

CLOSING THE LOOP: THE CHALLENGES OF REGULATION IN MUNICIPAL SOLID WASTE MANAGEMENT

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ABSTRACT

Regulation has a profound impact on markets and in recent decades it has also been perceived as a solution to a wide range of environmental problems. However, regulation may also induce barriers and undesirable effects. In recent years, there has been a rise in awareness for the need to monitor, evaluate and supervise regulation itself, its effectiveness and its associated processes via Regulatory Impact Analysis and Assessment (RIA). One of the significant environmental challenges characterized by extensive regulation is Municipal Solid Waste (MSW) management. MSW is, on the one hand, a significant environmental threat and an economic and social challenge to manage, but, on the other hand, a significant key factor in achieving sustainable production and a circular economy. Understanding the interrelationships between regulation and the MSW market, with its various stakeholders, is crucial to close the MSW loop and achieving a sustainable economy. This paper describes the analysis of the MSW market in Israel that provided an insight and understanding of the impact of regulation on this market and its various stakeholders. The market analysis constituted a focal stage in performing a full RIA of the MSW market in Israel. Findings show that regulation itself may create difficulties and barriers that prevent the implementation of economically and environmentally efficient solutions and obstacles in achieving a circular economy. It is also concluded that an ongoing monitoring and supervision of regulatory processes are of great importance and that RIA should be elaborated continuously.

1. INTRODUCTION

Regulation has a profound impact on markets and in recent decades it has also been perceived as a solution to a wide range of environmental problems. Environmental regulation is mainly based on the implementation of various regulatory principles and tools (such as command and control, green taxation and extended producer responsibility) to advance environmental and natural resources management (Sternier & Coria, 2012). Ensuring the right regulatory framework is essential for the development of the circular economy in the single market (EC, 2016). However, regulation may also induce barriers and undesirable effects, thus the regulatory tools selected by the regulator are critical to achieving the desired goals and objectives (Marques & Simões, 2008). In recent years, there has been a rise in awareness for the need to monitor, evaluate and supervise regulation itself, its effectiveness and its associated processes (OECD, 2002; OECD, 2009).

Regulatory Impact Analysis and Assessment (RIA) is a

systemic approach to critically assessing the positive and negative effects of proposed and existing regulations and non-regulatory alternatives, intended to be implemented as a tool for the measurement and evaluation of social, economic and environmental regulatory effects to assist policymakers in the design, implementation, monitoring and improvement of regulatory policies and systems (Kirkpatrick & Parker, 2007; Kirkpatrick et al. 2004; OECD, 2009). This key tool is universally used in OECD and EU countries to improve efficiency, transparency and, accountability for regulatory decision-making (Adelle et al., 2014) and is formulated from systematic advice and clear policy criteria based, including economic analysis and the impact of cost efficiency and cost effectiveness, taking into consideration various factors and stakeholders (Arndt et al., 2015; OECD, 2002). RIA is also cited as a factor leading to a more democratic regulation, particularly in complex political systems (Radaelli & Francesco, 2007).

A full RIA should include cost & benefit analysis and/or cost-effectiveness analysis, defining the various alterna-



tives in place and time frameworks, along with the components of uncertainty and risks (Garber & Phelps, 1997; Johannesson, 1995; OECD, 2006; OEDC, 2011; OECD, 2015; Schneider et al, 2012; Zurbrugg et al, 2014). There has been a significant increase in RIA adoption in all areas of regulation in the jurisdictions of the OECD countries since the mid-1970s, reaching over 34 jurisdictions in 2014 (OECD, 2015).

One of the significant environmental challenges characterized by extensive regulation is Municipal Solid Waste (MSW) management. The responsibility for the storage, collection, and disposal of MSW is in most cases of the local authorities, whilst the regulation constitutes a key tool for implementing strategies and plans to enhance the ability to handle the growing amount of the end-of-life components of consumption products (Ayalon et al., 1999; Broitman et al., 2012; Kinnaman, 2014; Marques & Simões, 2008; Pan et al., 2015; Simões & Marques, 2012b).

Even though it is a controversial method and considered to be an unsustainable one, landfilling is still the most common way in the world to dispose MSW and is relevant even when other advanced options are being used for recycling and/or volume reduction (Agamuthu, 2013; Ayalon et al, 2000, Broitman et al 2012). In Israel, the population reached 8.69 million in 2017 with an average gross domestic product (GDP) of 35,817 Euros/per capita, for 2016 (Central Bureau of Statistics, 2017; Di Maria et al., 2017), the local authorities are responsible for the storage, collection, and disposal of MSW, while the Israeli Ministry of Environmental Protection (IMoEP) is responsible for the formulation and implementation of waste management policies and legislation (IMoEP, 2018). Various services for the storage, collection, and disposal of MSW in Israel are provided by the private sector based on public tenders published by the local authorities. However, the private sector does not take part in the management of those arrangements. A retrospective analysis of the regulation in Israel between the years 2005 till 2015 shows that during this period about 80% of the MSW in Israel has been landfilled and recycling rates have not increased, despite regulations (Daskal et al., 2018). The case of Israel shows that even when there is an extensive regulation that includes a wide range of laws, economic penalties and financial incentives (such as landfill levy and financing of MSW separation at source arrangements), this does not guarantee proper treatment or even an improvement in MSW management. In the case of Israel, the lack of suitable infrastructure for MSW treatment has paralyzed this market, which has resulted in no change in the rate of landfilling for over 12 years.

This paper presents the analysis of the MSW market in Israel in light of IMoEP's strategic goal of landfilling reduction by increasing recycling and the regulation and legislation designed and implemented for achieving this goal. The MSW market relates to the nominal and actual place in which goods and services related to the storage, collection, and disposal of MSW are traded and handled. The analysis of the MSW market included building the Arena of the MSW market by mapping the main actors by sectors and identifying the interrelationship and conflicts between the different

stakeholders in the market. Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis was performed based on a survey of 40 experts in the field of MSW, and the results were elaborated to identify the core strategic competencies and root problems for achieving the regulator's goal of reducing landfilling. The core strategic capabilities were identified using the Core Competence Tree (CCT) methodology, by tying logical connections between the desirable phenomena and the root problems were identified using the Focused Current Reality Tree (fCRT) methodology, by tying logical connections between the undesirable phenomena (Coman & Ronen, 2002; Coman & Ronen, 2009; Ronen & Pass, 2008).

Following this introduction, this article is structured as follows: Section 2 presents the methodologies used for the analysis of the MSW market in Israel. Section 3 presents the results and discussion and Section 4 concludes the paper.

1.1 List of Acronyms

CCT	Core Competence Tree
EU	European Union
F.A.S.T.	Focused Arena Strategy
fCRT	Focused Current Reality Tree
FM	Focused Management
GDP	Gross Domestic Product
IMoEP	Israeli Ministry of Environmental Protection
MSW	Municipal Solid Waste
OECD	Organisation for Economic Co-operation and Development
RIA	Regulatory Impact Analysis and Assessment
SWOT	Strengths- Weaknesses- Opportunities -Threats
TOC	Theory of Constraints
VFM	Value Focused Management

2. METHODOLOGIES

2.1 The market analysis in the frame of regulatory impact assessment

RIA can be performed to evaluate regulation already implemented to indicate whether its targets and goals were achieved and whether gaps exist, efficiently identifying them (retrospective analysis). RIA can be performed for evaluating future regulation; this requires a pre-defined set of alternatives and methodological tools for comparing between them (forecast analysis). In both cases—retrospective analysis and forecast analysis—RIA must include market analysis as a baseline. The market analysis is the basic part and the basis of the full RIA model that was developed for RIA implementation of the MSW market in Israel. Results of the retrospective analysis were presented by Daskal et al. (2018).

Figure 1 shows a schematic diagram of the market analysis within the frame of the full RIA model.

There are various approaches and methods for analyzing performance based on cost and efficiency of the waste sector, taking into consideration various factors that affect the cost (Simões & Marques, 2012a; Simões & Marques, 2012b). Tools for analysis and evaluation of economic efficiency and operational efficiency are at the

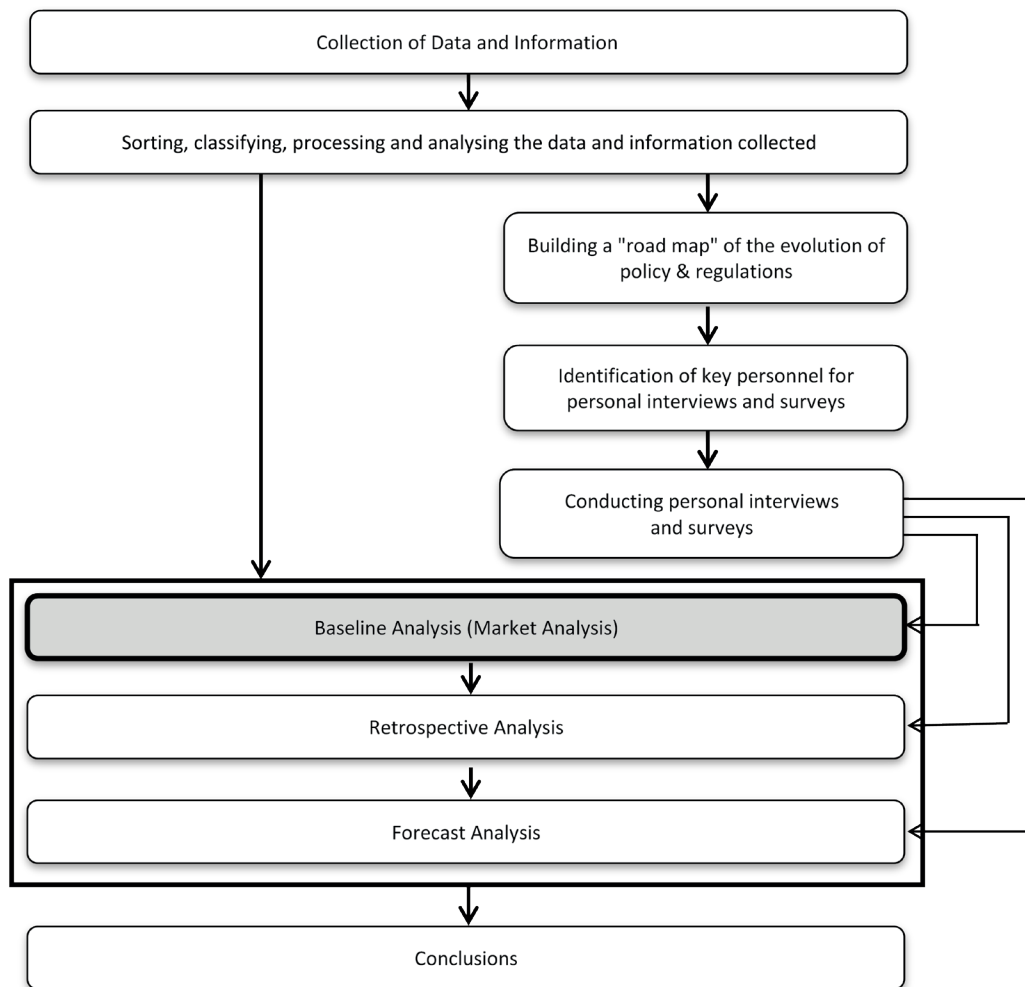


FIGURE 1: Schematic diagram - market analysis within the full RIA model flow.

core of the business administration discipline and therefore these models were adopted to perform RIA and assess the efficiency and effectiveness of the regulation in Israel. The models listed below are based on innovative approaches to improving value and performance: Focused Management (Ronen & Pass, 2008); Theory of Constraints (Goldratt & Cox, 2016); Focused Arena (Coman, 2008; Coman & Ronen, 2009); Value Focused Management (Ronen & Pass, 2008). An additional tool for strategic analysis is the Strengths, Weaknesses, Opportunities, and Threats (SWOT) model. SWOT is an efficient and easy-to-use analysis tool which results can be visually displayed and communicated (Graczyk & Rybczewska, 2007; Pesonen & Horn, 2013; Ronen & Pass, 2008; Srivastava et al., 2005; Yuan, 2013). Mor et al. (2015) conducted a SWOT analysis of MSW treatment practices in Chandigarh, India, and found that this approach helps in developing strategic action plans for the development of sustainable cities, effectively integrating the community, the private sector, and local authorities.

The MSW market analysis in Israel was conducted based on a model that integrated various approaches and models including Focused Management (FM), Focused Arena Strategy (F.A.S.T), Theory of Constraints (TOC) and

Value Focused Management (VFM) that were originally conducted in business management and industrial engineering disciplines (Coman & Ronen, 2002; Goldratt & Cox, 2016; Ronen, 2005; Ronen & Pass, 2008).

In the following sections 2.2-2.5, the methodologies of the market analysis are presented- Arena, SWOT, CCT, and fCRT.

2.2 The MSW market Arena

The Arena model is a strategic tool for the analysis of a market or an industry; it includes the location of different organizations in the environment in which they operate and their interrelationship (Coman, 2008; Coman & Ronen, 2002; Ronen & Pass, 2008). The methodology presented in this paper focuses on two main stages of the analysis and construction of the market Arena: (1) Mapping the main actors in the MSW market by sectors as detailed in section 2.2.1. (2) Analyzing the interrelationship and conflicts between different stakeholders in the market as detailed in section 2.2.2.

2.2.1 Mapping the main actors in the MSW market by sectors

The first stage of building the MSW market's Arena

dealt with mapping the main actors in the market according to sectors. In order to identify the main actors including key persons in the MSW market in Israel, an extensive survey was conducted. The survey included collecting data and documents including laws, minutes of government meetings, local government tenders, contracts of local authorities with various contractors, local authorities' financial reports and more.

2.2.2 The interrelationship and conflicts between different stakeholders in the market

The second stage of building the MSW market's Arena focused on identifying interrelations and conflicts between actors of various sectors. A significant conflict is a phenomenon known as "Not in My Back Yard" (NIMBY). This phenomenon is characterized by objections to the location of undesirable facilities such as renewable energy facilities (Horst, 2007) and the establishment of sites and facilities for the treatment of MSW (Garrar, 1993). A significant aspect of land use that's considered to be hazardous is distributive justice (Rosen-Zvi, 2007; Nakazawa, 2015) thus residents not only object to the exposure to various environmental hazards but also to inconveniences and a decline in the value of their real estate property (Eshet et al., 2007).

The conflict with residents reflects a conflict of interest in achieving the same goal, as the residents are also interested in an alternative solution to landfilling that will reduce the negative externalities and will enable conservation of land, factors that in bottom line result in a higher standard of living.

The literature shows that it is possible to reduce residents' objections by various means such as legal proceedings, persuasion, compensation (money), public campaigns, education and information, legislation and political proceedings, as well as by mobilizing people in a public status to support an idea or a plan (Halstead et al, 1993; Lee & Jones, 1991; Nissim et al, 2005). Additionally, some case studies from other places in the world present concrete solutions (Halstead et al, 1993; Lee & Jones, 1991; Rahardjana et al, 2004), these case studies indicate that this conflict may also be solvable in other places in the world, as well as in Israel.

2.3 Strengths, Weaknesses, Opportunities, Threats

The Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis originates in the business administration discipline but is also widely used in other disciplines and is a cornerstone of strategic analysis to identify and analyze strengths, weaknesses, opportunities and threats in an organization's internal and external environment (Coman & Ronen, 2009; Rachid & Fadel, 2013, Ronen & Pass, 2008; Yuan, 2013). This methodology is also used to analyze and evaluate projects and as a basis for strategic decision-making (Coman & Ronen, 2009; Rachid & Fadel, 2013; Ronen and Pass, 2008; Yuan, 2013).

The methodology for performing the SWOT analysis in the current research consisted of a survey of experts that included 40 key persons that were identified as part of the construction of the market's Arena. The survey of experts

resulted in the mapping of various phenomena in the MSW market according to the four SWOT categories as shown in Table 1 in section 3.2.

2.4 Core Competence Tree

The Core Competence Tree (CCT) is a methodology that enables the identification of core competencies for achieving desired goals and objectives.

The method: take the desirable phenomena from SWOT, i.e. strength and opportunities, and form the CCT by tying logical connections between the desirable phenomena. The desirable phenomenon always leads to achieving the defined goal, revealing 1 to 4 strategic root core competences which are the core strategic capabilities to be strengthened and to which the activity must be strategically subordinated (Coman & Ronen, 2002; Coman & Ronen, 2009; Ronen & Pass, 2008).

The CCT of Israeli MSW market is shown in Figure 3 in section 3.3.

2.5 Focused Current Reality Tree

The Focused Current Reality Tree (fCRT) is a methodology that enables the identification of root problems that prevent achieving desired goals and objectives.

The method: take the undesirable phenomena from SWOT, i.e. weaknesses and threats, and form the fCRT by tying logical connections between the undesirable phenomena as it leads to "the goal is not achieved", revealing 1 to 4 strategic root problems that prevent the achievement of the goal (Coman & Ronen, 2002; Coman & Ronen, 2009; Ronen & Pas, 2008).

The fCRT of Israeli MSW market is shown in Figure 4 in section 3.4.

3. RESULTS AND DISCUSSION

3.1 Arena of the MSW market in Israel

The survey conducted to map main actors in the MSW market in Israel resulted in identifying the following sectors:

- Controllers;
- Academia and educational institutions;
- Central government;
- Consultants;
- Local authorities;
- Entrepreneurs/Contractors;
- Recycling corporations;
- Manufactures and importers;
- NGO's;
- Waste manufacturers including residents/the public/commercial.

A significant conflict that emerged from the experts' survey is the NIMBY conflict between residents and the local authorities, who have responsibility for managing and handling MSW. Figure 2 shows a diagram illustrating the analysis of the Not in My Back Yard (NIMBY) conflict at the case of the local authorities. In this case, both parties share the identical goal of the reduction of MSW landfilling, however, the residents object to the establishment of infrastructure for the treatment of waste. This conflict can

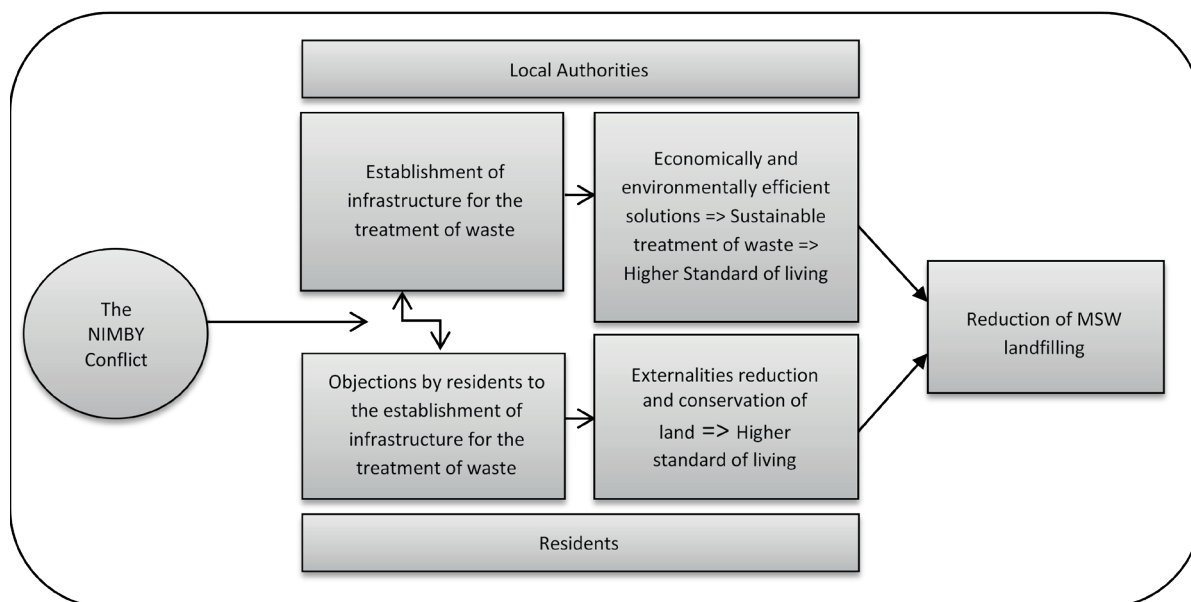


FIGURE 2: A diagram illustrating the analysis of the 'NIMBY' conflict, the local authorities' case.

be solved by providing information and educating the opponents, possible arguments in favor of the establishment of the infrastructure are externalities reduction and conservation of land, which leads to a higher standard of living.

3.2 Strengths, Weaknesses, Opportunities, Threats - Results

SWOT analysis was used to identify and analyze strengths, weaknesses, opportunities, and threats in the MSW market in Israel in terms of achieving the regulator's goal of decreasing landfilling via recycling and focus on strategic strengths and opportunities to advance the achievement of this goal and vision of IMoEP. Key persons were identified based on the survey conducted for mapping main actors in the MSW market by sectors as described in section 2.2.1.

The SWOT analysis for the Israeli market was carried

out through an expert survey of 40 key persons from different sectors involved in the processes that were studied, either in the past or in the present. Table 1 shows the SWOT result for the Israeli MSW market.

3.3 Core Competence Tree - Results

The two core competencies that were identified are the high motivation of the government and known amount of MSW. Figure 3 illustrates the Core Competence Tree for the Israeli MSW market, derived from the desirable phenomena, resulted from tying logical connections between them.

3.4 Focused Current Reality Tree - Results

The four root problems that were identified are: (1) Lack of research (for the past 12 years IMoEP has not issued any call for proposal of research grants in the field of waste

TABLE 1: The SWOT results for the Israeli MSW market according to the experts' survey.

Strengths	Weaknesses	Opportunities	Threats
1. The regulator (The Ministry of Environmental Protection) is committed to advanced MSW solutions.	1. Lack of cooperation between the government and the local authorities.	1. Advanced solutions such as Waste to Energy are required.	1. Risks due to regulatory instability.
2. Local authorities are aware and show interest in reducing MSW landfilling.	2. Lack of research on operational, environmental and economic aspects.	2. Operation of advanced MSW treatment facilities by local authorities starting 2014.	2. Very limited market for recyclable materials.
3. There are good statistical data on the amount of waste produced.	3. Lack of measurement and control.		3. High volatility in the prices of recyclable materials (e. g. plastic, paper, and cardboard).
	4. Lack of supervision and enforcement.		4. Inappropriate use and management of the cleanliness fund.
	5. Lack of performance indicators.		5. The "not in my back yard" (NIMBY) phenomena consist barriers for the establishment of additional advanced MSW treatment plants.
	6. Regulatory instability (political and official levels)		6. There is no demand for compost that's produced from MSW.
	7. Low quality of compost.		

management). (2) Lack of cooperation between central government and local authorities. (3) Regulatory instability (four environmental protection ministers were replaced between the years 2014 to 2018) (4) Lack of measurement and control.

Figure 4 illustrates the Focused Current Reality Tree for

the Israeli MSW market, derived from the undesirable phenomena, resulted from tying logical connections between them.

3.5 Summary

Regulation has a profound impact on markets. In order

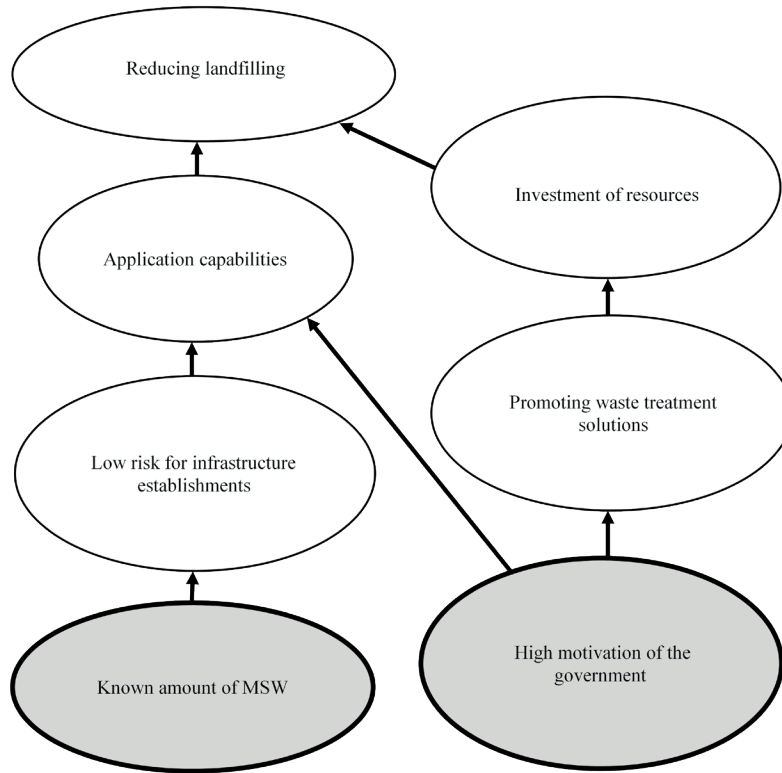


FIGURE 3: Core Competence Tree for identifying root competences in the Israeli MSW market.

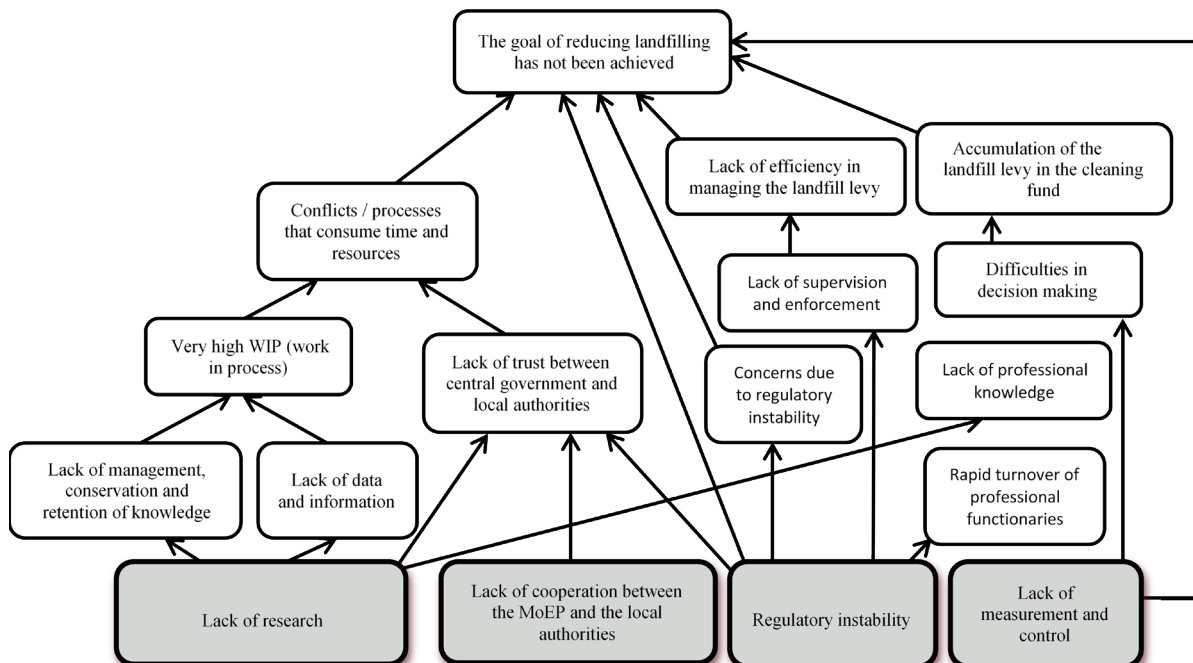


FIGURE 4: Focused Current Reality Tree for identifying root problems in the Israeli MSW market.

to analyze the effects of regulation on the Israeli MSW market, an analysis of the market included the construction of the market's Arena, SWOT analysis and building of a Core Competence Tree and a Focused Current Reality Tree. The Arena was constructed in two stages: (1) Main actors were mapped according to different sectors. (2) Interrelationship and conflicts were identified.

The Arena analysis enabled identifying key persons for conducting a survey of experts for mapping phenomena in the market according to the four categories of SWOT. Core Competence Tree and Focused Current Reality Tree methodologies enabled analyzing the SWOT results and identifying 2 core competencies and 4 root problems aimed to advance the achievement of the goal defined by the IMoEP (the reduction of landfilling).

The results indicate a lack of cooperation and lack of coordination between the various sectors, particularly the central government and local authorities. The root problems that were identified are: (1) Lack of research. (2) Lack of cooperation between the IMoEP and the local authorities. (3) Regulatory instability. (4) Lack of measurement and control. The results highlight the crucial impact of regulation on the conduct of the Israeli MSW market, and the need for elaborating an ongoing RIA.

4. CONCLUSIONS

This paper presents a methodology for analyzing MSW markets. This methodology was implemented for analyzing the MSW market in Israel. The analysis tools presented include the construction of the market's Arena, SWOT analysis and building a Core Competence Tree (CCT) and a Focused Current Reality Tree (fcRT) for identifying core competencies and root problems. The results focusing on the Israeli MSW market, highlight the crucial impact of regulation on the conduct of the market and shows that regulation that was aimed for enhancing MSW management, induced barriers and undesirable effects that resulted in stagnation.

Limitations of this paper might stem from the limited number of participants in the expert survey, though it lays a good foundation for reflecting the state of the MSW market in Israel.

Being the residual end-of-life component of consumption products, MSW is a key factor in achieving a sustainable industry that lays the foundation for the circular economy. In the case of Israel, the analysis of the interrelationship between the Israeli MSW market and the regulation revealed root problems and core competencies that enabled taking a further step towards a forecast analysis for identifying better future regulation alternatives.

Market analysis is essential for understanding the impact of regulation on the market and its various stakeholders, such an insight is essential for the advancement of sustainable processes that will facilitate the achievement of a circular economy. The ensuing results indicate the importance of monitoring and assessing policy and regulations to examine whether regulation is, in fact, effective, what are the implications on the market and various stake-

holders and what are the costs and benefits. Achievement of such insights requires the elaboration RIA continuously.

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