, quantity and source of waste generated within the territory of Georgia and an evaluation of the development of waste streams expected in the future;"

and in relevance

g) "Planned waste management technologies and methods, including for waste posing specific management problems;"

According to the new law, the development of a 15-year strategy and a 5-year action plan is proposed to manage specific waste types and municipal solid waste in all Georgian cities.

These definitions touch base for implementing a design for managing different waste types, most likely including PET bottles, which is interesting as various stakeholders become obliged to conform to the newly established requirements. This aspect will be further discussed in Chapter 5 - Analysis.

3.1.1 Extended Producer Responsibility

It is to be noted that Article 50 – Entry into Force states that "the present code shall become effective on January 15, 2015 with the exception of..." articles including Article 9 – Extended Producer Responsibility (EPR), which is to come into force on February 1, 2019 (Article 50, paragraph 6). Thus, as of now, producers and manufacturers are given time for seeking solutions for managing waste.

As for current provisions given in Article 9 – Extended Producer Responsibility, the following 4 paragraphs are to be given:

- 1) "The manufacturer of a product, which after its use becomes specific waste, and who places this product on the market, should design the product in a way that ensures:
 - a) Reduction of their negative environmental impact and the generation of waste during manufacturing and subsequent use of products;
 - b) Recovery and disposal of the waste from these products.
- 2) The obligation under paragraph 1 may be fulfilled through development, production and placing on the market of products that are suitable for multiple use, that are technically durable and that are, after having become waste, suitable for recovery and safe for disposal in the environment.
- 3) The producer of a product that after its use becomes specific waste and who places such product on the market shall be obliged to ensure the separate collection, transport, recovery (including recycling) and environmentally sound disposal of waste generated by their products.
- 4) The obligation under paragraph 3 shall be implemented individually or collectively by an association of producers."

In overall, the main take-away from the WMC is that it has been adopted on the basis of complying with the EU Directive 2008/98/EC and providing means for establishing executive mechanisms for the general society and producers to abide with. The following five concepts are taken as main foundations for sustainable development and sound waste management:

- Prevention
- Recovery
- Reuse
- Recycling
- EPR

3.2 Current Trends and Anticipated Projects

In this chapter, findings are given as to what degree and how the PET bottles are currently managed in Tbilisi, followed by ongoing and planned projects / initiatives and statistics that have been retrieved from local sources. In addition, the input of interviewed specialists and experts from different sectors is also given as means for providing qualitative information concerning the subject matter of this thesis.

Currently, PET bottles are recycled at very low rates and these quantities are mainly reused without any information concerning their hygienic treatment and washing procedure, which is in itself insufficient from health-related issues point of view and untrustworthy for future reuse development. The recycled plastic bottles, owing to downgrading, are recycled again for mostly beverage packaging that change color from white (pre-recycling) to brown (after recycling), which exposes the chemical toxin - antimony trioxide (along with bisphenol-A) even further to people compared to the state of the original PET bottle concentration of the chemical compound (Interview, Abramia, 2015). This aspect turns out be cost-effective for the recyclers but poses a health threat to the end-user. As for antimony trioxide (Sb2O3), a chemical toxin that is released / leached from all PET products, it is considered by a number of studies and specialists to be a chemical compound that is unsafe for humans (Grund et al, 2006). It is also compared to the features of arsenic.

At current levels, recycling in Georgia is very feeble, deriving from which the most common practice for treating PET bottles is having them hand-picked from landfills and dumpsites and then its redirection to storages and finally to facilities that refill them (Interview, Abramia, Kalandadze, Kirvalidze, 2015).

Current specifications and data analysis on diverse waste flows have been mostly generated by independent organizations and studies such as the scientific research firm "GAMMA Consulting" Ltd., Gerhard Blumenrother and "Geo-Cities Report 2011". Also by publications such as "Situational analysis of the green economy development in Georgia on the example of solid municipal wastes recycling" (Clean Up Georgia, 2012). The most up-to-date information about the total amount of generated waste types including plastic waste is the relative time-period data comparison between the one of Gerhard Blumenrother and GAMMA Consulting, given below in table 3-2.

Composition of wastes (kg), 2003 Gerhard Blumenrother, 2003 "The analysis of the waste generated in Tbilisi"		Composition of wastes (kg), 2010 Scientific Research firm "Gamma" "The project on feasibility study of building and exploitation of the polygon of solid domestic wastes of the city of Tbilisi" 2010					
				paper	5%	15 0 15 0 P	6%
				plastic	6%	plastic	6%
inert materials	5%	inert materials	5%				
metal	3%	metal	3%				
textile/leather	3%	textile/leather	3%				
organic wastes	33%	organic wastes	71%				
residue fraction	40%	residue fraction	1%				
green wastes	3%	green wastes	3%				
hygienic wastes	2%	hygienic wastes	2%				

Table 3-2. 2003-2010 Comparison of composition of waste in Tbilisi

Source: Retrieved from "Clean up Georgia" 2012, journal of Green Movement № 2 (20)

.

It can be seen that the figure for plastics had remained intact of 6% throughout 7 years, though no further specification has been found concerning various plastic waste types like PET bottles or other plastic packaging.

To have an idea of the data given in Table 3-2, a comparative analysis of general waste composition of foreign countries is also given for the purpose of relativity in Figure 3-2, describing the structures of waste.

Figure 3-2. Comparative analysis of waste streams in foreign countries and Georgia



Source: Retrieved from "Clean up Georgia" 2012, journal of Green Movement № 2 (20)

In regards with Figure 3-2, the analytical research conveying the figure argues that a relatively low indicator of paper and plastic resembles a waste tendency that is usual of what low income countries show (Clean Up Georgia, 2012). However, the reality today in Georgia is much different from the indexes of the 2003 period, as owing to the increase of population in Georgia, higher demand on beverages and increased consumption rates especially on soft drinks (Interview, Abramia, 2015).

Speaking of higher demand on beverages, the latter has resulted in new manufacturing facilities other than the existing ones (as of 2003) that are labelled as breweries, mineral and soft-drink companies and increased production and manufacturing from which all include PET in their product packaging array. Actually, to describe the current tendency of production growth, the largest share amongst the "components of nominal GDP" in Georgia (as of 2013), are shown below:

Figure 3-3: Components of Nominal GDP in Georgia (2013)



Source: Retrieved from Ministry of Economy and Sustainable Development of Georgia, Georgian Economic Outlook, 2014.

In addition, according to the same report (Georgian Economic Outlook, 2014), manufacturing is rated as the third most fastest growing sector as of 2013, in which small businesses share a 70-95% of registered tax payers (amongst businesses) and a 0-10% of tax revenues, while large businesses share >1% of registered tax payers and over 70% in tax revenues (Ministry of Finance of Georgia, 2011). The same ration for medium-sized businesses are 5-25% and 10-25%, (Ministry of Finance of Georgia, 2011). Whereas the highest tax revenue composition is VATs – 45% from the total 100% composition of tax revenues (Ministry of Finance of Georgia, 2011). The manufacturers of beverages are included in the medium-sized and large companies (Interview, Gvakharia, 2015).

The following most prominent companies producing beverages in Georgia are the following:

Company	Description	
Coca-Cola Bottlers Georgia Ltd.	Certified producer and distributor of Coca-Cola products on the local and regional market	
Pepsi Ltd.	Certified producer and distributor of Pepsi products on the local and regional market	
Borjomi	Market leader in producing mineral waters in the former CIS and Baltic States; currently exports to 30 countries worldwide	
Healthy Water (Nabeghlavi)	One of the market leader in spring and mineral waters	
JSC "Georgian Beer Company"	Local prominent brewery, famous for its beer "Zedazeni" and Zedazeni lemonade	

EFES Georgia – JSC "Lomisi"	Market leader in beer, known also as Natakhtari; currently exports to 20 countries worldwide
Kazbegi	One of the first breweries in Georgia; Brewery and soft drinks; mainly exports to CIS countries
Castel Georgia	Brewery and lemonade production; local and regional distribution

Most of these manufacturers operate assembly lines that possess the capacity of running both PET and glass lines in their respective facilities. The manufacturing companies like Coca-Cola Bottlers Georgia Ltd. get their PET resin pellets from China and partly Turkey (Interview, Chikviladze, 2015), then, by using modern appliances such as PET bottle blowing machines, these pellets are blow-stretch-molded and is ready for filling.

However, no data could be retrieved or found concerning the statistics of the annual amount of PETs that are produced, the headcount of these bottles that are distributed on the market and accordingly what the percentage of these companies PET products share is on the waste market stream.

This finding is yet another pre-requisite as to why PET bottles is an issue in the context of Georgia. Only 35% of the total amount of generated waste is collected from which around 90% end up in landfills and or dumpsites (according to all the interviewees) and the rough estimation of that percentage is 778,000 tons (Geo-Cities Tbilisi, 2011). 350,000 tons of this total amount of collected waste comes from Tbilisi, which accounts to approximately 45% of the generated solid municipal waste in the country (Geo-Cities Tbilisi, 2011).

From these figures, a rigorous assumption of 6% is plastic packaging (equivalent to 46,680 t / year), though experts (Interview, Abramia; Gvakharia; Kalandadze, 2015) exclaim that this percentage is much higher in reality and that PET bottles make up the most of plastic waste content, therefore needs timely and effective management.

Recycling PET Bottles

Recycling plastic packaging and PET bottles has been discussed and proposed by various institutions at various times in Georgia (Interview, Abramia, Chikviladze, 2015), though this area has never been as actively discussed and anticipated as it is now (Interview, Abramia, Chikviladze, Gvakharia, 2015). The best optimal solution for PET bottle waste is reuse and recycling, since it can be recycled a number of times back into the same product, and also for food packaging, clothing, personal care products, construction and industrial materials, etc. (American Chemistry Council, 2014). Georgia's recycling industry is currently at a bare minimum and requires foreign and internal investments for it to have both an economic and environmental benefit.

To a certain degree plastic recycling exists in Georgia and the known ones are to be covered here. Companies such as Coca-Cola and Borjomi have their waste collected and separated by handpicking on Ialghuja landfill in Tbilisi, which is co-owned by BP plc and also on the Rustavi landfill, which then partially gets redirected to local recycling companies such as "Interpolimeri" Ltd., "Plastik Teqnoloji" Ltd., "Caucasian PET Company" JSC (closed in 2013), "Eko-Spero" Ltd. and "LMY" Ltd. Currently, by the means of avoiding this hassle and providing more efficient management, the "Solid Waste Management Company" Ltd., which is a sub-branch of the Ministry of Infrastructure and Regional Development of Georgia, is now responsible for operating 52 landfills in the scope of Georgia (limited to the existing conflict regions of Abkhazia and South Ossetia and the autonomous region of Adjara) (Shukhashvili, 2015).

According to interviewees Mr. Abramia and Mrs. Chikviladze, the "Solid Waste Management Company" Ltd. will also be in charge of operating forthcoming proposed recycling centers at the above mentioned 2 major landfills including the Gldani landfill in Tbilisi, which will ensure quality sorting and recycling processes of incoming waste. This aspect remains to be seen, as the "Solid Waste Management Company" Ltd. is currently largely focused on negotiating finances for constructing new landfills and has reached drawing up an agreement with the European Bank for Reconstruction and Development (EBRD) for the purpose of financing a new landfill that will serve 5 municipalities of the region Qvemo Qartli (web-site publication of "Solid Waste Management Company" Ltd, 2015).

One of the findings that is also to be highlighted is the recycling project that a company named "Ecoorganical Corp" is aiming to implement. The company is planning to establish a polymeric waste recycling facility in city Poti, which will primarily recycle PET / PP / PE waste. The area designated for this project is the free industrial zone of city Poti (see Figure 3-4), in which an estimated amount of 12000 tons of polymeric waste will be shipped to from European countries several times per year for recycling. The facility's peak capacity of washing and recycling is projected to be 10 t of polymeric waste per hour. The facility will process and sort the waste, then shred, wash, melt the shredded flakes and have it pelletized, after which it will be processed into small granulates and be the end-point of the production process. The details concerning the after sale and distribution of these granulates is not provided. (GAMMA Consulting, 2015).

The above information was obtained from the Construction and Exploitation Project of the Polymeric Waste Utilization Facility in Poti Free Industrial Zone, Environmental Impact Assessment (EIA) Report made by "GAMMA Consulting" Ltd. in 2015 for "Ecoorganical Corp". The permission for using the report's data was given exclusively by the director of "GAMMA Consulting" Ltd, Mr. Vakhtang Gvakharia, though due notice is that the current project development is still underway, as the consultancy is yet in the finalization process of issuing the mentioned EIA report. The report title has been translated by the author of this thesis.

Figure 3-4. Project location and implementation area of the Free Industrial Zone



Source: Adapted from the Construction and Exploitation Project of the Polymeric Waste Utilization Facility in Poti Free Industrial Zone, EIA Report. "GAMMA Consulting" Ltd. 2015.

Moreover, the Caucasian PET Company, being the first PET-preforms manufacturer in the Caucasus region that was established in 1996, which eventually closed down in 2013, was preoccupied with making PET preforms from obtained recycled plastic bottles of all sorts and had sales with local and regional mineral water and soft drink bottlers (JSC Caucasian PET, 2004). Some of the companies that made purchases from them was Kazbegi and the Mineral Water Company (Green Alternative, 2006). The former manager at the company gave an interview to an online publishing journal called Investor.ge, stating:

"We exported manufactured preforms in Turkey and sold them in the local market. In Georgia, there is a field where all bottles are sorted, but they are of a low quality... It is also a very small volume for secondary manufacturing" – Enriko Moselishvili.

The Metaloplastic Plastic Processing Factory is another plastic packaging manufacturer providing its plastic containers to small-scale soft drink producers, which bases 80% of their production on secondary raw materials such as "broken boxes, washtubs, bottles, polyethylene waste, etc." (Green Alternative, 2006). The factory sees a marginal profit in terms of using secondary raw materials as this is much more cost-effective than the traditional input of raw materials into the assembly line. As a factory representative has reported, the factory's "primary raw materials are low- and high-pressure polyethylene granules" (Green Alternative, 2006), which is a low-hanging opportunity for them, but another company representative said that collecting these waste materials from landfills have become more of a challenge. The factory usually paid 500 to 600 GEL per 1 t/metric plastic, though the stations selling these secondary raw materials do not receive plastic waste as much any longer owing to its low weight and

amount, which results in that the Metaloplastic Plastic Processing Factory may not even process 1 metric t of plastic waste for over a month. The low weight factor is also discussed by Borjomi: "Plastic containers were introduced for customer convenience due to plastic's lightweight quality" (Borjomi web-page).

The report of Green Alternative is also the only documented source (apart from common knowledge in the society) where it states that there is a practice of individuals (mostly homeless people), at the request of certain organizations, collecting plastic bottles other than glass bottles and bringing them to landfill stations or to companies such as the Metaloplastic Plastic Processing Factory for sale at a low price (Green Alternative, 2006).

According to the Green Alternative report, there is also a company called Tao+LLC (producing cellophane bags for food packaging) that has drawn interest of Dutch investors for funding their project plan concerning the establishment of a recycling factories along with two storage stations that will receive secondary raw materials from all 49 districts of Georgia. According to the report, the LLC believes that there is a market for reproducing a variety of waste types and thus selling the 'granules' abroad because of the existing demand. For this, collection, washing and processing procedures can be enacted within the scope of the projected recycling plant, but the necessity of complying with international standards was stressed (Green Alternative, 2006).

Other notable firms were found, such as the one of "KA" LLC (Kontinent Ammo Limited), which is a manufacturing and trading company, exporting raw metal materials and baled PET scrap. They sort and compact the PET bottles into bundles and put it on sale or export for recycling purposes (sales person, "KA" LLC. 2015). Data concerning where these PETs were obtained from or its quantities or processes could not be verified by the contact person.

Coop Georgia, a non-profit social enterprise established in Tbilisi, 2012, is an organization that offers recycling services to businesses, various organizations and schools. Their activity comprises the placing of separation containers to organizations, communities, etc. (upon mutual agreement) which they replace regularly and transport the accumulated waste to their own sorting facility, but only accept glass, paper and plastic waste. After sorting, the waste is compacted and stored, then redirected to their official recycling partners who originally undertake the recycling procedure. Currently their local partners only recycle paper and glass, whereas plastics are exported to Iran. Coop Georgia seeks to develop recycling services for the purpose of improving environmental conditions in Georgia. They also offer recycling labels (eco-friendly stickers) to their customers (Coop Georgia web-site, 2015).

Also, certain companies ship their accumulated waste to Bulgaria and Turkey for recycling, which is regulated by the Basel Convention (Basel Convention, 1999-2011) as concerns hazardous waste, however, the quantities, type of waste and procedure has not been reported (Part II Annual Reporting – Section A, Basel Convention, 2013), (Interview, Chikviladze, 2015).

The consortium of NGOs ("Greens Movement of Georgia / Friends of the Earth-Georgia", the "Union for Sustainable Development Ecovision" and the "Georgian Society of Nature Explorers Orchis") project "Clean Up Georgia" is also involved in this area of discussion. The project is ongoing and are currently implementing their 2nd phase that is concerned with increasing public awareness and involvement in solid waste management improvement by the means of modern approaches and mainly have an emphasis of popularizing the "3R" initiative, standing for reducing, reuse and recycling (Clean Up Georgia Report, 2012).

3.3 Reflections on DRS

Here qualitative data is discussed and the reflections that interviewees have concerning the theoretical application of a DRS in Tbilisi, Georgia. The individuals who were interviewed are from various sectors, namely: the government, private sector, NGOs and individual experts (see section List of Interviewees).

Deriving from and because of the newly issued WMC of the Georgian legislation, nearly all the interviewees viewed the DRS system in a positive manner and had a purposeful reflection about it in the first place. Though, of course there were a number of assumptions and evaluations concerning the feasibility of introducing such a system, which is exclaimed further into detail below. Moreover, all interviewees reflected the issue and high necessity of addressing PET waste in general and formulating executive mechanisms for its management. The stress made concerning PET bottle management was that its percentage on the local waste market (or rather just the landfilling sector) is high and is increasing exponentially owing to the supply and demand uptake on beverages.

Most of the interviewees also highlighted the urgent need of redirecting the illegally dumped waste back into the current operational waste stream, as there are many such sites in Georgia where waste has been accumulating over the years in the environment and close to populated areas. It was expressed that the latter reality contributes to the significant deterioration of human health and the surrounding environment as a number of local NGOs have reported the vast occasions of such dumping and its elicit health and land / surface waters / ambient air implications on degradation. Also, these sites are frequently burned by the local population or municipalities (Interview, Abramia, 2015). The issue of burning the accumulated waste is quite a known phenomenon in the general public.

No information has been obtained whatsoever concerning refillable or non-refillable PET bottles.

Most of the interviewees indicated the advantage of the new WMC, as it has been an unprecedented move of adopting and introducing the concept of an EPR and principles of prevention, recovery, reuse and recycling. Furthermore, following Article 8 – on prohibition of littering paragraph 1 of the WMC, which states that "no waste shall be thrown, discarded or abandoned in the environment outside designated waste collection containers or collection facilities" - this aspect will highly influence citizens to act differently and comply with the law, since fees concerning the violation of this law starts from 80 to 100 GEL, which is not a small amount for an average Georgian (Interview, Kirvalidze, 2015). Thus, having introduced an economic incentive such as a DRS in Tbilisi for PET bottles, would stimulate citizens to discard their PETs in a reverse vending machine as opposed to trash bins (Interview, Abramia, Chikviladze, Kalandadze, Kirvalidze, 2015). In terms of building environmental awareness and publicizing the DRS model within the general society, spreading word that recycling and effective mechanisms such as a DRS is beneficial for the environment and also that a DRS is an effective tool for managing waste, would result in people discarding their waste in reverse vending machines even if there was no rebate or refund (Interview, Kirvalidze, 2015).

In line with this supposition, Coop Georgia has also expressed a similar view that "66% of Tbilisians say that they are ready to recycle, if they have the chance" (Coop Georgia web-site, 2015). An analogous statistical evaluation was made from Mr. Abramia, stating that if a DRS were to be established in Tbilisi, whether it were made a mandatory issue or not as of the legislation, approximately 60-70% of people would practice the DRS, knowing that it would evade externalities such as the prevention of illegal dumping and support the foundation of

investing in recycling facilities (Interview, Abramia, 2015). There were diverse views as well concerning recycling, in that there would not be of much use of having a DRS and / or separation containers in place if there is no capacity of recycling in the first place (Interview, Chikviladze, Geladze, Kalandadze, 2015). However, it is also true that there is a demand of secondary raw materials on the market, from local and foreign stakeholders, which plays a role of providing financial interests to these stakeholders along with individuals who already practice collection and further sales of waste in the scope of Georgia (Interview, Kalandadze, 2015).

It is also worth mentioning that certain individuals, especially ones from the upper class of society, would not be up to changing behavior in relation to accumulating their PET waste and depositing / disposing it publicly (Interview, Abramia, Kalandadze, 2015). Alongside this, changing public behavior was discussed by interviewees as mostly being an erratic phenomenon, but certain positive outcomes will be reached by the means of the new WMC. Executing the provisions in the new code is very much up to forming an executive mechanism, body or legal structure (of the government) that will ensure and regulate compliance to the law and impose fees in case of violation (Interview, Gurguliani, Kalandadze, 2015). In regards to the latter, an EU funding program / competition was announced in which a group of experts will be formed to address the issue of establishing an effective executive mechanism that will ensure the functioning of EPR in Georgia (Interview, Gurguliani, Kalandadze, 2015).

The reason as to why EPR is essential to have in effect is that it will engage producers in managing their own waste and by doing this it would be of high necessity to put a DRS model into use. As for now, a national strategy and implementation plan is being designed to address waste issues in Georgia, however, the Ministry of Economy and Sustainable Development of Georgia is currently not considering the provision of any forms of incentives nor carrying out negotiations with local producers concerning EPR initiation.

Although, the Ministry of Environment and Natural Resources Protection of Georgia and the EU are discussing the latter issue and additionally, in partnership with the OSCE, there have been attempts of introducing the idea of a green economy and of effective mechanisms such as a DRS to major stakeholders including manufacturers and continue working in this direction. Even though local producers are not familiar with such concepts, the tendency is that the Ministry of Economy and Sustainable Development of Georgia will eventually consider the implementation of EPR, since the waste management strategy and plan will be adopted this December, 2015 (Interview, Gurguliani, 2015).

Introducing a mechanism such as the DRS in Tbilisi would entail a number of barriers, such as bureaucratic and legislative (Interview, Kalandadze, Kirvalidze, 2015), financial interests of manufacturers (Interview, Geladze, Gvakharia, 2015). Deriving from the current reality and conditions of Georgia, the greatest barriers for establishing a DRS is the political and economic situation that would hinder the mechanism, but in due time, it will be very effective to consider once the new WMC is executed (Interview, Abramia, 2015).

What is to be considered if a DRS is under discussion is the willingness and capacity / capability of retailers to accept the traditional "formula" of an operational DRS that includes the placement of the reverse vending machines in their commercial areas. Such realistic candidates in Tbilisi are the chain supermarkets, namely Goodwill, Carrefour and newly spread Spar, who carry the potential capacity and area for having the indicated machines placed at their locations. For this, they must be either economically interested in this mechanism or otherwise the DRS must be mandated by the national legislation and certify the placement. Having this said, it is most likely that the legislation along with NGOs put pressure on the manufacturers, since in reality they must certainly be aware of the provisions of EPR and that they will need to address

their generated waste through introducing new effective mechanisms (Interview, Kalandadze, 2015).

Another point is that even if a DRS is mandated, supermarkets such as the above mentioned and convenient stores might not be the optimal place for placing reverse vending machines, either because the store managers will not be willing or that there will simply be the problem of space for just that. In this regard, policy makers, the private sector (producers) and retailers must have an in-depth evaluation and discussion about this subject matter (Interview, Kalandadze, 2015).

The government is very interested in introducing effective mechanisms such as the DRS for the purpose of sound waste management and is oriented on R&D in this direction (Interview, Chikviladze, Gvakharia, Kirvalidze, 2015). By the means of changing behavior and putting a demand / legal requirements on the society, it is fundamental to contemplate with the experience, methodology and models developed nations have already applied that implement their respective strategies for reducing / eliminating waste and putting prevention, reuse and recycling as top priorities (Interview, Chikviladze, Geladze, Gvakharia, Kirvalidze, 2015). In light of these concepts, it would be much easier to facilitate and envisage the benefits that these concepts offer to businesses and the general public, from which new economic and environmental value can be obtained (Interview, Abramia, Chikviladze, Kirvalidze, 2015).

4 Case Studies

In this chapter, there is a brief description as to how DRS was applied in two different countries - Estonia and the model of Croatia that is unlike a traditional deposit system, also followed by the steps taken in Belarus that adopted EPR, which can be looked further into for convenience by Georgian policy makers. Herein the findings provide general features, practices and regulatory themes of the given countries which will play a fundamental role for discussing the comparability and transferability of their adopted characteristics to the reality of Georgia (discussed in Chapter 5 - Analysis).

The ultimate methodology for selecting these countries is the relevant socio-economic aspects that are more or less identical to the one of Georgia's, thus making a feasibility study in this regard is more practical than comparing the transferability of a DRS model of e.g. Sweden or Germany. Even though living standards in Estonia (GDP – \$24.88 B. GDP per capita – \$18,783. World Bank, 2013. Population – 1.34 m. EUROSTAT, 2012c) and Croatia (GDP - \$57.87 B. GDP per capita – \$13,607. Population – 4.25 m. World Bank. 2013) are higher than Georgia's (GDP - \$16.14 B. GDP per capita – \$3,605. Population – 4.47 m. World Bank. 2013), it is still relevant to make a transferability comparison of their adopted models to Georgia.

4.1 Estonia

Pre-2002 period in Estonia was characteristic of having beverage container management issues, including PET bottles, of which most of the waste flow was directed to landfills and incinerators (such as Eesti Energia (Enefit)) (ETC/RWM, 2008). During the years 1993-1997, there was a slight increase of municipal solid waste by 40% compared to the recent status quo levels, which was largely comprised of packaging materials, and the waste share per person in Estonia was 221-350 kg per year, from which most of it was going to landfills (Saarniit, 2004). As of 2012, the average person in Estonia generates 279 kg per year, though 40% of it is recycled and the residual waste per person is 167 kg, "that is less than 0.5 kg per person per day, 2 times less than

a Dane, 3 times less than a Greek and 4 times less than a Maltese..." (Zero Waste Europe, 2014). This resulted in Estonia being amongst the leaders in Europe in terms of waste performance indicators (Zero Waste Europe, 2014).

The primary reason for this achievement was the adoption of EU policies and legislative frameworks such as the Waste Directive 2008/98/EC, including the provision of a DRS into their National Waste Management Plan (NWMP).

Estonia adopted and mandated the container-deposit legislation in 2005, this year being its 10th anniversary, along with initiating their recycling system to meet the uprising standards coming from the EU (EFTA Report, 2011). For this, the NWMP was adopted in 2002 and sought its implementation strategies throughout the years of 2003 and 2007 to fully synchronize with the EU waste legislation and policy. The universal deposit system was applied as an effective instrument to fulfill the set goals and objectives and policy of the National Environmental Strategy of Estonia. Up to now, the DRS has been considered as very successful means of diverting waste from the traditional curb-side collection model and further encourage recycling, proving to be cost neutral for all including stakeholders – producers (including PET), retailers and government. The separate collection and recovery of packaging waste generates a circulation of approximately 250 m in the deposit system annually and has shown a collection rate of 80% of PET bottles (ETC/RWM, 2008).

Both for manufacturers (who pay a fee per unit of packaging) and end-users the DRS is a winwin condition, while the retailers who sell beverage containers are required to comply with the take-back principle, i.e. the deposits that have been sold on their property. If the retailer's commercial area is less than 200 m² then the sold packaging (bottle / container) may be deposited to a different location of which premises is over 200 m². In addition, markets that have an area of less than 20 m² are not required to take back the container sold at their property. Therefore, the recovery system location is set at retailers for return (Packaging Act, 2004).

Reverse vending machines (RVM) take the returned packages either manually or automatically, in which the type of containers that is possible for deposit are one-time and refillable containers, for which the deposits for PET bottles are the following:

- PET bottles that are non-refillable ≤ 0.5 l: $\notin 0.04$
- PET bottles ≥ 0.5 l: $\notin 0.08$

There are also additional fees such as handling fees and administrative fees and also the packaging excise duty, however, first the recovery organizations must be discussed. These organizations are responsible for taking charge of managing the collection of packaging materials and the DRS itself. Having the EPR in place, the manufacturers are responsible for managing their own waste and packaging in terms of collection, who govern the recovery organizations along with retailers, of which these organizations are required to be non-profit and are obliged to reinvest their attained profits back in their organization (Waste Act, 2004). These recovery organizations are recognized by the MoE of Estonia (Waste Act, 2004).

From these, the Estonian Deposit Packaging Ltd. (OÜ Eesti Pandipakend), abbreviated as EPP, is in charge of the DRS itself, keeping "all unclaimed deposits and charges service fees", whereas OÜ TVO, Eesti Taaskasutusorganisatsioon and Eesti Pakendiringlus are responsible for maintenance and collection of the packaging items (Packaging Act, 2004). There is also the Packaging Committee that acts as a regulatory and consultative body for maintaining the system and ensuring that the Packaging Act objectives are satisfied (Packaging Act, 2004).

The EPP recovery organization also set a labeling (see figure 4-1) for various beverage packaging and an EAN bar code for beverage type recognition, which requires all the companies member to the EPP to carry the label.

Figure 4-1: Labelling system for beverage packaging types



Source: Retrieved from Eesti Pandipakend web-site

The handling fees are authorized by the EPP to manage the costs of collection and take-back for refillable and non-refillable deposit packaging, remunerated to the collectors / retailers. Thus it is the DRS Company that regulates this practice, along with the administrative fees that is discussed below as well. Handling fees also depend on the way the packaging materials are inserted (as mentioned above – manually or automatically), having different rates monetary-wise, as shown below:

- "Manual collection 0.0086 € per packaging unit plus VAT (all types of packaging)"
- "RVM collection without container compression 0.0192 € per packaging unit plus VAT (all types of packaging)"
- "RVM collection with container compression 0.0269 € per packaging unit plus VAT (all types of packaging)"

The above figures are obtained from the web-site of the Container Recycling Institute (CRI).

It can be seen that the handling fees are fixed for all types of packaging, but varies to the manner of deposit, of which RVMs encompass higher fees due to their ability to compress the inserted packaging that facilitates the material's portability to and assembly to recycling facilities and also marginally cuts the initial costs for product / container waste compression. The process is monitored by a body called the Environmental Inspectorate, known to have undertaken the monitoring procedure of 900 retailer locations where RVMs have been positioned; this data was registered during the 2005-2006 monitoring procedure, playing an effective executive role for ensuring compliance with the Packaging Act (ETC/RWM, 2008).

As for the administrative fees, below are the fees that have to be paid by the producers to the EPP. According to the relevant fees disseminated in 2011, the following numbers concerning the administrative fees have been obtained from the CRI:

Administrative fees as of 2011:

- "Packaging with unique EAN bar code 0.012 € plus VAT;"
- "Packaging with standard EAN bar code 0.017 € plus VAT;"

In line with the administrative fees, the beverage companies / packagers have to regularly fill out sales and recovery reports that are sent to the packaging register (i.e. in the national database) (Packaging Act, 2004). What is also to be mentioned here is that no stakeholder sees a loss in profit deriving from this system, not discouraging them to participate.

Having introduced the financial incentives to the producers plays a significant role for implementing the system, but interest has been expressed by the public as well who actively participate in the take-back principle, also being given the option for donation (donation buttons installed on 49% of the RVMs in Estonia) to charity organizations (CRI, 2011).

The competent authority for managing waste in Estonia is the Ministry of Environment of Estonia (MoE) that is also responsible for implementing and enforcing EU legislations and national law. The main legislation concerning waste is the Act on Waste Management 2004, which has been amended a number of times. However, the legislative summary concerning the deposit refund in Estonia is the Packaging Act (of the Packaging Directive) adopted in 2004 and implemented in 2005 (EIONET, 2009).

The Packaging Act regulates the take-back system in which "packaging companies are required to accept, from the final user or consumer, sales packaging and packaging waste, or to arrange for such service based on a contract at another place of sale in the close proximity of the undertakings" (ETC/RWM, 2008). This in turn encourages reuse and recycling that are regarded as the most optimal practices, reducing the waste stream going into landfills. Moreover, in accordance with the Packaging Directive the Act establishes certain targets that are to be met regarding the issue with recycling and recovering packaging waste. As far as recycling waste goes, there are annual overall goals and targets set to determine waste recovery rates, calculating the recovered waste and the entire sum of the packaging products placed on the market. The latter is defined by percentage and weight of the mass of packaging products. A specific packaging good that fails to comply with these goals will most likely be designated to pay the packaging excise duty (companies to government) (ETC/RWM, 2008).

The National Environmental Strategy set targets for recycling, reuse, refilling and collection, thus, as of 1995, set a goal to of reaching the share of waste recycling to 50% and over. The overall goals and objectives according to the Packaging Directive, determined by the NWMP is to maximize the recovery of municipal waste according to the following (ETC/RWM, 2008):

- "At least 60% recovery of the total mass of packaging waste a calendar year;
- 55-80% recycling of the total mass of packaging waste per calendar year" (Packaging Act, 2004)

However, the specific goals for specific packaging materials vary upon the material itself, for example, the material-specific goal for plastic waste is the following:

• "Plastic waste: 55% recovery of the total mass, 45% recycling of the total mass and 22.5% reprocessing into plastic" (Packaging Act, 2004)

Other than the Packaging Act, the Packaging Excise Duty is also put into effect in which beverage companies pay a tax to the government, i.e. the Tax and Customs Board, concerning all packaging put on the Estonian market. Excise tax exemptions are permitted if a company has reached recovery rates ranging from 15-85%, depending on the product / packaging type and quantity. However, if waste recovery rates do not comply with the assigned target, the responsible company has to pay the packaging excise (Packaging Excise Duty Act, 1998-2008).

The excise rate for plastic packaging is 2.5 € per kg (Packaging Excise Duty Act, 2008).

Another finding is the interesting factor of alcohol tourism, noted to be a contribution to the decrease of container returning rates, of which are taken to neighboring countries such as

Finland, also known to be the receiving country of glass bottles from Estonia (BiPRO WFD, 2011).

The diagram (figure 4-2) below illustrates the applied operational DRS mechanism in Estonia.

Figure 4-2: DRS mechanism in Estonia



4.2 Croatia

Waste management and environmental awareness of the public in the Republic of Croatia used to be one of the most challenging environmental issues in the country. As of current trends, approximately 1-3% of PET packaging waste out of a 30% packaging waste content is documented within the scope of municipal waste, which is considered as a large proportion in the waste flow (Layman Report, 2004-2006). Croatia, also had landfill overload problems until 2005, when the laws – Waste Act (2004-2006) and the Ordinance on Packaging and Packaging Waste, 2005). From 2013 a new regulation on waste management was adopted that is also synchronized with the Directive 2008/98/EC.

The Ordinance on Packaging and Packaging Waste will be further abbreviated and referred to as the packaging ordinance / or ordinance within the provided text.

As of today, the model that Croatia uses in regards to managing beverage containers (including PET bottles) is primarily based on fees that is regulated by the packaging ordinance (Packaging Ordinance, 2005); as mentioned above, the set provisions of the ordinance is not described as the traditional DRS, but resembles a similar approach as the DRS but is limited to the practice of RVMs. Although it can be argued that the system in Croatia is much like a deposit-refund, but the terminology and the associated traits are rather different.

The ordinance defines packaging and its related regulatory themes as the following:

"Packaging presents all products regardless of the nature of the material it is made of, or if they were used for containing, keeping, handling, delivery, and representation of goods, from raw material to final products, from manufacturer to users and consumers" (Packaging Ordinance, 2005)

The latter entails all specific packaging types and its materials, but is required by the ordinance that the packaging containers be fit for reuse or recycling and keep certain amounts of material per unit to a specified degree, as specified by the ordinance (Packaging Ordinance, 2005). If this threshold is not satisfied then producers are obliged to pay the following:

- "Expenses of collection";
- "Expenses of disposal";
- "Recovery of their products' packaging"

Source: (Packaging Ordinance, 2005).

The fees that are assigned as of the ordinance are designated to producers, who pay three different types of fees to the Environmental Protection and Energy Efficiency Fund (Packaging Ordinance, 2005). The fund is described as a "legal person" holding public authority that carries out the management process / activities of the ordinance and is also in accordance with the Waste Act (Waste Act 2004).

The three fees for placing packaging containers on the Croatian market are the following:

Table 4-1: The three fees of the ordinance

Fees	Range	Fee Description
Returnable Fee	0.5 HRK / unit of packaging sales. Including all beverage container types (glass, PET, etc.) > 0.20 1	Paid by producers for placing new packaging containers on the market. Applies to single-use containers. Producers taking responsibility of collecting \geq 50% of their own packaging / packaging waste are exempt from the fee.

Disposal Fee	0.10 HRK / unit, a uniform fee for all beverage type containers; For PETs it is 410 HRK / t	This fee is not refundable. Does not apply to reusable packaging. Disposal fees also varies on the types of packaging material and volume.
Stimulative Fee	For PET (& glass): > 0.251– 0.3 HRK; 0.25 0.501–0.5 HRK; 0.5-1.51–0.7 HRK; < 1.51–1.0 HRK	Applies to manufacturers who do not produce reusable containers, depending in which year the returnable rates reached the national targets or not; encourages returnable containers. Small producing companies are exempt from this law.

Note: Table formulated according to the Packaging Ordinance, 2005. Also, according to the ordinance, the range of fees provided in the Stimulative Fee is only in effect until the "Framework Target" is reached (Packaging Ordinance, 2005).

It is also necessary to mention the Framework Target (Article 27) of the packaging ordinance, which defines the set targets according to respective years:

Article 27

"The Framework target pursuant to this Ordinance shall be 55% of mass of recycled packaging waste by 31 December 2008 that is 80% of mass of recycled packaging waste by year 2015, and from that recycled at least 60% of mass of each packaging material contained in packaging waste except wood."

Another difference as opposed to the traditional DRS is that consumers are not required to pay an advance deposit fee, however, once the containers are returned to the retailer, the "sellers" give compensation (0.15 HRK). In this regard, it can be assumed that the initial cost per unit of packaging container is value added by the producer in the first place. The "sellers" are referred to as the retailers or the natural person vending the product, under the definition of the packaging ordinance (Packaging Ordinance, 2005).

The sellers, who are responsible for taking back packaging containers (of which the premises area is $\geq 200 \text{ m}^2$), are also required to submit reports every quarter concerning the packaging that has been collected within the annual quarter and the refunds / compensation returned to the consumers (Packaging Ordinance, 2005).

The sellers are also obliged to give the accumulated packaging to official collectors or transporters accredited in Croatia, which further direct the flow to recycling factories (Packaging Ordinance, 2005). Both the sellers and transporters are then fully compensated by the fund (Environmental Protection and Energy Efficiency Fund), however, for sellers, this only applies to the ones who undertake sorting procedures of the accumulated packaging containers according to their type (Packaging Ordinance, 2005).

The transporters / collectors (who also store the packaging and packaging waste) are refunded by the Fund by 20 HRK / t (Packaging Ordinance, 2005). In addition, compensation is given from the Fund to collectors who undertake the transportation of the packaging containers at certain distances, such as given below, obtained from the Ordinance:

- "100 HRK/t for transportation distances of up to 100 km"
- "200 HRK/t for transportation distances of 100 200 km"
- "300 HRK/t for transportation distances of 200 300 km"
- "400 HRK/t for transportation distances greater than 400 km"

Though it is to be mentioned that there have been financial issues concerning the Fund and falsification of returns made in foreign countries (CRI, 2011). As of 2006, the Fund especially had a deficit of more than €41 m, owing to the factor that Stimulative fees were not properly implemented, thus the Fund spent far more than it received (CRI, 2011).

PETREC Project

Furthermore, findings included here is a supportive project design that has been provided by a local Croatian NGO called "PET-EKO", assisting and undertaking consultative work for developing sustainable management of PET-based products in Croatia. The implemented project (PETREC) focused on providing an optimized policy analysis with relevant recommendations for developing a PET collection and recycling scheme to the Ministry of Environmental Protection and Physical Planning of Croatia and the Fund (Layman Report, 2004-2006).

However, the take-back here is the activities that the PETREC Project carried out, such as piloting of new collection systems (RVMs) at convenient locations, informational campaigns and workshops, promotional programs and public events, which bolstered the tendencies of engaging PET waste issues, collection and recycling initiatives. The belief behind the project framework was the importance of initiating modern technological solutions and practices for the sound implementation of collection, transport and recycling of PET waste in a waste management system (Layman Report, 2004-2006). For this, a higher level of environmental awareness in the public is essential, to meet the modern demands and challenges within a given environment.

The project commenced its activities focusing on raising the educational level concerning recycling and modern waste collection systems and the convenience of creating incentives. The activities involved were offering consultations with various stakeholders, such as governmental, producer and retail representatives, carrying out public events such as public meetings, workshops and media coverages. Local schools also participated in the held events (Layman Report, 2004-2006).

Certain promotional programs were held at universities and schools to assess consumer's state of awareness of returning bottles and recycling and evaluating the necessary extent to which motivation of the society is needed for engagement. Promotional programs included: students participating in competitions in which awards were given to those who collected the most PET bottles, logo designing, etc.

In addition, a pilot test was launched in a town called Bjelovar, which entailed the installment of 5 RVMs (in supermarket chains and schools) in the center of the town in different spots. This activity was followed by more informational and public event campaigns. The outcome of this pilotage was that 10 times more PET was collected "in the first 9 months than the amounts over the last 6 years together" (Layman Report, 2004-2006).

4.3 EPR in Belarus

The reason Belarus is brought up as a case study has much to do with the view that DRS approaches are regarded as efficient policy instruments that is compatible with an EPR program (Walls, 2011). Thus, this part is also analyzed in Chapter 5 and mentioned in Chapter 7.

The text given here is translated by the interpretation of the author of this thesis from Russian to English, obtained from the Overview of the legislation of the Republic of Belarus on extended producer responsibility (unpublished document), by the means of gaining further insight as to how producers responsibility of PET waste can be addressed with the EPR concept. For this, a number of provisions and regulations are given below.

The resolution № 261 made by Council of Ministers of the Republic of Belarus on 27.02.2003 No. 261 is concerning questions addressed to plastic waste (resolution No. 261). The State body responsible for the resolution performance by EPR subjects is the Ministry of Natural Resources and Environmental Protection, featuring a legal body such as the Environmental Inspectorate.

The EPR objects concern a number of container including plastic containers applied for goods and beverage packing. The types of containers were defined by the Ministry of Natural Resources and Environmental Protection.

EPR subjects (legal entities such as producers and importers) shall take the following measures listed below for decreasing the harmful effects of plastic waste on the environment, which are obtained after consumption of the goods packed in plastic containers:

- a) Make payments to the environmental protection fund for the organization of plastic waste processing;
- b) Create their own system for collecting and processing plastic waste (preparation) which are consumed by users for the rate of the established standards;
- c) Sign contracts with the specialized organizations in charge of collecting and processing plastic waste, which are consumed by users for the rate of the established standards.

EPR subjects have the right to choose any of these measures. However, if point "b" or "c" is chosen and the plastic waste calculated at the rate of the established standard is not collected, then the EPR subject shall make a payment (i.e. point "a").

The payment according to the resolution N_{2} 261, became a part of the taxation objects with an ecological tax. The payment was calculated at a rate of 60 basic sizes of one for one ton of plastic waste. The quantity of plastic waste is calculated deriving from the quantity of the sold containers and the established standard. The payment was enrolled to the environmental protection funds. The manager of the fund is the Ministry of Natural Resources and Environmental Protection.

The Ministry of Natural Resources and Environmental Protection adopted the following resolutions of:

• 18.03.2003 № 9 "On the approval of the standard of decreasing harmful effects of plastic waste on the environment and the list of plastic containers concerning which this

standard is established";

• 28.03.2003 № 12 "On the approval of the instructions for collecting and processing plastic waste."

At first the standard established a 30% quantity (in tons) of sold plastic containers. Thus, the EPR subject shall collect and process plastic waste that make up not less than 30% of the total plastic containers sold by such subject. For example, an EPR subject selling 10 tons of plastic containers for half a year on a local market of the Republic of Belarus, shall collect and process 3 tons of plastic waste or make a payment for 3 tons (1 ton "cost" 60 basic sizes).

The list of the type of containers include: medium and large size PET bottles.

5 Policy Analysis

In this chapter, the main focus is made on the adaptability of the findings presented in the case studies to the conditions of Georgia. By the means of assessing what the most realistic scenario would be for stakeholders to consider adopting a DRS model in Tbilisi, an ex-ante multi-criteria analysis is carried out, discussing the overall feasibility of application, economic aspects, social and political acceptances, policy and views and the necessary variables for adopting a DRS. The discussion is summarized in a SWOT analysis.

The deposit-refund, being highly valued as an efficient policy instrument that addresses externalities in the same manner as Pigouvian taxes (Bohm, 1981), is credited for redirecting waste disposal flows, preventing or minimizing illegal dumping, facilitating recycling processes thus also reducing resource/raw material extraction in the following environmentally beneficial ways, concerning PET bottles (provided that recycling factories are present within a country):

- Helps reducing the total amount of energy consumed for production;
- Helps reducing the total amount of oil and other raw material needed for production;
- Helps reducing CO₂ emissions;
- Helps preventing waste dumping, burning and land-filling.

Although consumption taxes and disposal rebates of a DRS much resemble a corresponding concept of the Pigouvian taxation (Fullerton and Wolverton, 2000), the market activity is driven more efficiently by the former in terms of preventing the practice of illegal dumping, tax evasion and also ensuring better monitoring and enforcement provision (Walls, 2011). Adding up these circumstances summarizes the DRS as a market-based instrument and an environmental design addressing negative environmental externalities (Walls, 2011).

As demonstarted in the cases of Estonia and Croatia, incentivizing PET bottle return has advantageous results both economically and environmentally, though proper initiation and commitment is needed from relevant stakeholders. However, the overall impression obtained and analyzed in Georgia is that currently there is no specific view or ideas foreseeing the application of a DRS model, which gives basis for discussing the latter aspect. The qualitative and partially quantitative data obtained regarding Georgian policy and approach towards PET bottle waste as such and methodologies for seeking solutions to it can be concluded as the following:

- PET bottles are regarded as a waste issue that needs new management tools to treat it in an environmentally sound context (mostly identified among interviewees from various sectors and in published reports)
- The provision of an EPR in the WMC plays a distinctive role for addressing the above mentioned issue, while the concepts of prevention, recycling, reuse and recovery are also introduced in the WMC
- The lack of awareness and advocacy for effective mechanisms such as a DRS among producers and policy makers is present, which makes it more challenging for policy makers to commence a process for introducing it
- No regulatory body (from government or manufacturers) in place that controls and keeps track of data sheets, monitoring, reports, facts, statistics, and types concerning PET waste flows
- Advocacy of such mechanisms among the general public is also lacking, as owing to current socio-economic trends in the country; political discourse is aimed at economic growth rather than the disclosure of environmental performances
- There is a lack of awareness and methods on how specific waste such as PET bottles can be treated, but the Ministry of Environment and Natural Resources Protection of Georgia is currently negotiating and articulating the issue with various governmental bodies and the private sector
- Further developing new landfills is favored over introducing market-based instruments and recycling
- DRS has not been envisaged as a potential policy instrument, but deriving from current trends, potentially resulting in it (or other MBIs)
- The capacity of introducing a new policy scenario is largely feasible and dependent upon governmental pressure on related stakeholders, as the latter is not familiar (or does not discuss) with effective waste management schemes and their importance (Interview, Gurguliani, 2015)
- The recycling capacity is low and insignificant, however, ongoing developments and projects will give opportunity to support a DRS
- The capacity of beverage manufacturers possessing financial means and willingness to connect with a DRS policy or similar mechanism is unclear
- Imposition of environmental costs on Georgian beverage manufacturers would need a comprehensive study and win-win-driven negotiations

Hence, in consideration of the above factors which show relatively low awareness/environment for a DRS application for managing PET bottles in Georgia, evaluations are given further as to what would be more realistic for adopting a DRS model based on the provided case studies in Chapter 4. Achieving environmental objectives and adjusting "greener" economic schemes is a matter that should be discussed on a national policy level, thus this requires an all-inclusive stakeholder agreement (Fullerton and Wolverton, 2000), to establish a framework that is more efficient and cost-effective for the country.

However, for now, the feasibility question of applying a DRS in Georgian policymaking is to be analyzed. Therefore, what are the specific factors that must be looked into?

5.1 Administrative Feasibility

One of the points that are addressed is the administrative and legal feasibility. Enforcing environmental regulations and policies and meeting the norms pertained within requires establishing relevant laws that execute monitoring, control and enforcement mechanisms (OECD, 2008). Having the newly set WMC in Georgia that is synchronized with the EU Directive 2008/98/EC is a fundamental basis for initiating sound environmental approaches, which will require producers and the public to comply with. The EPR concept set forth in the WMC is the focal point. Even though it will be enforced in 2019, it still needs the provision of thorough executive mechanisms and regulatory bodies that will ensure monitoring and control. Two examples can be taken for achieving this point:

- 1. The Estonian model, in which the Packaging Excise Duty is obligated. Beverage companies are required to pay a tax to the Tax and Customs Board for all types of packaging (including PET bottles) that are placed on the Estonian market, in case a company fails to meet the national target recovery rates of 15-85%. This in turn, both acting as a law and incentive for producer's compliance, results in as an effective executive mechanism for ensuring successful operation of the Estonian Packaging Act. Ensuring the latter compliance in Georgia can be undertaken by the means of establishing a likewise taxation policy. However, the recovery rate targets have to be established in accordance with the manufacturer's production and the recycling factories intake capacities. Also, the Environmental Inspectorate could be granted more authority overseeing compliance issues.
- 2. The Croatian example for monitoring and controlling retailer's compliance with the Ordinance is the quarterly reporting of the beverages collected along with the compensation given to the consumers. The same practice can be attained in the retailer stores who will be held responsible for receiving back used PETs in Tbilisi, provided that RVMs are not acquired. However, ensuring that fraud and money laundering does not occur, the Revenue Service existing in Georgia can regulate this (the revenue service is a legal entity representing the Ministry of Finance of Georgia that executes state control over businesses and tax payers (Revenue Service, 2015)).

The given methods are only valid provided a Packaging Act or Ordinance on Packaging and Packaging Waste such as of the Estonian and Croatian are adopted on a legislative level. Also, the latter can be achieved by making the proposed EPR of the WMC of Georgia mandatory, which may also incorporate similar acts on Packaging, or otherwise adopt a resolution like N
⁹ 261 of the EPR in Belarus that deals with packaging standards and concrete producer responsibilities. This is fundamental for the policymakers to choose and decide upon, while the governmental structures will also need to highly collaborate with the producers and retailers.

The main body for establishing such regulations would be the Ministry of Environment and Natural Resources Protection of Georgia, however, securing a taxation policy would require a mandate from the Ministry of Economy and Sustainable Development of Georgia, making plastic waste collection an obligatory requirement (as in Belarus), thus stipulating the necessity of applying a DRS in the country would be of interest to the producers. Making a container deposit legislation mandatory or not is solely up to the policymakers to decide, however, a mandatory system would be highly effective and would be in correlation with an EPR program.

Putting an EPR into effect will trigger the use of point b), paragraph 2 of Article 1 of the WMC, which touches upon the introduction of effective mechanisms for managing waste. Thus, a DRS is highly compatible with the objective of the law, which also ensures prevention and reduction of waste adversary impacts. Administratively, stakeholders such as governmental authorities, beverage companies (like Borjomi, Coca-Cola Bottlers, major breweries, etc.) and retailers (such as Carrefour, Goodwill, Spar who hold supermarkets as big as 200 or more square meters) have to strike agreements in which compromises should be made with the immediate executive bodies who will run the DRS, though this aspect is a discussion under 5.2 Economic Aspects.

It is also essential to address the aspect of financial and operative governance, a body that will be responsible for administering the funds and direct management associated with maintaining and running a DRS in Georgia. For this, adapting a similar approach as the one of the Estonian or Croatian strategy would be possible.

As mentioned above, stakeholders must reach agreements for fulfilling a potential DRS, in which the establishment of a recovery, collection and processing system also has to be discussed. Theoretically, both the Estonian and Croatian systems can be applied in which the stress should be made on establishing a system such as the Estonian Deposit Packaging Ltd (EPP) or the Environmental Protection and Energy Efficiency Fund as in Croatia. It is realistic to consider such a Fund or organization that would manage a DRS in Tbilisi, however, active involvement from both government and industry would be needed, since the industry alone does not anticipate anything similar to a DRS as of current trends (Interview, Chikviladze, Kalandadze, 2015), which is why they need more pressure and incentivizing from the authorities (Interview, Kalandadze, 2015). In addition, reaching such objectives is disregarded if state regulations are not enforced to a certain degree (Crabbe and Leroy, 2008). This is again where the provision of an EPR would play a big role.

If an agreement cannot be reached with retailers concerning the placement of RVMs, other alternatives can be considered (Interview, Kalandadze, 2015). In this regard, the "Solid Waste Management Company" Ltd. (of MoE) could adopt a strategy in which separation containers could be placed at convenient places such as in neighborhoods and public areas. The containers should be labelled in accordance with the types of waste, e.g. PET waste, glass, paper, etc. Thus, this scenario would most likely exclude a traditional DRS, but allow PET bottles to be sorted more effectively and be directed to recycling facilities nevertheless (in case of its existence). RVMs could also be placed at such sites, but this scenario would need a whole different evaluation.

Administrative feasibility also includes the factors of initiating voluntary agreements and awareness and capacity building with the industrial sector (OECD, 2008). Carrying out public events, award mechanisms, piloting projects, informational campaigns, workshops and others can play a major role in facilitating administrative feasibility (OECD, 2008), and a good example of this can be replicated by the Georgian authorities from the PETREC project carried out in Croatia (see sub-chapter 4.2). As for capacity building, the government may also promote various practices such as establishing and adopting technologies that recycle the generated PET waste (e.g. non-refillable bottles) into different products, as the range of products made from recycled plastic is huge (Recycle Now, 2015).

Currently, defining the level of administrative feasibility is challenging, as the commitment of Georgian policies is oriented much on economic growth in terms of foreign investments and loans rather than environmental pricing reforms. Regulating environmental inconsistencies has always been an issue, thus, a holistic approach needs to be taken to foster environmental regulations in Georgia (Interview, Abramia, 2015).

5.2 Economic Aspects

At this point, the taxation policy that is enacted in Georgia towards the industry does not incorporate environmental aspects or the advocacy of using efficient mechanisms for the environmental purposes, but rather focuses on mere increase of governmental revenues. Government intervention in the business sector has been limited and there have been a number of advantageous reforms for businesses in terms of facilitating and easing tax revenues, also resulting in the increase of SMEs. Consequently, the Georgian government revenue is largely relied on taxes paid from local/foreign businesses, in which the industry along with trade has largely increased as described in the findings of 3.2 Current Trends and Anticipated Projects.

Though as far as introducing incentives goes, there have been very limited discussions about the topic. According to most of the interviewees, they insist that there are no pro-active approaches or ecologically green policies that would promote a "greener" taxation system, which would also in turn provide a competition amongst the producers that are competing on the local/regional market, hence prospering and healthy competition in this sense would also compensate for the costs related to the production of beverages, but only in case there is a relevant cost-effective policy approach in place. Such terms can be achieved in Georgia by an effective policy instrument such as a DRS and recycling in place. Defining a cost-effective policy that can be significant in this context is the following definition of Field and Olewiler, 2002:

"A policy is cost-effective if it produces the maximum environmental improvement possible for the resources being expended or, equivalently, it achieves a given amount of environmental improvement at the least possible cost."

The provision of tax incentives in Georgia would improve overall effectiveness of productivity and by the means of achieving laid out objectives or national targets and action plans, environmental effectiveness has to be considered, as it defines the impact of a certain policy on the level of imposed environmental damage (EEA, 2001). Moreover, the implemented measures of a policy instrument can be assessed according to the degree to which the set goals have been achieved and accomplished (OECD, 1997). Tax incentives or MBIs are necessary to accomplish a sound waste management policy in which the circulation of secondary raw materials on the waste market is present.

However, recycling and a DRS both entail administrative issues, compliance and transaction costs, but the relativity of minimizing costs to waste management schemes can be obtained through the former models, which minimizes the costs for the above mentioned aspects and is much more cost-effective for achieving waste targets as opposed to the current traditional curbside collection model in Georgia.

It is mostly challenging to determine the evaluation of environmental performance policy options for policy makers, as making environmental impact assessments is a complex matter holistically speaking (Field and Olewiler, 2002). It is optimal for policy makers to carry out cost-effectiveness analysis (CEA) for measuring the damage inflicted by environmental degradation and the relevant environmental performance quality and efficiency levels, which will help determine the feasibility of reaching environmental targets at the lowest costs possible (Field and Olewiler, 2002). From a general point of perspective, it is believed that the factor of cost-effectiveness is much more important in countries where there is less capacity and resources for administering the environmental challenges (Field and Olewiler, 2002).

Finding the optimal level or best realistic scenario for stakeholders to adopt a DRS would also require commitment to equity. If, for instance, a solution is reached amongst producers and governmental authorities, the scope should not miss out the capability of the society being able to cover the associated costs. For example, as of current prices of certain PET beverages on the market –

- a) 1L Coca-Cola costs 1.45 GEL (≈0.57€)
- b) 1L Borjomi mineral water 1.10 GEL (≈0.43€) and

c) 1L Natakhtari (EFES Georgia – JSC "Lomisis") beer – 3.00 GEL (≈1.18€).

If a surcharge of e.g. $0.10 \in$ is set on the respective products according to their size, then this would most likely not generate an issue for the consumers. However, the rebate principle might not be even considered and accepted by consumers if the surcharge on the beverages is figuratively – between $0.50-1.00 \in$, as this becomes a general perception of consumers that the product is too expensive, thus does not anticipate purchasing the product. This aspect also needs advocacy and general public awareness building, in order to avoid such a phenomenon. Defining the administrative and handling fees would require a financial study which is advisable for future research-based recommendations.

Therefore, the approach to the optimal policy scenario has to be all-encompassing, in which incentives fit in to address the issue (OECD, 2008). Incentives provided within a DRS both touch upon dealing with the generated PET waste issue and its minimization and the direct interest of involvement of society, which makes the DRS quite equitable.

If incentives are not the case, producers will most likely oppose the move (such as advance disposal fees alone) due to the unwillingness of paying additional costs imposed on them (EPA, 2001). There has been a study in the US in which the cost-effectiveness of a DRS was compared with traditional advance disposal fees and recycling subsidies, concluding that "a 10% reduction in waste disposal would cost \$45 per ton of waste reduced under a deposit system, compared to \$85 per ton under advance disposal fees and \$98 per ton under recycling subsidies" (Palmer et al. 1995). In this regard, there is again a high need for government intervention in the sense of promoting DRS. Municipal bodies, or local government can play a significant role by partly shouldering the costs faced by private producers, for instance, the costs associated with maintenance or relatively high administrative costs of a DRS as opposed to advance disposal fees or recycling subsidies (Ackerman et al 1995).

The partial assistance from the government may take the form of introducing certain tax breaks for the companies that will have the desire to comply with the DRS, in which way purely economic incentives will be created. The tax concession could be a reduced VAT, but in this case legislative and regulatory reforms would have to be introduced in the first place.

Besides, even if the latter reform is not implemented, another question is to be put forward regarding the perspective of producers concerning the DRS: how motivated would a certain company be to introduce a DRS model, taking initiative to partner with recycling companies (local or abroad), establish an organization like EPP, a Fund and pro-actively take producer responsibility into their company framework? The motivation for doing this would be quite considerable (Interview, Abramia, Gvakharia, 2015), as if other manufacturers reject the offer (if offered collaboration) then the company would have a pure competitive advantage, because the existing companies are not liable (and yet interested) for the post-consumer product that they put on the market and hence the DRS practitioner would get hold of it. Realistically speaking, if necessary DRS advocacy and promotion takes place, all relevant beverage companies should be interested in the system.

However, the most likely issue that would arise with the DRS is the placement issue of the RVMs: even if social compliance and acceptance can be succeeded, there is a great chance that retailers (who highly value their commercial space and price it accordingly for commercial means) demand high or significant fees for having reverse vending machines placed in their commercial areas, taking a considerable portion of their commercial space. From this, if the

container-deposit legislation is mandated by law and have RVMs placed at large supermarkets (retailers), the top-management of the supermarkets will potentially administer higher fees, which in turn will impact the manufacturing companies and respectively their product sales, even if there is a fund established (like the EPP in Estonia) that is undertaking collection and processing activities and is in charge of the DRS itself. A likewise EPP organization should focus (assumingly along with the feedback from top-management of beverage companies) the positioning of RVMs in busy areas, districts, central avenues and streets, or retailers where the public largely shows up, be it for shopping, leisure, etc.; this can help reduce the costs associated with collection and transportation on long distances (implying that it would be useless to place RVMs in areas where beverage containers will be deposited less, effecting the productivity chain of collection/recovery). The latter discussion and observations needs further looking into for more insight.

Deriving from the above observation, alternative locations can also be assumed as mentioned before, however, as noted a separate study would need to be conducted for evaluating this.

The DRS, being an economic instrument, can be considered a viable policy option for managing PET packaging also due to its transparency feature and the elaborate win-win incentives that it offers to the designated stakeholders. However, as mentioned before, the associated costs regarding a fully functional DRS may slightly affect stakeholders respectively as opposed to existing traditional recycling programs, therefore if the latter recycling system (or advance disposal fees) is present in a country, a DRS may halt its cost-effectiveness by averting the cash flow (McCarthey, 1993). Having the two systems in place may prove to be ineffective, perhaps environmental goals can be achieved by having less land-filling, but at a certain point they contradict one another. To better evaluate this observation and compatibility in Georgia, again more quantifiable and financial data is needed to be obtained.

However, recycling capabilities should not be missed out, as a DRS cannot function and fulfill its purpose without redirecting the accumulated and sorted waste to recycling centers. The Tao+LLC management also stresses the issue of recycling and its economic importance, indicating that "the price for granules is much less than that of the initial manufacture and market for secondary raw material is broad" (Green Alternative, 2006). However, without the state subsidizing the latter would most likely make the project unprofitable (developing a recycling factory and two storage stations) to undertake in Georgia, since the belief is that the factory would not make profits within the first five years, while it should be of high interest both environmentally and economically to the government as well, of which government intervention in the sector is necessary (Green Alternative, 2006).

The stress is also made on the assumption that there is insufficient waste generation in the country that will be enough for the recycling factories to have operational upkeep, but both on the governmental and private sector level there are contradictory evaluations, however, the valid point is that the lack of data concerning the types of waste, be it PET or other, and its quantities makes it difficult to make an adequate analysis (Interview, Gurguliani, Gvakharia, 2015). As of the Green Alternative report, there are views of the Ministry of Environment and Natural Resources Protection mentioning the convenience if private companies were to invest in recycling plants of whom would also manage the import of waste from abroad if waste scarcity was the case (Green Alternative, 2006). But the latter is also believed to have an adversary side to it as well: the risk of hazardous waste being imported illegally (Interview, Abramia, Kirvalidze, 2015).

What is also to be brought up is the recycling facility project design that is currently being implemented by the "Ecoorganical Corp" of which GAMMA Consulting made an EIA.

According to the preliminary assessment of the project, the recycling factory in Poti will play a beneficial role in developing the economic and environmental profile of Georgia, designed to create a cost-effective capability that will assist the recirculation of PET waste dynamics, the integration of a waste separation culture and new job opportunities. This will in turn adhere to solving local waste management problems and base a platform for establishing an effective collection instrument like the DRS. This is also why there is a high necessity of establishing recycling opportunities. On the other hand, given that if a recycling system is not present, the alternative is to export it to countries where there is a demand on waste, thus a waste market. Such potential alternatives for Georgia is Turkey and Iran, of which both undertake recycling practices to a considerable degree, and as Coop Georgia points out, the accumulated plastic waste that they process is sent / exported to their partner recycling center located in Iran.

Furthermore, practice sometimes shows unclaimed refunds, in which case an EPR program can administer it back to the DRS fund (e.g. covering administrative costs) or use it for some other environmental benefit (Interview, Dienes, 2015).

5.3 Social and Political Acceptance

The information contained in this sub-chapter is fundamentally of qualitative nature, thus the provided data is based on interviews, feedback, relevant reports and a public open survey. In general, there is a constant political dilemma within the society regarding political parties, sorting out priorities on the national context and others. But as socioeconomic concerns are much higher than the environmental, therefore less environmental awareness, it becomes more challenging for policy makers to introduce and prioritize on the latter aspect. Thus, merging waste issues and potentially introducing a DRS in Tbilisi with the current socioeconomic conditions may be challenging on an informational awareness building level (Interview, Kirvalidze, 2015).

As the Georgian political climate is versatile and still under high risks of having national security undermined, the social perception and priority views are largely focused on national security, poverty eradication and political stability, while prosperous development of other sectors in the country are regarded second priority. Politically, a DRS would be acceptable and even regarded as beneficial for the means of effective waste management, sorting, collection and recycling, which would significantly enhance the waste management profile in Georgia (Interview, Abramia, Chikviladze, Gvakharia, Kalandadze, Kirvalidze, 2015). Including the DRS into the national waste management action plan framework would highly resonate with the goals of achieving specific waste targets that the Georgian government aims in the near future (Interview, Chikviladze, Gurguliani, Kirvalidze, 2015). Focusing on the fiscal measures, new reforms and taxation policy regarding the DRS, would be up to the Ministry of Economy and Sustainable Development of Georgia and Ministry of Environment and Natural Resources Protection of Georgia along with the mandate of the government to establish, for which their willingness and capacity is present, as the socioeconomic and environmental benefits from the system are visible (Interview, Chikviladze, Geladze, Gurguliani, 2015). For this policy makers must take a pro-active approach and collaborate with all relevant stakeholders for the system's integration; European provisions and directives concerning effective waste management entailing prevention, reuse and recycling are politically "correct" goals for the political agenda as of Georgia's current political views (Interview, Gurguliani, Kirvalidze, 2015).

It must also go for saying that there is frequently a conflicting tendency amongst politicians when deciding what policy options to choose, establish, or adopt, especially concerning economic progress and its compatibility with environmental issues (Interview, Abramia, 2015). Therefore, imposing taxation policies such as referred to in MBIs, relevant reforms and environmental regulations would be an obstacle to socioeconomic priorities. In this regard, if environmental costs and further taxation were introduced addressing the business sector, namely beverage manufacturers, the latter would see it as a policy against their growth.

Views concerning social acceptance of participating in new effective mechanisms such as in DRS, recycling initiatives, etc., are more or less positive. According to a survey carried out by Coop Georgia, concerning the readiness and willingness of the society to participate in new effective waste management systems, including participation in recycling (depositing household waste in separation containers), "66% of Tbilisians" are ready to participate, "if they have a chance" and opportunity to do so.

Also, an open public survey was conducted to evaluate the readiness of Georgian citizens (primary target of the survey) to participate in a DRS, being asked the following question: as a citizen, having consumed a PET-based beverage (such as Coca-Cola, Borjomi, Nabeghlavi, Natakhtari, Kazbegi, etc.), would you deposit the bottle in a RVM? Prior to the question asked, the surcharge and rebate principle of the DRS and RVMs was also explained. The results obtained from the survey are showed in the following bar chart (Figure 5-1) below, in which a total of 26 respondents participated.





Thus, 21 respondents indicated that they will, 3 - maybe, no -1 and N/A -1.

The survey shows a limited response from consumers, which in principle cannot entirely reflect upon the whole society (living in Tbilisi), but gives a general view of social acceptance (based on average citizens of Tbilisi who randomly participated in the survey). There are contrasting views to this from certain individuals, who indicate that the populace is not ready to act as responsible citizens, having frequent cases when household trash is discarded directly in the streets, wilderness and wherever applicable. Though the new WMC also sets laws (Article 8 of the WMC) and fines concerning unlawful littering, imposing significantly high violation fees (Article 31) upon violators (WMC, 2015).

5.4 Necessary Conditions to Promote DRS

The necessary conditions for promoting and potentially establishing a DRS would entail the following aspects for its successful installment:

- Further developing the EPR mentioned in the WMC that will include resolutions defining producer responsibilities and PET recycling rate targets;
- Alternatively, establishing a Packaging Act or a bottle bill that would be in correlation with Georgia's national waste management action plan;
- Developing recycling capabilities in the state boundaries or negotiating agreements with foreign countries for exporting PET waste for the purpose of recycling;
- Promotion of DRS in terms of public / industry awareness, along with general environmental awareness;
- Engaging stakeholders to practice the DRS and in return grant compromises/tax breaks, etc.;
- Developing a fund and recovery organizations that would be in charge for operating the DRS;
- Take a pro-active approach for greening the economy and invest more in environmental pricing reforms.

To sum it up, a fully functional EPR or Packaging Act with an executive mechanism is needed, for this the example of Belarus can be taken, or adoption the EU Packaging Directive 2004/12/EC, promotion of public awareness concerning PET waste issues and advocacy/informational campaigns on DRS; government pressure on industry, imposing tax breaks and incentives to facilitate the adoption of the system for producers and assist the establishment of recovery organizations; ensuring that data sheets, quantities, total amount of PET generated waste and packaging are recorded and organized; further developing recycling capabilities, initiating a healthy environment for the development of competitiveness; etc.

The private sector/industry should not be held responsible to formulate financial solutions for establishing recovery organizations, RVM issues and funds alone, but governmental intervention is required, which will also make sure that EPR or national waste management targets and responsibilities are fulfilled (Walls, 2001). Owing to the fact that contamination indicators are relatively high in Georgia, an optimal choice might as well be to have both deposit-refund, traditional curb-side collection and fines imposed. The SWOT analysis provided below reflects upon applicability of the case of Georgia incorporating a DRS (and its effects) as a policy choice for managing waste.

	Strengths	Weaknesses	
Internal	 Minimizes waste generation Reduces illegal dumping Provides incentives to stakeholders (win-win concept) Ensures compliance and tax monitoring Minimizes costs for raw material purchases and its associated costs 	 For introducing a DRS, the lack of data and information on PET waste Lack of awareness from government, private sectors and public DRS has no function unless recycling is in place in the country 	
External	 Provides an effective management scheme for collecting specific waste, creating opportunities for recycling companies to use Better sustainable management of PET bottles Capacity of reusing secondary raw materials, can assist in developing a local waste market 	 The administrative costs can be slightly significant Social activity / participation may not occur The functioning of a fund and recovery organizations may be too costly for relevant governing bodies (e.g. manufacturers) 	

Figure 5-2: SWOT Analysis

Opportunities

Threats

6 Discussion

This chapter seeks to evaluate the validity and aptness of the research aim and questions that have been addressed in this thesis. The research that is undertaken is largely based on the given chosen findings and the perspectives that are offered in the analysis section, which in its entirety is a result of the thesis aim and questions that are addressed.

Findings that were obtained concerning the main research questions, especially on PET waste issues in Georgia, is seen to be quite limited in terms of necessary data / literature existence. Filling in the literature gap was largely based on providing qualitative data and information that at its most tries to answer the primary questions, offering an insightful overview about the current trends and possible outcomes on the research subject topic. The question of *what* the problem is in terms of PET bottles in Georgia and *why*, is described partly by the means of available literature, feedback, interviews and overall assumptions driven from these methods answering the question. The obstacles and gaps existing within the problem needed a thorough approach by evaluating possible solutions that have been applied elsewhere, which gave corresponding ground to the question *how* the primary research question is possible to evaluate.

The driving forces and missing gaps within the problem have been identified by the findings provided in the research with certain limitations, however, mechanisms that deal with the problem elsewhere are provided in further findings, i.e. in case studies. Therefore, investigating the potential as to *how* the problem of PET bottles can be managed was portrayed within the case studies and further analyzed in the policy analysis section, with exceptional limitations. In

total, the practical implementation of the title of this thesis maybe further applied if the limitations of this thesis and further recommendations are fully incorporated.

However, the choice of case studies and the existing findings pertained in the thesis proved to be interesting and worth of more observations and insight, as various views and management strategies are indicated that aims at solving a particular waste issue according to the current conditions in Georgia.

In addition, as the current trends in Georgia show a reactive tendency in regards to sustainable policy options and general approach towards effective waste management schemes, the observations here offer sound solutions that are considerable for application, whether in terms of political, legislative, socioeconomic or environmental aspects. The current tendency of approaching the defined problem is on a level of gradual improvement, of which the analytical perspectives of this thesis also go in line with and provide further input. In this regard, the analytical choices and methodology of the research went considerably deep into obtaining relevant outcomes and evaluations that serve the legitimacy of the outlined research question. But yet again, further contribution to the field is necessary to obtain more of a financial background to the topic. Deriving from this, new research questions have emerged in terms of the specifics of implementing a DRS in circumstances where certain variables may not apply, such as placing RVMs in traditionally acclaimed retail areas.

The behavior and concrete feedback from producers can be further studied, to grasp their perspectives concerning the actuality of engaging the private sector in a DRS. This however, would be a sensitivity analysis, as the behavior of the producers of beverage companies in Georgia cannot be predicted due to the dynamic external factors that influence business in the country (such as national security issues or inflation parameters).

Moreover, qualitative data and overall findings affect the key outcomes presented throughout the paper, inasmuch as they reflect the realistic circumstances in which analytical navigation is possible. In this regard, as the research question actually addresses the country of which status is on a developing stage, other developing country stakeholders may also use and apply the given findings and conclusions in their geo-political, socioeconomic context. Stemming from here, the results given are generalizable to a degree where other developing country representatives and stakeholders simply interested in applying a DRS can exploit, playing a supportive role for policy evaluation and comparison, technical and legislative feasibility, administrative and socioeconomic aspects.

The technical aspects behind the implementation of a DRS for managing PET bottles can be challenging, especially in areas where there is a gap of necessary variables, however, stakeholders interested in applying a DRS holistically, i.e. concerning every packaging type or concerning other waste product flows such as electronic devices, tires or batteries, will need to carry out a number of research studies and consider various analytical framework options for achieving the goal. The technicality behind this would be much more extensive and challenging, but summing up separate studies such as this thesis with other studies and research, can provide an insightful and legitimate understanding for implementation.

Ultimately, applying a DRS in Tbilisi for managing PET bottles is a topic that needs to be addressed based on foreign successful models or relevant experiences, such as the one of Estonia or Croatia, owing to their more or less similar socio-economic context to Georgia. But to have an understanding about the consequences, piloting and experimental activities would play a big role for this.

7 Concluding Remarks and Recommendations

This chapter recaps the problem and research questions addressed within the study. Accordingly, it conveys a number of remarks, findings and conclusions derived from the policy analysis and lastly provides future research recommendations.

A specific waste stream such as PET packaging, is globally an increasingly developing phenomenon including developing countries such as Georgia, where consumption of certain beverage types are increasing, which is indirectly associated with socio-economic growth in the country. As the beverage industry experiences more maneuvering space in terms of expanding their company's sales and consequent rate of production, the more alarming the environmental issues becomes, regarding waste disposal regulations and other environmental parameters as well that deteriorates the overall environmental profile. Even though there are certain talks and gradual reforms taking place that addresses environmental externalities, the level of commitment and initiation is on a legislative stage. The new WMC depicts and identifies the associated environmental problems that waste generation has and programs such as EPR that is necessary to attribute, but there is still a lack of resistance to illegal dumping, burning of waste in remote / populated areas (in which PET-based packaging content is usually high), interest in redirecting the existing waste policy towards modern effective systems and truly eradicating the pollution / impact that stems from waste accumulation. In spite of this, policy makers always seek more viable options and politicians respectively, as more the social awareness and discontent raises, the more the relevant authorities and stakeholders have to change behavior.

Globally, one of the most dynamic developments in the sphere of managing PET-based packaging is the principle of multi-reuse, thus simultaneously aiming at prevention of extraction of raw materials and obsoleting the generation of waste, thus making sustainable use of secondary raw materials. Deriving from this, a sound alternative for managing PET waste is utilizing prospective and quite rational methods of recycling and its related mechanisms. Recycling alone, might not stand out as a primary link to eradicating PET bottles, as its administrative costs cannot pay off without the proper supply of waste input, which is why a DRS fits in this gap and makes the two concepts interdependent.

Currently, there are no analogous activities in Georgia, whether be it recycling or DRS applications, however, deriving from the developmental experience that countries like Estonia and Croatia have and also the ever increasing environmental standards / requirements along with the increasing demand on reuse of secondary raw materials such as PETs there is on the global market, it is logical and necessary that at some point there will the perspective for Georgia to grasp as well. The latter has commenced by the means of integrating and harmonizing the Georgian waste management code with the relative standards of the EU legislation, however, due to a number of reasons, it is difficult to implement a DRS at the moment:

- The general lack of data / documentation concerning the resource flow (e.g. PET amount generated per year and type)
- Lack of awareness or unwillingness to promote effective policy tools such as MBIs and respectively incentives amongst stakeholders
- Low level of cooperation between the government and the industry
- Low level of action despite the recognition of PET packaging as an increasingly rising waste issue (from various governmental representatives)

- More or less low level of social awareness concerning waste issues and its urgency for management
- Few piloting or experimental projects oriented at increasing public activity in promoting environmentally sound waste management practices
- Political agenda oriented towards economic growth rather than environmental efforts that mitigate or eliminate waste streams
- Conflicting political environment including tense foreign conditions undermining national security, resulting in less stable policy making

These reasons may be explained to the characteristic traits that a developing country like Georgia has, entailing both current socio-economic and political levels, along with the low tradition of exercising modern waste treatment practices and level of informational availability.

In the first world, where environmental protection is granted high attention, generally the tendency of reusing and recycling PET content is steadfastly increasing, for which the norms and adopted legislation plays a big role for achieving this. Accordingly, the public practice of sorting their waste into different sorting containers is also at hand, and having this said, public participation is also high in countries where DRS is present, whether it is mandated or not. As a result of this, the outcomes are that the sorted waste (household) are managed and organized in rational ways, from which the proportion of PET-based packaging is large.

In order for Georgia to harmonize with the global practices and tackle the problem of eliminating PET waste, an MBI such as a DRS is offered as a recommended economic instrument that plays the role of a pricing mechanism, largely having the capacity to influence the existing environmental performance of Georgia. Applying such a policy tool requires governmental involvement to the degree that negotiates terms and conditions with the industry sector (producing PET-based beverages) and facilitation of the process for implementing the policy instrument. As a DRS in itself acts as an incentive for consumers and industry, once established, government pressure or involvement is less needed, thus producers remain their flexibility to operate the system and their company, but this is something that has to be implemented in mutual collaboration of the producers and the authority. Having this said, the favorable outcomes are possible to be present once recycling opportunities also arise, either from the current projects that are being undertaken in Georgia or by export means to the waste market of Turkey or Iran. Though the latter would have to be calculated, as to how economically feasible it would be to export accumulated PET waste to foreign countries for recycling; then what would be the next phase after recycling and would there be sufficient volume of collected PET packaging for export? Which regional market will be interested in importing PET waste from Georgia?

Deriving from the above observations, it would also be recommended to design piloting projects that will try to generate practical figures and feasibility levels. But prior to this, both the government pressure would be needed on the industry to comply with recording and reporting the annual generated and produced PET products (and type) while the retailers have to act accordingly by the means of reporting the total amounts of PET packaging sold. The latter can be most likely obtained from the Revenue Service too, but the practice that is applied in Croatia seems more effective in this regard.

Furthermore, it would be also highly recommended that governmental structures, the industry sector and NGOs to promote effective waste management practices such as the PETREC project implemented. Informational campaigns, workshops and public events are an effective tool for spreading word and enhancing public awareness, by this means, a DRS piloting project could be enacted and the society would be introduced to it.

To the best knowledge of the author, analyzing the applicability of a DRS into Tbilisi, Georgia, was the first attempt, thus the given results and findings are to be viewed in a contextual manner if it is also to be further investigated for other case studies. In overall, this research can be generalizable and applied to other case studies / interested stakeholders, if the given conditions, findings and requirements are yet again contextualized. Drawing from this point, this thesis has contributed to the field by demonstrating analytical compatibility of a policy to a site-specific area of which there is a gap in the disposition.

7.1 Future Research Recommendations

In order to assess whether a DRS policy instrument is credible and viable for managing PET packaging issues, further evaluations can be made by the means of conducting a cost-benefit analysis, which will compare the costs associated with the PET pellet acquisition from foreign suppliers, its transportation, operational costs for blow-stretch-molding and further distribution with the costs associated with establishing a DRS model and recycling in retrospect, such as of Estonia or the untraditional DRS model of Croatia.

Consequently, the question that must be asked is whether the administrative costs for running a DRS is more costly (environmentally and economically) or constant PET pellet purchases and its associated costs? Thus, an interesting point for future research would be for policy makers to undertake a CEA of a DRS compared to the existing curbside collection system, while producers to make a CBA.

Also, what would be the recurrent costs along with the administrative fees, would there be a shortage of funds for the adequate operation of a DRS? If so, then what should the original fund look like which will govern the DRS (envisaging the organization controlling PET packaging and packaging waste and thus recovery organizations)? Thus, as this thesis is primarily oriented on managing the issues with PET bottles, the application of DRS concerning other types of packaging is also interesting to look into and assess, to have a holistic understanding technically, which functions extend to other types of packaging materials and products, as electronics, batteries, tires, etc.

Financial assessments and testing of placing RVMs in different locations other than supermarkets can also lead to new research results and outcomes, which would most likely also require experimental tests and piloting projects, similar to the PETREC project (carried out in Croatia). This part would be highly recommended for further research, as its nature would be practical and more extensive, which will guarantee to show specific results. Also, in spite of the thesis limitation, identifying what views local producers have would also be interesting for future observers.

A better analysis would have been shaped provided that if recycling factories were also present within the country. Exports are an alternative to this, however, this increases administrative costs and the cycle, i.e. the distances, which might affect the outcomes in a less cost-effective way. This another aspect in which a CBA can be conducted.

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CEU eTD Collection

Appendix A

List of Interviewees

Government Representatives of Georgia:

Mr. Davit Geladze – Senior Specialist. City Cleaning Services, Tbilisi City Hall. Tbilisi (Interviewed 27 April, 2015). Personal Interview

Ms. Khatuna Chikviladze – Main Specialist. "Solid Waste Management Company" Ltd. Ministry of Environment and Natural Resources Protection of Georgia (MoE). Tbilisi (Interviewed 28 April, 2015). Personal Interview

Ms. Nato Kirvalidze – Senior Specialist. Department of Ecology and Green Spaces, Tbilisi City Hall. Tbilisi (Interviewed 27 April, 2015). Personal Interview

Ms. Irma Gurguliani – Deputy Head, Waste and Chemicals Management Service, Ministry of Environment and Natural Resources Protection of Georgia (MoE). Tbilisi (Q/A 14 May, 2015). Via mail

NGO Sector:

Mr. Grigol Abramia – Director. International Center for Environmental Research (ICFER), Tbilisi. (Interviewed 29 April, 2015). Personal Interview

Private Sector:

Mr. Vakhtang Gvakharia – Director. "Gamma Consulting" Ltd. Tbilisi (Interviewed 29 April, 2015). Personal Interview

Sales Manager – Kontinent Ammo Limited (KA LTD). Tbilisi. (Question - Answer 25 April, 2015). Phone Call

Individual Experts:

Mr. Givi Kalandadze - Waste Management Expert. Tbilisi (Interviewed 5 May, 2015). Via email.

Mr. Tamas Dienes - Waste Management Expert. (Discussion April 20, 2015). Via email.

Appendix B

Questionnaire

- 1) What do you think of the current methods that are applied in Georgia concerning waste management? How effective is it?
- 2) Is there any available input of information concerning PET-based packaging? If yes, from where does it originate?
- 3) How do you see the beverage companies in Georgia in terms of their environmental performance and contribution of generating PET packaging waste?
- 4) Do you know from where do the packaging pellets / preforms are imported? To what degree are they blown-stretch molded here and are there any plastic production facilities in Georgia?
- 5) How do you look at the concept of PET bottles? Do you consider it as a major waste stream issue in the country?
- 6) What to do you think of a deposit-refund system? How do you imagine market-based instruments functioning in Tbilisi?
- 7) Would government and / or industry be willing to accept such (above mentioned) applications? Would an interaction and mutual collaboration among governmental authorities, industry and retailers have a positive outcome for reaching agreements?
- 8) What barriers would there be economically and socially speaking for applying a DRS in Tbilisi?
- 9) What are the current levels of recycling capabilities in Georgia? Are there any numbers concerning waste exportation?
- 10) As of the new waste management code, do you think an EPR program will have value for addressing the issue with PET-based packaging and waste?
- 11) Which retailers / supermarkets in Georgia would be willing to comprise their commercial space for placing RVMs?
- 12) To your mind, what would be the necessary conditions in Tbilisi for adopting a DRS? Which stakeholder(s) must make the first move?