Burn the Wicked Waste!

A look into Hungarian waste incineration policy

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Abstract:

EU targets set by the Waste Framework Directive regarding waste management are soon to be complied and Hungary is still lagging behind. Nearly half of the waste is sent for landfill and the need to move up the waste hierarchy is more pressing than ever. The question is whether the government is willing to go beyond energy recovery, i.e. waste incineration. To answer the question a policy analysis is conducted on main policy documents as the National Waste Management Plan 2014-2020, National Collection and Recovery Plan 2015, Operational Programmes for the time period 2014-2020, including the National Energy Strategy 2030. Throughout the analysis it becomes clear that waste is regarded as a renewable energy source by the government, and the attitude of "killing two birds with one stone" is manifested by combining waste management with energy plans. Burning waste to produce energy may seem to be a convenient solution for both issues, but it is crucial to recognize waste policy and planning as wicked problem indicating that unintended consequences might arise. Environmental and social problems caused by waste incineration are already identified that should not be cast aside. A more holistic approach is needed to deal with waste issues and a move towards zero waste could be an answer.

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Foreword

Due to the interdisciplinary nature of Human Ecology, during the master's program Culture, Power and Sustainability, we touched upon a great deal of topics from production, consumption and identity to climate change, 'business-as-usual' and social injustice. However, although very connected to the aforementioned matters among many other ones, I have recently come to the realization that the topic of waste and waste management issues never came up explicitly. It had not occurred to me while reading Miller (2010), Schor (1999) or Bauman (2005) or during the discussions about Western 'consumer society', because the questions how and why we consume are already such broad and interesting topics, I am aware that there is not enough space or time to perfectly understand them.

As luck would have it, I worked as an intern and now am employed at a Hungarian NGO called Humusz Waste Prevention Alliance (hereinafter: Humusz). As the name suggests, the organization's main profile is waste and to be more precise, - waste prevention, i.e. how one can minimize waste production, but also giving advice on how to best - from an environmental and social perspective - deal with the amount already produced. The latter issue is the question of waste management: do we collect the different waste streams (e.g. paper, plastic, organic) separately and send them to recycling facilities or do we burn our waste or take them to a landfill? Having a background in environmental sciences, I had the opportunity to study waste management, thus I was not unfamiliar with the topic when I started my work at Humusz.

However, waste prevention is tricky, because if one manages to prevent its production for instance with sharing items or elongating a product's lifespan, then we are not talking about waste, right? Consequently, it brings us back to consumption patterns and the arguments about the way one can become a responsible and conscious consumer – and to the abovementioned readings. That is when I started to miss the waste perspective from all the discussions we had during the course 'Political Ecology, Consumption and Identity'. The problem is not simply about consumption, though. As individuals we can choose for example between products with more or less packaging or not to buy at all – decisions which the organization encourages through environmental education, but as consumers we have less say in production, distribution or legislation. One can argue with the latter pointing out how

demand and supply changes or mentioning the roles of the activists. My intention is not to diminish the power of the individual, but to call attention to the complexity of the overall waste issue that requires an interdisciplinary, holistic approach that a human ecological framework could provide.

It is not surprising, therefore, that I have chosen to write my thesis about the field of waste management. However, my topic is not about prevention, consumption or their interconnectedness. At Humusz we (as a member of the staff it is difficult to separate myself from the organization, but will do in the upcoming parts) seldom advocate recycling or incineration and landfilling, especially. However, it is important to know as much as possible about these topics if we want to remain well-respected in the field. Moreover, Humusz is known for its expertise work as being member of various committees (e.g. Hungarian Ecolabel Committee), the National Environmental Council and actively participating in social consultations where the organization's suggestions have been considered various times and even included in national plans as the National Waste Management Plan 2014-2020. Apart from being able to have a voice in the decision making process, the organization always has up-to-date information about the current trends in waste management on a national level. On an international level, Humusz is a member of organizations such as the waste working group of the European Environmental Bureau (EEB), Zero Waste Europe (ZWE) or GAIA (Global Alliance for Incineration Alternatives/Global Anti Incineration Alliance), gaining information about tidings in the European Union (EU) and gathering good practices from all around Europe and world-wide.

As a result of such connections, it came to our attention that there are more and more incentives promoting waste incineration (in this case burning waste to generate heat and/or energy) in Hungary and even plans to build waste to energy plants or to switch to waste from coal (B. Horváth 2014) (MTI 2015). Humusz received requests to look into the matter, even though the organization has no or little capacity to do research on such a specific topic distant from the organization's main field. However, if the "rumours" are true, today's decisions can affect the future of waste management and therefore cannot be looked over. My research will be a policy analysis on Hungarian waste management, particularly in incineration. The task I set for myself is to show the importance of understanding the implications of the goals set in

policy documents like national plans and programs. Furthermore, I would like to demonstrate how waste management issues could be considered as wicked problems (Rittel and Webber, 1973) and what this indicates in a public policy setting.

1. Introduction

1.1 Definitions and state-of-the-art

In July 2014 the European Commission published the communication "Towards a circular economy: A zero waste programme for Europe". The main points of a more circular economy include resource efficiency through waste prevention, ecodesign, re-use and higher recycling targets together with a change in today's linear business model. The communication also predicts that the measures to be taken will save €630 billion per year for the European industry, create over two million jobs and reduce total annual greenhouse gas emissions by 2-4% (COM (2014) 398). Together with the Circular Economy Package, the Waste Package was proposed to amend certain waste related directives (Directives 2008/98/EC on waste, 94/62/EC on packaging and packaging waste, 1999/31/EC on the landfill of waste, 2000/53/EC on end-of-life vehicles, 2006/66/EC on batteries and accumulators and waste batteries and accumulators, and 2012/19/EU on waste electrical and electronic equipment) to set a more ambitious waste policy.

The proposal sets a minimum 80% recycling rate by weight of all packaging waste to be re-used and recycled, a minimum of 70% by weight for recycling and preparing for re-use of municipal waste and to accept only residual waste in landfills for non-hazardous waste by 2030 (COM (2014) 397). Although the Waste package was welcomed by NGOs, the recycling industry and some ministers, it was also attacked claiming to be too ambitious starting a great debate about the package and its future which was ended by being scrapped by the current Juncker Commission in the beginning of 2015 (Confino 2015) (Crisp 2015). Among the protestors were the V4+ group (Poland, Czech Republic, Hungary, Slovakia, Bulgaria and Romania) opposing in a joint statement the binding recycling and landfill targets set for 2030 as they are "too ambitious and [their] implementation would be economically challenging in [their] regional conditions and national circumstances" (Kość 2014).

Hungary joined the European Union on 1st May 2004, thus, any legally binding target not fulfilled brings serious sanctions for the country. The latest report by Eurostat shows that the amount of municipal waste generated per person in 2013 in the EU 31% was landfilled, 28% recycled, 26% incinerated and 15% composted while in Hungary only 21% was recycled and 65% of the waste is still landfilled (Eurostat 2015). Therefore, Hungary's opposition is more than understandable considering the difficulties to reach the 50% target for preparing for re-use and recycling for paper, metal, plastic and glass from households by 2020 already set in the Waste Framework Directive (2008/98/EC, WFD). The same Directive requires Member States to establish waste management plans and waste prevention programmes, as well. Hungary's National Waste Management Plan (original: *Országos Hulladékgazdálkodási Terv*, OHT) for the period 2014-2020 was acknowledged by the Act CLXXXV of 2012 on Waste. The OHT presents waste management policies, legislation, the current state of treatment technologies by waste streams, weaknesses and defines targets to be reached and required actions, implementations (OHT 2013, 1). Furthermore, the National Waste Prevention Programme can be found in the OHT 2014-2020.

The organizational background of Hungarian waste management is included, as well in the plan. In 2010 the tasks and responsibilities of the former Ministry of Environment and Water was taken over by the Ministry of Rural Development, but the waste management tasks (determination of strategies, development of programmes, integration of the EU *acquis*, law preparation, setting technological requirements for waste treatment facilities etc.) are now under the responsibilities of the Ministry of Agriculture. In 2012 the National Waste Management Agency (original: *Országos Hulladékgazdálkodási Ügynökség*, OHÜ) was established by the state as the only coordinator of the management and treatment of the waste coming from the products obliged to pay product fee (2011. évi LXXXV. törvény). The product fee provides the materialization of the extended producer's responsibility (EPR) scheme.

The collection and recycling of the waste is financed from the product fees paid by the producers. Furthermore, the OHÜ – that is the National Environmental and Nature Protection Inspectorate National Waste Management Directorate (original: *Országos Környezetvédelmi és Természetvédelmi Főfelügyelőség Nemzeti Hulladékgazdálkodási Igazgatóság*, OKTF

NHI) from 1st January 2015 – is obliged to prepare the National Collection and Recovery Plan (original: *Országos Gyűjtési és Hasznosítási Terv*, OGyHT) annually which contains the amount of waste produced, needed to be collected, transported and pretreated/recycled and the money available for the given year (OGyHT'15). It is therefore an important document that shows what type of treatment for which waste category is subsidized by the state. Regarding expertise work the National Environmental Institution (original: *Nemzeti Környezetügyi Intézet*, NeKI) is the ministry's background institution in environmental matters and assists in political decisions (OHT, 2013). A significant change in the public services strategy in waste management mentioned in the OHT 2014-2020 is in the proprietary structure whereas in the future only nonprofit organizations will provide the public services and the ownership will be 100% state or municipality based.

The main legal document is the Act CLXXXV of 2012 on Waste that is in line with the Waste Framework Directive. Among many other matters, it sets the priority order in waste prevention and management legislation and policy which is the waste hierarchy (7.§):

a) prevention of waste generation
b) preparation for re-use
c) recycling
d) other recovery, especially energy recovery
e) waste disposal

The Act also encourages the options delivering the best overall environmental outcome, but it is possible to depart from the hierarchy if the choice is justified by an analysis based on life-cycle thinking. However, the governmental decree regulating life-cycle analysis (LCA) has not been prepared, yet.

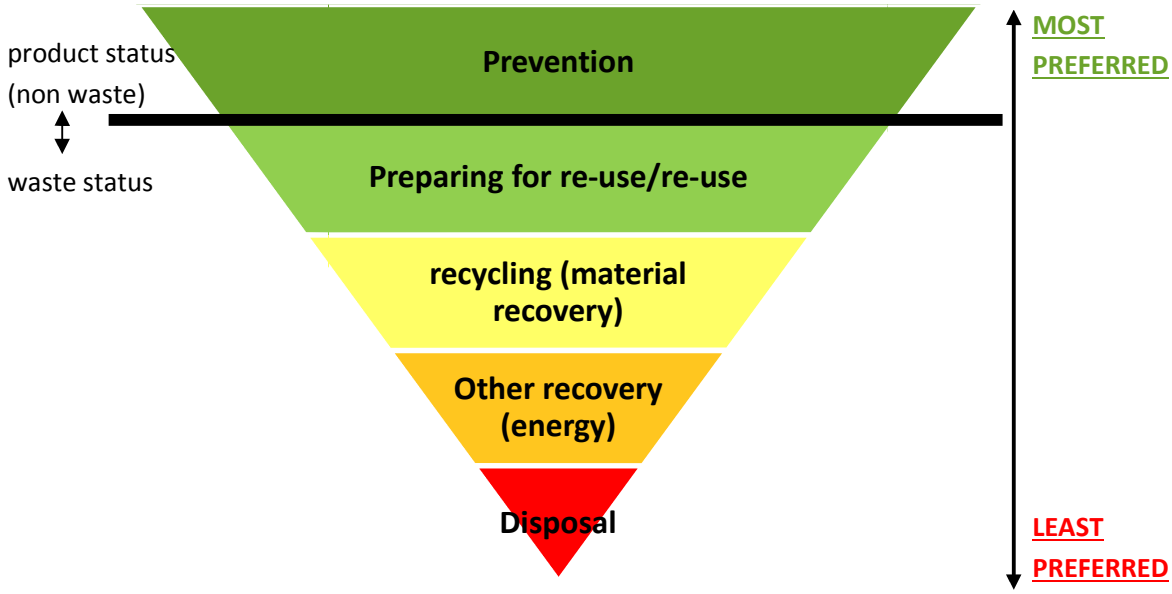


Figure 1 Waste Hierarchy

It is important to mention and explain the definitions found in the Act on Waste relevant for our case. The word and operation 'recovery' (Hungarian*: hasznosítás*) means that the waste is serving a useful purpose by replacing other materials and are defined in Annex II (2008/98/EC). 'Recycling' (Hungarian: *újrafeldolgozás*) is distinguished from other recoveries, because it is material recovery and thus an environmentally better operation. 'Disposal' means "any operation which is not recovery even where operation has a secondary consequence the reclamation of substances or energy" and is listed in Annex I (2008/98/EC, Article 2.19). The Zero Waste Hierarchy of Higher and Best Use 6.0 (ZWH 6) adopted by Zero Waste International Alliance (ZWIA) and Zero Waste Canada in 2014 defines destructive disposal as "Discarded materials placed in landfill or in an incineration facility" (p.5).

As the main focus in our case is waste incineration I would like to concentrate on its definitions. In 2000 the European Parliament and the Council adopted the Directive 2000/76/EC on the incineration of waste. It defines incineration plant as

> "any stationary or mobile technical unit and equipment dedicated to the thermal treatment of wastes with or without recovery of the combustion heat generated. This includes the incineration by oxidation of waste as well as other thermal treatment

> processes such as pyrolysis, gasification or plasma processes in so far as the substances resulting from the treatment are subsequently incinerated"
>
> (Article 3.4., emphasis added by author).

Therefore incineration can be a disposal operation (D10: incineration on land) or a recovery operation (R1: use principally as a fuel or other means to generate energy and R3 in the case of gasification and pyrolisis) set in the Waste Framework Directive's Annex I and II. When processing municipal solid waste (MSW) a formula is used to determine whether the operation is considered recovery or disposal based on energy efficiency (WFD, Annex II).

Waste incineration is used as a treatment for different types of waste, but includes more technologies. Directive 2008/1/EC concerning integrated pollution prevention and control (IPPC) lists in Annex I waste incineration of MSW and disposal and recovery of hazardous waste. To learn more about the technologies, information can be found in the IPPC Reference Document on the Best Available Techniques for Waste Incineration (European Commission, 2006), but is out of the scope of this thesis. The Decree 29/2014. (XI. 28.) contains the range of technical specifications, operational terms and emission limits for waste incineration in Hungary.

Another form has not been mentioned which is co-incineration. Its

> main purpose is the generation of energy or production of material products and:
> - which uses wastes as a regular or additional fuel; or
> - in which waste is thermally treated for the purpose of disposal.
>
> If co-incineration takes place in such a way that the main purpose of the plant is not the generation of energy or production of material products but rather the thermal treatment of waste, the plant shall be regarded as an incineration plant (2000/97/EC, Article 3.5.).

Waste can be co-incinerated in cement kilns or energy plants. For instance, in Hungary they burn waste together with coal and lignite at Mátra Erőmű Zrt. or use it as replacement of fuel at Duna-Drava Cement and Lafarge cement kilns, just to mention a few.

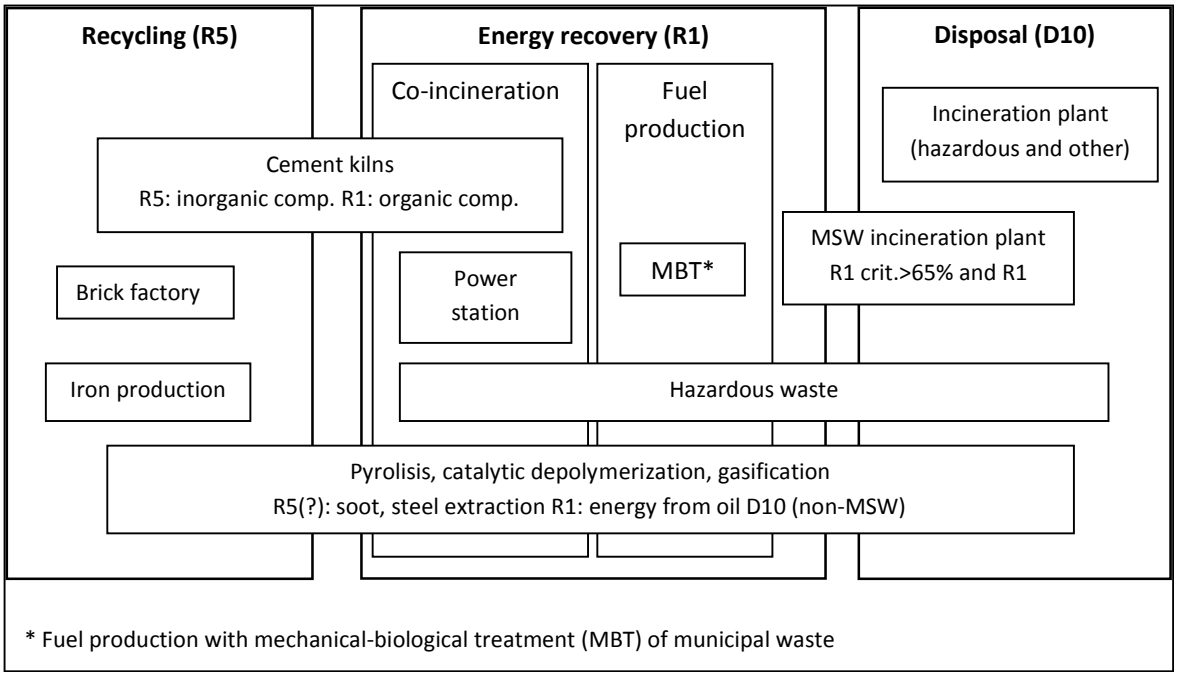


Figure 2 Thermal treatments by operation categories (Source: Bocskay 2015, 27)

The definition of incineration found in the ZWH 6 says:

> Some forms of incineration may be described as resource recovery, energy recovery trash to steam, waste to energy, energy from waste, fluidized bed, catalytic cracking, biomass, steam electric power plant (burning waste), pyrolisis, thermolysis, gasification, plasma arc, thermal depolymerization or refuse derived fuel (RDF) (p.6).

This means that they do not make a distinction between energy recovery and disposal as these systems "are dependent upon the continued production of discards" (p.6). Their claim is that "[m]ore energy can be saved, and global warming impacts decreased, by reducing waste, reusing products, recycling and composting than can be produced from burning discards or recovering landfill gases" (p.1). More arguments against incineration will be presented later.

A few statistics representing Hungary's current situation in waste management in needed to further understand policies being implemented. The latest data found in OHT are from year

2011. The total amount of waste generated was 18 596 thousand tons of which 26.9% was recycled, 4.4% energy recovery, 0.5% incinerated (as disposal), 46.1% landfilled and 22.1% other (OHT 2013, 14).

Waste category	2011 (thousand tons)
Waste from agriculture and food industry	744
Industrial and other	5 928
Construction and demolition waste (C&D)	4 415
Hazardous waste	777
Municipal solid waste (MSW)	3 809
Municipal liquid waste	2 923

Table 1 Waste generated in Hungary 2011 by waste categories (Source: OHT 2013, 12)

Waste cannot be imported or exported for landfill purposes (Act CLXXXV, 19 §), but is possible if there is not enough capacity for recovery in a given country. 60 632 tons of combustible waste (EWC 19120) was imported in 2011 (*ibid*, 21). The table below shows the greatest amounts imported by waste and treatment code. It is clear that most of the waste sent to Hungary is treated with R3 (recycling/reclamation of organic substances which are not used as solvents (including composting and other biological transformation processes including gasification and pyrolisis using the components as chemicals) and R1 (use principally as a fuel or other means to generate energy) operations.

EWC	Amount (tons)	From which country	Recovery operation
191210	27 812	Italy	R1
190805	26 187	Slovenia	R3
191210	25 566	Italy	R1
191212	13 181	Italy	R1
190805	3 844	Italy	R3
191210	3 719	Austria	R1
191210	3 535	Slovenia	R1
190805	3 285	Slovenia	R3
030307	2 872	Slovenia	R3

Table 2 Imported wastes in Hungary 2011 by amount and recovery operations (Source: OHT 2013, 23)

In the upcoming parts I will mostly concentrate on municipal waste. 3 988 thousand tons of MSW was generated in 2012 which was an increase compared to the previous and continuous decline due to the economic crisis of 2008 (*ibid*, 44). Municipal waste is not only waste from households, but includes wastes similar to households i.e. generated in institutions and businesses. As mentioned before, the treatment of MSW differs from the overall picture, because more than 60% is landfilled. Energy recovery covers 9.1% which comes from the only waste-to-energy facility in Budapest (*Fővárosi Hulladékhasznosító Mű*, HUHA). The maximum capacity is 420 000 tons/year, but the actual amount treated in 2012 was 364 047 tons (*ibid*, 46).

In the case of packaging waste (paper and cardboard, plastic, wood, metal, mixed composite, glass) 836 thousand tons were generated in 2011 from which 59% was recycled and 4% incinerated for energy recovery. The treatment took place in HUHA and three cement kilns. From the mechanical treatment of household waste mostly containing packaging, alternative fuel was produced for utilization in cement kilns (*ibid*, 187-188). The light fraction from mixed waste and residuals can be separated and recovered as refuse derived fuel (RDF). Waste derived fuels include residues from MSW recycling, industrial/trade waste, sewage sludge, industrial hazardous waste, biomass waste, etc. (A. Gendebien et al. 2003, 1). RDF's heat of combustion extracted from household waste is 20% lower than from industrial waste due to the high organic component of the general household garbage (even higher in the countryside) that could be improved with biological treatment (Bocskay 2015, 29). However, the quality is rarely adequate for cement kilns thus requiring auxiliary fuels (*ibid*). The capacity of mechanical-biological sorting facilities built and under construction is more than 750 000 tons/year and the treated amount in 2012 was 241 000 tons from which 26 000 tons of RDF were realized (OHT 2013, 50).

1.2 Research objective

Having received a picture about the waste situation in Hungary – concentrating especially on incineration -, I will now move to the policy analysis where I will map the goals set in waste management concerning energy recovery in different documents already mentioned in the introduction like OHT, OGyHT, but other sources outside the field of waste will guide me for example Hungary's National Energy Plan 2030 (original: *Nemzeti Energiatratégia*, NES) and Operational Programmes 2014-2020.

The question I seek to answer by the analysis is *the future of waste incineration (specifically energy recovery) in Hungary set by the government*.

Therefore, I would like to understand the Hungarian government's attitude towards thermal treatment of wastes and how it is represented in the documents. For the reason that the documents I chose to analyze are governmental and recently published, I believe that I am able to get a reasonably good picture of the ideas around the role of waste incineration in waste management and energy plans.

Throughout the analysis I am not applying a theoretical framework. Instead, the theory development process can be described as 'practice-research-theory'[1] where I will introduce the theory of 'wicked problem' at the end of my policy analysis and discuss my findings following the ten properties of planning problems set by Rittel and Webber (1973).

1.3 Literature review

Humusz developed a webpage to inform the public about waste incineration issues (www.piromania.info). However, regarding expertise work, the main field is prevention in which the organization participates. In 2005 in the framework of 'No Waste is Good Waste' program, Humusz published a series of reports elaborating on the topic of waste prevention in Hungary. The first book is about the Hungarian, the second about the EU policy state and the third book offers proposals to the waste prevention strategy. The first report called "Is the principal of waste prevention being implemented in Hungarian waste management? – an analysis" (original: *Érvényesül-e a megelőzés elve a hazai hulladékgazdálkodásban? – helyzetelemzés*) examines national strategies and laws, the role of prevention in economic

[1] http://www.jou.ufl.edu/faculty/mleslie/spring96/theory.html

sectors and the relationship of waste and consumption. The series gives a good example of a complex policy analysis conducted by the non-governmental sector. Unfortunately, due to capacity constraints – both financial and personnel – Humusz has not made a similar document since. However, the methods used for the analysis could be employed for the current research.

László Szilágyi analysed four policy documents: II. National Environmental Program and Thematic Action Programs; National Waste Management Plan and Regional Plans; National Development Plan Strategy; Environmental and Infrastructure Operational Program (Szilágyi 2005). Three research questions were applied for the documents:

- how do they assess the actual waste situation
- what are the short-term projections
- how is the main principle of waste management, waste prevention being implemented – if it is, at all (*ibid*, 12).

The analysis starts with general comments on the documents and their use of definitions. The main critique is the lack of reliable data which makes their analysis ambiguous. Furthermore, when evaluating priority areas set in the documents, the order is obvious, but later not expressed. In the case of goals, no definite indicators, plans are mentioned – according to the thorough analysis. Funding opportunities, planning processes and relation to EU expectations are examined at the end. There are no exact social scientific research methods applied which can be regarded to the dualistic nature of policy analysis (explained in the next chapter). However, as an example, the report proved to be useful to help determine the questions and points necessary for evaluation in a policy analysis.

Another example for a policy analysis prepared by an NGO is the report named ‘Throwing away the chance to improve waste policy?’ published by EEB in 2012. Having members throughout the European Union, EEB conducted a survey to find out how the WFD is being transposed and implemented in the Member States. The report does not propose a new legislation. Different tools and methods have been used as online survey, data collection (requesting specifics about waste treatment from members), actively participating in European Commission stakeholder consultations and monitoring and analysis of official

studies (Malizou and Arditi 2012, 9). The findings of the report proved to be useful for my research, as well. However, considering the differences regarding data and tool availability between international and national NGOs, the possibilities for the latter are less. Since I have little or no connections to stakeholders in waste management, my research and analysis is limited to official documents.

Policy analyses in waste management, especially about incineration are not ubiquitous in the Hungarian literature and researches. Usually waste incinerators are examined from a technical and technological perspective, like in the case of the pamphlet published by the former Ministry of Environment and Water (Köztisztasági Egyesülés munkacsoportja 2003) or their negative environmental aspects are studied (Szuhi 2008, 2013). Therefore, my analysis is unique in this sense as it fills a gap in waste management literature. Furthermore, it could serve as a starting-point for Humusz in later debates and social consultations.

2. Analysis of Hungarian waste incineration policy

2.1 Methodology

"Policy analysis is a social and political activity" (Bardach 2012, XV). It "emerged to both better understand the policymaking process and to supply decision makers with reliable policy-relevant knowledge about pressing economic and social problems" (Fischer et al. 2007, XIX). Therefore, policy analysis is a tool, practice for both social scientists and actors in political settings from governments to organizations. Policy analysists help in managing, planning, decision making and can work alone, in teams or in networks (Bardach 2012, XV). As it is not a methodology by itself, the analysis can be done using and combining different methods found in the social sciences e.g. interviews, surveys, discourse analysis, depending on the objective of the analysis. The field was from the 1950s thought to be a process that evolves through a sequence of stages or phases (Jann and Wegrich 2007, 43). One version of such linear approach is the rationalist model where one first defines the problem, determines evaluation criteria, identifies and then evaluates alternative policies, selects and at the end implements preferred policies (Patton and Sawicki, no date). Another method for instance is the eightfold path developed by Bardach (2012, XVI) which consists of the following stages:

- Define the Problem
- Assemble Some Evidence
- Construct the Alternatives
- Select the Criteria
- Project the Outcomes
- Confront the Trade-offs
- Decide!
- Tell Your Story

However, in actuality the creation of policies are more complex and never really ending as there are always unintended consequences of a policy that needs re-evaluation, possibly because it inherently overlooked specific aspects or the circumstances have changed meanwhile (Rittel and Webber, 1973, Jann and Wegrich, 2007). To address these problematics the framework of policy cycle has been developed as it "takes into account the feedback between the different elements of the policy process" and "focuses attention on [its] generic features rather than on specific actors or institutions or particular substantial problems and respective programs" (Jann and Wegrich 2007, 44-45).

There is a thin line between analysis and planning in the policy development process and in many cases the term analysis is used when the latter would be more appropriate (Patton and Sawicki, no date). Patton and Sawicki differentiate between analyses made to give advice to policy makers ("basic analysis") and the ones conducted by researchers hired specifically ("researched analysis") (*ibid*). The main difference is the time and resources available for the analysis or planning where usually there is less for the former. To give a real life example, Humusz as mentioned earlier, takes part in the expertise consultation of policy drafts and the general practice is that they are sent for revision a few days before the deadline. Consequently, the conduct of a research or plan is not possible. For that reason the term analysis of policy is more appropriate than policy analysis as the latter implies the whole process (linear or cycle) from problem definition through formulation of objectives and goals to the selection of the most effective alternative (Fischer 2007, 223-224).

The methodology I apply for my analysis is most similar to narrative analysis, where "the most straight-forward unit of analysis is an "existing text" of a specific author – e.g. policy

papers, news reports, bureaucratic forms …" and seeks the position of a group or organization (van Eeten 2007, 253). I will also analyse texts to understand the position of the government and my method is basically to see what is written (or not mentioned which also holds information) and the use of definitions. I will not use any specific method for the text analysis as the contents of such policy documents are quite explicit. In the policy process I will reach to the point of problem definition and evidence gathering as there is no space for deeper policy analysis. The methodology already implies that I have preliminary knowledge of the waste management policy that requires critical analysis, therefore it is inevitable to mention why I (and the position of various international NGOs) find it problematic and which direction could be one of the answers.

2.2 National Waste Management Plan 2014-2020 (OHT), National Collection and Recovery Plan 2015 (OGyHT'15) and MSW Management Development Strategy 2007-2016

The OHT 2014-2020 already introduced contains not only the *status quo* of waste management, but also projections for the next years along with general and specific action plans by waste types (like municipal, industrial, construction and demolition wastes). I will look at the municipal waste, packaging waste and sewage sludge (under Act on waste). The latter is important, because of the news about a new facility to be built in the Southern part of Budapest for sewage sludge incineration (B. Horváth 2014). The project of the Central Waste Water Treatment Plant is still not finished and a long-term solution for the sewage sludge treatment is needed and the new incinerator could be the answer (municipal waste would be burned there, as well).

The general action plan for MSW can be found under 2.4.1.3. The main points are the development of selective waste collection and of waste sorting systems (specifically metal, glass, electronic and electrical equipment and battery components from mixed waste). In the field of prevention and reuse among many others the goals for 2020 are: the use of life cycle analysis in waste management, the spread of home and community composting systems, establishment of reuse centers and awareness raising campaigns. The specifics can be found in the Waste Prevention Program which is part of OHT. The next part is about recovery (original: *hasznosítás*), but not specified whether material or energy. However, not all the

points indicated are related to recovery operations. For example the first is about the improvement and extention of the deposit fee for beverage packaging which is rather reuse (the packaging returned are ideally sent for refill). The second point determined that the capacities for residual waste disposal should be available within the national borders which is again not about recovery. The third point indicates the necessity of compost and biogas facilities where the first is a type of material recovery and the second is energy recovery (but not incineration). The remaining points only mention the targets that are set by the WFD. In the case of disposal the long term objective is to cease the deposit of residual waste to landfills and incinerators.

The specific action plans for MSW (2.4.1.4.) are also divided into prevention and reuse, recovery and disposal. Among recovery the following are included (not all points will be indicated): improvement of the technical regulations of the collection and treatment systems, especially for mechanical-biological treatment (MBT), hazardous components, waste yards, house clearance and curbside collection; funding of recovery operations from operational programmes (*not specifying whether material or energy*); awareness raising about the importance of selective collection and the unsafety of illegal disposal; plough back the incomes from product fee to preparation for reuse and recycling facilities. Both general and specific actions do not include nor mention explicitly the development or improvement of waste to energy facilities for municipal waste.

Due to the National Municipal Sewage Disposal and Treatment Realization Program the amount of sewage sludge has been increasing, thus adequate placement and recovery options are crucial in the future. Alternative recovery solutions include composting, energy and recultivation recovery (86). However, the sludge and compost utilization in agriculture are limited, because of the heavy metal and organic contaminant content. The OHT indicates that energy recovery can be stimulated with tenders and an important political goal is the decrease of sewage sludge disposal (88). The general action plan (2.4.4.3.) acknowledges the high energy and nutrient content of the sludge that needs te bo recovered, *but the methods are not specified in most cases*. Anaerobic digestion (AD) and biogas production and utilization will be mandatory at water treatment plants with higher than 30 000 p.e (population equivalent). The amendment of the Decree 147/2010 (IV.29.) will provide this – can be read in the

specific action plan (2.4.4.4.). Furthermore, funds from KEHOP 2014-2020 (Environmental and Energy Efficiency Operational Programme) are necessary to reach the goals set (90).

Regarding packaging waste in the projections (2.4.7.2.) an increase of collected waste waiting for recovery is anticipated.

> Especially the collection of selective, but non-recyclable, mostly mixed plastic fraction and mixed contaminated packaging has been increasing due to the expansion of curbside collection and mechanical sorting of mixed municipal waste. Their incineration in cement kilns and power plants will be concluded, short term capatities are insured, but are uneconimically far in third of the country. (189)

In the specific action plan (2.4.7.4.) the development of deposit fee systems can be found under prevention (unlike in the case of municipal waste). More important for our case are the schemes for collection and recovery. Here, the definitions are constantly used wrongly. The first sentence says: "Increase of recovery and material recovery is necessary…" (190). If one would like to separate the different recovery methods they should use energy and material recovery as recovery by itself contains both. It continues: "The key issues of recovery are collection, collection within municipal waste needs to be intensified. The collection of industrial packaging is almost comprehensive." On page 191 it is written that the economic background for alternative fuel production has to be guaranteed for the energy recovery of non-recyclable plastic. Furthermore, it is said that residuals possible for recovery can be diverted from the landfills with the utilization of mechanical-biological pre-treatment plants and promotion of alternative fuel production (*ibid*).

The reason why I emphasize the misuse of the terms, because there is a huge difference between the two types of recovery as their order in the waste hierarchy indicates. In addition, collection not necessarily equals recycling as it is never 100% clean – maximum 90% of the separately collected waste can be recovered ((KvVM) 2006, 26) – and "according to the legal provisions, it is enough to send a certain amount of waste to a final recovery/recycling plant to consider the shipment as totally recycled" (Malizou and Arditi 2012, 30). As the abovementioned quotation shows, with the increase of curbside collection the proportion of contaminated packaging is growing, too, which limits their

recycling. The contaminated materials are further separated at the sorting facilities. The term in Hungarian is *utóválogatás* which means post-sorting, because with curbside collection there is already a separation at source, but to make sure that good quality waste is sent for recycling, the contaminated or non-recyclable materials need to be sorted out. The residuals can be shredded and used as alternative fuel i.e. RDF.

The mechanical-biological pre-treatment (MBT) is used for mixed MSW where

> metals and inerts are separated out and organic fractions are screened out for further stabilisation using composting processes, either with or without a digestion phase. It also produces a residual fraction which has a high-calorific value as it is composed mainly of dry residues of paper, plastics and textiles (A. Gendebien et al. 2003, 32).

After screening and compression secondary fuel is produced for co-incineration or landfill (Ballabás 2012, 113). The advantages are volume and mass decrease, stabilization of the waste, but greenhouse gas emission is a huge problem (*ibid*). The calorific value of the RDF is at least 12-14 MJ/kg while waste without any treatment has only 7.5-8 MJ/kg ((KvVM) 2006, 30). Power plants' fuel demand is 6-12 MJ/kg, but cement kilns need fuel with higher calorific value (15-25 MJ/kg) (*ibid*, 31). Therefore, for co-incineration purposes pre-treatment is obligatory.

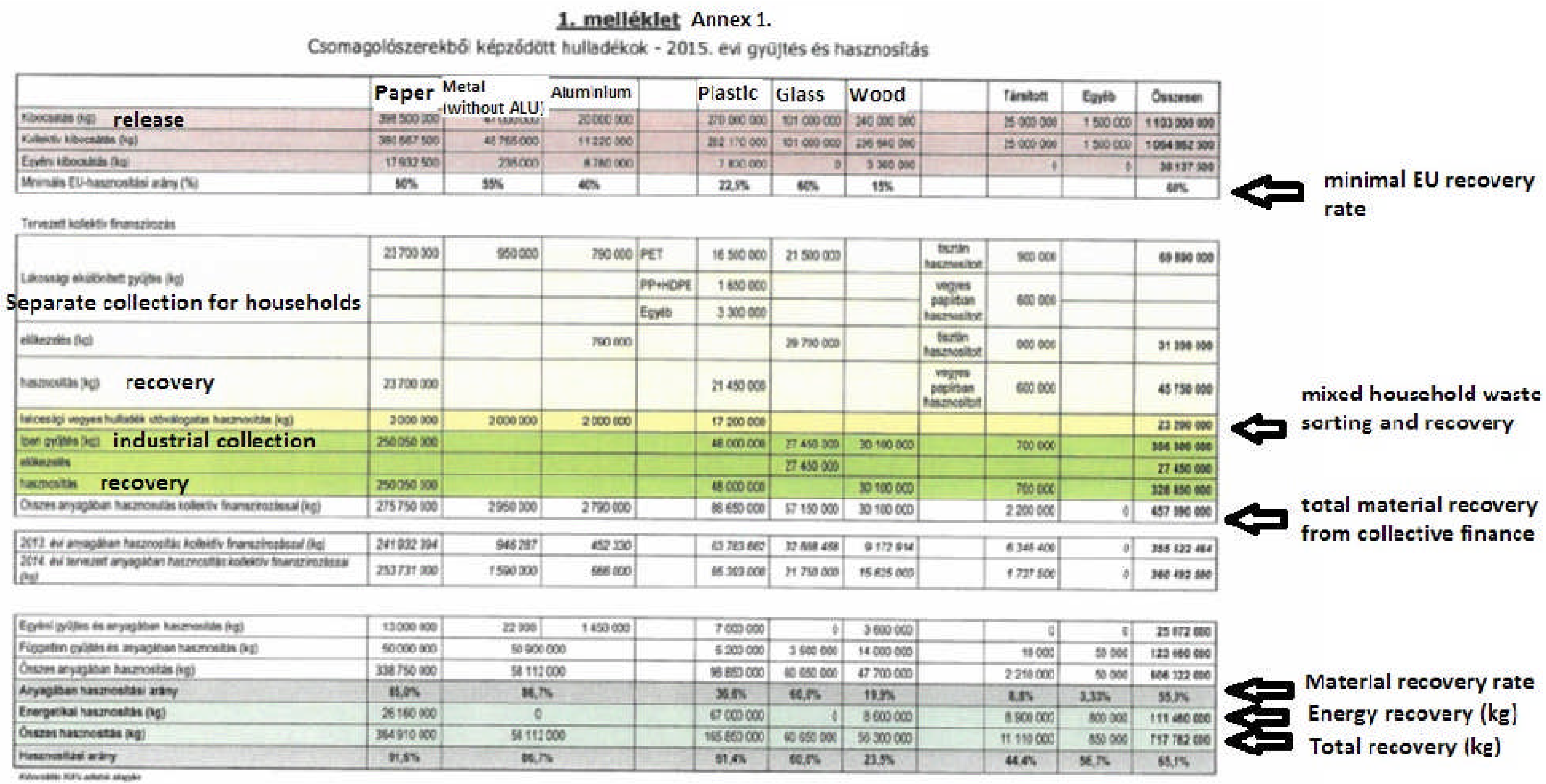
The OHT 2014-2020 sets no specific plans for MSW, only indicates the want for higher collection rates and acknowledges the targets. In the case of sewage sludge recovery as a solution is named, but the operations are not specific, either. At first look we might assume that energy recovery utilization of waste is not on the agenda according to the National Waste Management Plan. However, the plans for packaging waste mention the need for alternative fuels and their extension. The constant confusion of the terms is deceptive. One might think that the reason behind it is to mislead the readers by assuring them of a progressive waste management plan where recycling is of high priority whereas the true intention is recovery of other sort (energy). However, it is unadviseable to jump to any conclusion based only on the OHT and without analysing other documents.

The OGyHT'15 shows concrete numbers regarding release, collection, pre-treatment and recovery of packaging, electric and electronic equipments, tyres and accumulators and

expenditure (costs available and intended by waste stream). Annex 1. shows packaging waste collection and recovery for 2015 in kilograms and percentage.

Though the table is not fully translated, the first table shows the release in kilograms for different waste streams, the second table the planned collective finance, the third the finance for year 2014 and 2013 and the last table shows the recovery from individual and independent collection, rates and amount of recovery (material and energy). According to Directive 94/62/EK the recovery of packaging waste must be 60% from which recycling is 55% by December 31st 2012 and recycling by waste stream: paper and glass 60%, metal 50%, plastic 22,5% and wood 15% (OHT 2013, 189). This means that from the 60% energy recovery can only represent 5%. The total recovery indicated in the table is 717 782 000 kg from which total material recovery is 606 322 000 kg (84.5%) and energy recovery is 111 460 000 kg (15.5%). The total release of packaging predicted is 1 103 000 000 kg indicating 55% recycling and 10% energy recovery. The plan therefore shows that EU requirements will be fulfilled for year 2015 and even overshoot. However, we must keep in mind that the extra 5% comes from energy recovery and not recycling (the percent is not shown in the table, one can only see if they take the time to do the math).

The second part of Annex 1 shows the amount of money distributed between different waste streams and operations in Hungarian forints. The second table indicates the fees per kilograms by waste streams. In the case of paper, the industry or entity taking care of the waste management receives 10 HUF/kg if they sort it out from mixed household waste and send it for recovery, but receives 3,1 HUF/kg for separate collection and 1,4 HUF/kg for recovery (total 4,5 forints). The sorting of plastic from mixed waste worth 17 HUF/kg, industrial collection 8 HUF/kg and recovery 15 HUF/kg (total 22 forints). As the plan shows the amount of collected and recovered waste the Government suggests for the given year (OGyHT'15, 5), the financial distribution indicates a high incentive for sorting compared to collection and recovery (which in this case would mean waste separately collected for recycling). Taking into account the expense of a system that needs to be established for collection and recovery (sorting facilities and send for recycling) – not to mention the time and complexity – it is clear that for the paper industry sorting is more worthwhile as they receive twice the money and is less complicated.



1. melléklet Annex 1.

Csomagolószerekből képződött hulladékok - 2015. évi gyűjtés és hasznosítás

	Paper	Metal (without ALU)	Aluminium		Plastic	Glass	Wood		Társított	Egyéb	Összesen
Kibocsátás (kg) release	398 500 200	[illegible]	20 000 300		270 000 000	101 000 000	240 000 000		35 000 000	1 500 000	1 103 300 000
Kollektív kibocsátás (kg)	380 567 500	47 765 000	11 220 300		262 170 000	101 000 000	236 640 000		35 000 000	1 500 000	1 064 862 300
Egyéni kibocsátás (kg)	17 932 500	235 000	8 780 000		7 800 000	0	3 360 000		0	0	38 137 300
Minimális EU-hasznosítási arány (%)	60%	55%	40%		22,5%	60%	15%				60%

Tervezett kollektív finanszírozás

	Paper	Metal (without ALU)	Aluminium		Plastic	Glass	Wood		Társított	Egyéb	Összesen
Lakossági elkülönített gyűjtés (kg) Separate collection for households	23 700 000	950 000	790 000	PET	16 500 000	21 500 000		tisztán hasznosítot	900 000		69 890 000
				PP+HDPE	1 650 000			vegyes papírban hasznosítot	600 000		
				Egyéb	3 300 000						
előkezelés (kg)			790 000			29 790 000		tisztán hasznosítot	900 000		31 390 000
hasznosítás (kg) recovery	23 700 000				21 450 000			vegyes papírban hasznosítot	600 000		45 750 000
lakossági vegyes hulladék utóválogatás hasznosítás (kg)	2 000 000	2 000 000	2 000 000		17 200 000						23 200 000
Ipari gyűjtés (kg) industrial collection	250 050 300				48 000 000	27 450 300	30 100 000		700 000		356 300 600
előkezelés						27 450 000					27 450 000
hasznosítás recovery	250 050 300				48 000 000		30 100 000		700 000		328 850 000
Összes anyagában hasznosítás kollektív finanszírozással (kg)	275 750 300	2 950 000	2 790 000		86 650 000	57 150 000	30 100 000		2 200 000	0	457 390 000
2013. évi anyagában hasznosítás kollektív finanszírozással (kg)	241 932 394	946 287	452 330		63 783 662	32 668 468	9 172 914		6 346 400	0	355 122 464
2014. évi tervezett anyagában hasznosítás kollektív finanszírozással (kg)	253 731 300	1 590 000	666 000		65 303 000	21 750 000	15 625 000		1 727 500	0	360 492 800

	Paper	Metal (without ALU)	Aluminium		Plastic	Glass	Wood		Társított	Egyéb	Összesen
Egyéni gyűjtés és anyagában hasznosítás (kg)	13 000 000	22 300	1 450 000		7 000 000	0	3 600 000		0	0	25 072 000
Független gyűjtés és anyagában hasznosítás (kg)	50 000 000	50 900 000			6 200 000	3 500 000	14 000 000		10 000	50 000	123 460 000
Összes anyagában hasznosítás (kg)	338 750 000	58 112 000			98 850 000	60 650 000	47 700 000		2 210 000	50 000	604 322 000
Anyagában hasznosítási arány	85,0%	86,7%			36,6%	60,0%	19,9%		8,8%	3,33%	55,2%
Energetikai hasznosítás (kg)	26 160 000	0			67 000 000	0	8 600 000		8 900 000	800 000	111 460 000
Összes hasznosítás (kg)	364 910 000	58 112 000			165 850 000	60 650 000	56 300 000		11 110 000	850 000	717 782 000
Hasznosítási arány	91,6%	86,7%			61,4%	60,0%	23,5%		44,4%	56,7%	65,1%

[illegible]

Figure 3 Annex 1 for packaging waste collection and recovery (to be continued) (Source: OGyHT'15 p.7)

	Paper	Metal (without ALU)	Aluminium		Plastic	Glass	Wood		Társított	Egyéb	Összesen
Lakossági elkülönített gyűjtés (Ft) curbside collection	450 300 000	9 500 000	30 020 000		1 476 750 000	817 000 000			65 400 000		2 848 970 000
előkezelés (Ft) pre-treatment			7 900 000			237 600 000			31 500 000		277 000 000
hasznosítás (Ft) recovery	33 180 000				364 650 000				21 000 000		418 830 000
lakossági vegyes hulladék utóválogatás hasznosítás (Ft)	20 000 000	16 000 000	16 000 000		292 400 000						344 400 000
ipari gyűjtés (Ft) industrial collection	775 155 000				384 000 000	466 650 000	240 800 000		10 500 000		1 877 105 000
előkezelés (Ft) pre-treatment						219 600 000					219 600 000
hasznosítás (Ft) recovery	360 070 000				720 000 000				10 500 000		1 090 570 000
Összesen nettó (Ft) Net total	1 628 705 000	25 500 000	53 920 000		3 237 800 000	1 740 850 000	240 800 000		138 900 000	0	7 066 475 000

mixed household waste sorting and recovery

Anyagfajtánkénti díjak (Ft/kg)

	Papír	Fém (alum. n.)	Alumínium		Műanyag	Üveg	Fa		Társítható
Lakossági gyűjtés Collection from households	19	10	38	PET	80	38		Isztán hasznosított	60
				PP+HDPE	55			vegyes papírban hasznosított	19
				Egyéb	20				
hasznosítás recovery	1,4				17			vegyes papírban hasznosított	35
lakossági vegyes hulladék utóválogatás hasznosítás	10	8	8		17				
Előkezelés ipari és lakossági pre-treatment			10			8		Isztán hasznosított	35
ipari gyűjtés industrial collection	3,1				8	17	8		15
hasznosítás recovery	1,4				15				15

mixed household waste sorting and recovery

Figure 4 Annex 1 for packaging waste collection and recovery (part 2) (Source: OGyHT'15 p.8)

For plastic the trend is similar though for collection and recovery the fee together is 22 HUF/kg while sorting is only 17 HUF/kg. However, if we compare sorting and recovery separately then 17 forints for the former is again higher than the 15 forint for the latter.

What conclusions can be drawn from the tables presented? The paper and plastic sorted out from mixed household waste are highly contaminated thus cannot be recycled only sent for energy recovery as both waste streams are good RDF materials due to their calorific content. Though mixed household waste would otherwise go to incineration or to landfill and with sorting out a part of it for energy recovery decreases the amount, it is to be feared that separately collected waste would end up in the mixed pile just to collect the money for sorting them out again. The question is then why the distribution of the money for the different types of treatment is allocated the abovementioned way.

In comparison to OHT 2014-2020 the goals set for MSW management are clearer in the case of the Municipal Solid Waste Management Development Strategy 2007-2016 (original: *A települési szilárd hulladékgazdálkodás fejlesztési stratégiája 2007-2016*) issued by the former Ministry of Environment and Water (original: *Környezetvédelmi és Vízügyi Minisztérium*, KvVM) in 2006. Even though the circumstances and political background have changed in the last couple of years, the strategy could have had an influence on waste management matters. Therefore, I find it important to mention my findings in the document.

Under chapter 7.2.5. do the requisites for thermal treatment of waste occur. The target for 2013 is 50% recovery of MSW which cannot be reached only with recycling and with the capacity of HUHA (KvVM 2006, 30). The suggested solution therefore is MBT from which 498 000 tons of waste suitable for incineration can be produced and their utilization as secondary fuel must be solved (*ibid*). Technical and technological potential for secondary fuel utilization from MBT could be either industrial co-incineration or at municipal solid waste incinerators (MSWI). The former includes cement kilns (four listed) and power plants (five listed). It is claimed that for cement kilns instead of MSW based RDF, more homogenous waste with higher calorific value is preferable, primarily sewage sludge (*ibid*, 31). Mátrai Erőmű Rt. is supposed to be one of the power plants with the potential of waste co-incineration with 200 000 tons/year capacity. By now we know that today they do use

RDF and the plant has a 300 000 tons/year capacity, but only 37 000-45 000 tons are burned, imported from mostly Italy and Slovenia (OHÜ 2014).

The establishment of MSWIs is economic only with a minimum of 80-100 000 tons/year capacity. As the strategy is counting with 498 000 tons of MBT waste of which 200 000 tons will go to power plants, 298 000 tons of capacity is needed to be built which would mean two or three new incinerators with 100 000-150 000 tons of yearly capacity (KvVM 2006, 32). However, we do not know of any MSWIs under construction in the areas mentioned today. Nonetheless, co-incineration of waste in cement kilns are customary (at Duna-Dráva Cement Kft. 49 000-58 000 tons) (OHÜ 2014). The presentation given by the former OHÜ in one of the working group meetings of KSZGYSZ (*Környezetvédelmi Szolgáltatók és Gyártók Szövetsége*, a union of environmental services and industry having members from recycling to incineration industry) shows that in the period of years 2000-2015 new RDF producer facilities i.e. MBTs have been established from KEOP funds (Environment and Energy Operational Programme) and the planned capacity by 2015 is 194 676 tons with operational capacity of 93 400 tons (*ibid.*). *This indicates a 100 000 tons of overcapacity after which it is not surprising that the successor of OHÜ, the OKTF NHI is pushing for alternative fuel production (sorting and recovery of mixed household waste).*

2.3 Operational Programmes 2014-2020

Funding from the EU for the time period 2014-2020 will be realized in 10 Operational Programmes (in Hungarian: Operatív Programok) and are in line with EU2020 Strategy (www.palyazat.gov.hu). One of them is the Environmental and Energy Efficiency OP (in Hungarian: *Környezeti és Energiahatékonysági Operatív Program*, KEHOP) receiving 3217.1 million EUR without co-financing (KEHOP, 34). For priority area 3., waste management and remediation 340 173 000 EUR is allocated which is 10% of the total (*ibid*,37). Objective no. 1 is the development of separate collection and no. 2 is the systematic development of the municipal waste treatment facility network. The goal of the first objective among others is to reach 50% recovery rate for MSW for the four waste streams (paper, plastic, metal, glass) by 2020. The indicator used for reporting will be the percent of waste separately collected compared to the total MSW generated. The indicator for objective no. 2 is the percent of waste pre-treated for recovery compared to total generated.

Notice that indicators set are for collection and pre-treatment, not actual recovery. However, one of the explanations for this could be the fact that most waste is exported for recovery as there is not enough recycling capacity in Hungary.

The second action advocates further treatment of separately collected waste, the establishment of necessary sorting facilities supplementing with development of biological or mechanical pre-treatment plants together with complex waste management centres combining sorting and MBT. Furthermore, it includes recovery operations (e.g. composting, alternative fuel production) (70-71). The supported facilities can either sort waste for recycling or for RDF – it is not clearly defined. The beneficiaries can be municipalities and associations and non profit organizations with majority of state ownership. There is no further specification concerning operations, therefore funded facilities can be either to promote recycling or energy recovery. There are no other objectives or priority areas regarding waste management in KEHOP.

Before I go any further I would like to add that normally I would have stopped and moved to other operational programmes dealing with waste management issues as I will eventually do. However, in October 2014 I attended a conference organized by KSZGYSZ called "Thermal recovery of wastes". The program and presentations are open for the public to download and read.[2] As a representative of a "green" NGO I found myself quite uncomfortable among all those business and industry representatives supporting waste incineration as being the solution for both waste and energy problems. Moreover, during the conference was the first time I ever heard waste regarded as *renewable energy source*. Therefore, when trying to find anwers for my question – what is the government's intention concerning energy recovery of waste – I have to extend my research to energy strategies, as well. At the conference the voice of the industry was heard, but in some cases it is hard to distinguish it from the government (see later).

Returning to KEHOP, priority area 5 covers the increase of energy efficiency and the use of renewable energy sources. 845 597 152 EUR is allocated for this area which is 26.28% of the total funding available. Objective no. 1 is the increase of the use of renewables, action no. 1

[2] http://www.kszgysz.hu/hirek/szovetsegi-hirek/hulladekok-termikus-hasznositasa

covering the advance of “green power” from renewables generated for grid excluding buildings. It consists of biomass recovery, biogas production and sewage sludge recovery apart from conventional renewable sources (photovoltaic, water, geothermal - *not mentioning wind*). Under objective no. 2 (energy efficiency and increase of renewables) is the modernization of the energy efficiency of buildings with the combination of renewable source utilization (action no. 2). Action no. 3 is the development of district heating and heat supply systems putting them on a renewable base.

During the conference one of the speakers, Tibor Orbán represented Főtáv Zrt., the district heating company of Budapest. His presentation starts with a motto by Ferenc Hízó, the assistant state secretary for green economy development, climate politics and public services of high priority.

> *The government finds* liable waste management, the extention of selective waste collection and energy recovery of wastes *important.* […] regarding renewable energy sources the natural capabilities are ideal for heat energy production. Therefore, *the district heating sector should concentrate on the opportunities given by waste energy recovery*, biomass and geothermal sources found *among alternative energy sources.*
>
> (Orbán 2014, slide 2, emphasis added in the presentation, translated by the author)

The establishment of the South-Budapest (Csepel-Kispest-Kelenföld) heat cooperation system was also introduced in the presentation. The project is listed in KEHOP under big projects (KEHOP, 102). The aim is to intagrate Budapest’s three power plants’ line to constitute a unified district heating system. The building of new municipal waste and sewage sludge incinerator in South-Budapest (referred to as HUHA II.) was presented by Tibor, as well. Though the location is not determined yet, there are already possible sites listed. The planned capacity for MSW is 230 000 tons/year and 240 000 / 100 000 tons for dehydrated/dried sewage sludge (Orbán 2014, slide 26). Related to the topic it is worth mentioning the footnote found in KEHOP page 89 commenting on priority area 5: „The

contribution of KEHOP priority area 2 action no. 3[3] to the renewable targets presented in this priority area is planned by the energy recovery of sewage sludge."

There is a figure in KEHOP on page 8 where the columns show the horizontal aims (like resource efficiency, pollution prevention and mitigation), the intervention areas (like use of renewable energy sources, energy and energy efficiency development, developments in waste management) and direct and indirect specific goals (like increase of the use of renewables, increase of energy efficiency adaptation). The fields that are linked with an arrow between intervention areas and specific goals indicate their close connection. *The intervention area 'use of renewables' is connected to the specific goal of 'development of separate waste collection; systematic development of the network of municipal waste treatment facilities' which shows that the Hungarian government sees alternative fuel from waste as a renewable energy source.*

To support the result found, let's have a look at another operational program, namely the Regional Development OP (in Hungarian: *Terület – és Településfejlesztési Operatív Program*, TOP). The main aim of the programme is to support local and regional economic development. The first priority area is the 'regional development of economic circumstances to boost employement'. Table 12 shows the intervention areas and the funds allocated. Equal amount of money (20 320 143 EUR) is allocated for 017 (household waste treatment including minimization, sorting and recovery), 018 (household waste treatment including MBT, incineration and landfill) and 019 (treatment of commercial, industrial or hazardous waste).

The second priority area is called 'enterprise-friendly, population preservative township development'. Among the investment priorities we can find development of environmental infrastructure including:

> In the framework of the invervention complementing KEHOP and GINOP[4] actions, municipalities are given the opportunity for thermal recovery of wastes and to treat

[3] Priority area 2: Municipal water supply, sewage disposal and purification, development of waste water treatment. Action no. 3: Investments, developments necessary for the optimal recovery of sewage sludge with elements of energy efficiency

[4] Gazdaságfejlesztési és Innovációs Operatív Program (Economic Development and Innovation Operational Programme)

> residuals and mixed waste with incineration. In selective sorting facilities waste best suited for incineration is generated (500 000 tons/year). Its recovery due to its high calorific content is possible at special incinerators (RDF thermal recovery plant). (84)

Later it is added that it is possible for municipalities to build recycling capacities within the TOP as KEHOP does not finance such activities. The same proposition cited above is repeated (190) under priority area 6 which is 'sustainable urban development in towns with county rights'. Furthermore, in both cases under 'awareness raising actions and training' it is stated that campaigns that are closely related to funded developments should be emphasized. This indicates that campaigns that for instance would raise awareness of the risks of waste incineration are not likely to receive any funding. Furthermore, even though recycling is mentioned as an option there are no specifics given compared to energy recovery.

It can be concluded that while funds are allocated for waste treatment and sorting facilities, in most cases the term recovery is used to hide whether later recycling or thermal recovery operations will be advocated. Furthermore, it is clear that the government percives refuse derived fuel as a renewable source and therefore would like to extend its use in the district heating system and other incinerators. The National Energy Strategy will back my conclusion.

2.4 National Energy Strategy 2030

The National Energy Strategy for Hungary (original: *Nemzeti Energiastratégia 2030*, NES) was issued by the Ministry of National development in 2012. The government's aim with the strategy is to unite energy and climate politics while being attentive to economic development and environmental sustainability, to define the future direction of energy demand and progess, furthermore to design the future of Hungarian energetics together with the actors of energy business (NES, 11). The main objectives include energy saving and efficiency and the increase of the share of renewable sources (*ibid*, 9). The vision is to increase the share of renewables in primary energy use from 7% to 20% by 2030 (*ibid*, 15). Priority sources are biogas and biomass based power plants, but the document also emphasizes the utilization of non-recyclable municipal and industrial wastes and sewage sludge for energy (*ibid*, 15-16).

A whole section on page 17 details energy recovery of wastes. It claims:

> Municipal organic waste can be regarded as biomass thus adds to the share of renewable energy sources. In many countries they present 15-20% of biomass use for energy purposes and the share could be increased in our country, as well. Burning combustible municipal waste in waste incinerators to generate energy is considered solved in the developed countries with strict technological discipline and rigorous pollution norms. 60% of these types of waste could be recovered under the present technical-technological conditions. Our country has to move in this direction, because disposal without recovery is not sustainable, uses up land space, endangers water supply and biodiversity.

In 2009 only 8% of electric power generation came from renewable sources from which 68.5% was biomass, 13.4% wind power, 9.7% hydroelectric, 2.2% biogas and 6.2% originated from municipal waste (NES, 34). Hungary's renewable potential is quite good, but not well exploited in the field of biomass, biogas, geothermal and solar energy. Moreover, there are reserves in the case of water energy and thermal recovery of waste (*ibid*, 42). Chapter no. 6 shows the future of energy politics. 6.1 is primary energy where among the istruments we can find "renewable energy (especially biomass and geothermal) and differentiated subsidy system encouraging the spread of energy generation from waste" (*ibid*, 60). Renewable energy sources are detailed under 6.1.3 where it is stated that "the energy recovery of non-recyclable municipal and industrial wastes have to be solved in waste incinerators under strict environmental regulations" (*ibid*, 67). In the case of heat energy (6.3) the energy recovery of wastes are indicated again, adding its application in the district heating system. Therefore, "awareness raising campaigns demonstrating the social benefit of waste energy recovery focusing on technological development and waste recycling-recovery are strategic objectives" (NES, 87).

The strategy recognizes that waste will become the most important industrial resource and strategic energy carrier in the 21st century and that most of it is still landfilled in Hungary (NES, 116). However, throughout the document *thermal recovery of waste is listed under renewable energy sources.*Waste does have biodegredable components which thus can be considered renewable, but municipal and industrial waste consists of plastic, metal and other

non-renewable materials, as well. Directive 2009/28/EC on the promotion of the use of energy from renewable source defines ‘energy from renewable sources’ as “energy from renewable non-fossil sources, namely wind, solar, aerothermal, geothermal, hydrothermal and ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases” (Article 2). From the definition it becomes clear that waste is not listed as a renewable energy source.

In February 2015 the Energy Union Package was published. The goal of the Union is secure, sustainable, competitive and affordable energy with an ambitious climate policy (COM (2015) 80, 2). With connection to waste, we can find that “[t]he Commission will further establish synergies between energy efficiency policies, resource efficiency policies and the circular economy. This will include exploiting the potential of "waste to energy"” (*ibid*, 12). However, the 7th Environmental Action Programme of the EU writes about “[l]imiting energy recovery to non-recyclable materials” (1386/2013/EU, Annex 40.). Though EU approach to waste to energy policies is not clear or consistent, the technology is not considered as renewable energy.

3. Discussion

In the introduction we have seen the present circumstances of Hungarian waste management, the organizational background and the most recent documents describing policy measures that have been analysed to understand the governement’s approach to energy recovery options. Though the research objective was to analyse waste management policy, as energy recovery does coincide with energy policies, the assessment of the National Energy Strategy was needed to answer the research question. In order to synthetize the findings of the previous chapter, a theoretical framework will be applied. As mentioned in the Methodology part, policy analysis is closely related to planning processes, therefore a theory in planning will guide me throughout the assessment of the result.

My analysis of the Hungarian waste incineration policy has been quite critical. One might raise the question what the ideal solution for waste management is in my opinion. The anwer, naturally, is not easily definable. The general approach for waste management is generally technological and experts come from the field of natural sciences and engineering.

From this perspective, the problem appears to be well-defined and assumes that the problems are stable in a relatively short-term, therefore waste management is a ‘tame’ problem (Ritchey 2011, 19-20). However, technology is also a „cultural categor[y] that train us to think about our socio-ecological realities in particular ways” (Hornborg 2009, 239). Where lots of people work on a specific set of complex problems within organizations such as institutions, goverments, corporations where many stakeholders are involved, the decision-making and problem solving are much more difficult (Conklin and Weil 2007, 4). Public-policy planning issues have long ago been defined as inherently ’wicked problems’ (Rittel and Webber 1973). They are distinguished from problems which have definable and findable solutions, because “they rely upon elusive political judgement for resolution” and are never solved, but re-solved (*ibid*, 160).

I argue that waste management is a wicked problem, as well as it also includes wide range of stakeholders and is a public policy issue. Environmental problems e.g. pollution, land degradation, like policy issues, are usually described as wicked, mostly because of their interconnectedness to various fields within and between natural and social sciences. Some issues, for example climate change is desrcibed as a super wicked problem “because of its even further exacerbating features” (Lazarus 2009, 1160). Waste issues could be easily defined as super wicked, too, but I am perfectly satisfied with the original term coined by Rittel and Webber. The authors of ‘Dilemmas in a General Theory of Planning’ distinguished ten properties of wicked problems. While presenting the propositions, I will connect them to the topic and results of my research. My intention in doing so is to justify why I consider waste management (and specifically energy recovery of waste) a wicked problem and to provide my findings and conclusion a theoretical framework.

1. There is no definitive formulation of a wicked problem (p.161)

According to the authors, the way a problem is described already reflects how one wishes to solve it. “The process of formulating the problem and of conceiving a solution (or re-solution) are identical, since every specification of the problem is a specification of the direction in which a treatment is considered” (*ibid*). As there are usually more solutions to a problem, there are many definitions of a problem, as well. In our case if the problem is too many waste going to landfill, then the solution can be anything that diverts waste from

landfills, even waste incineration. If the problem is too many waste generated, then solution would be anything that motivates prevention. Or the problem could be not enough recycling. However, waste incineration is a rather simple and fast solution to reduce the amount of waste going to landfills untreated (compared to recycling where collection systems have to be developed, people educated, waste sorted, etc.). Due to the fact that problem definition and solution are concomintant, it is difficult to decide which came first: was the problem ill-defined from the beginning or was it described in a way to serve the solution? One can only guess.

Furthermore, to determine where does one problem end and another start is complicated, as well. Energy recovery could be approached from both a waste management and energy perspective. From the energy sector's point of view the problem can be the low rate of renewables, high dependency of imports or cost efficiency. If there is a technology that already produces energy while taking care of the waste problem, the solution seems obvious and convenient.

2. Wicked problems have no stopping rule (p.162)

Because problem definitions and solutions are endless and interact with other systems, there will always be a better option the planner never thought of. Policy and planning problems are never solved, only a decision is being made for the time being.

3. Solutions to wicked problems are not true-or-false, but good-or-bad (p. 162)

How one sees the solution depends on their interests, value-sets or ideologies. Therefore, there are always debates around public policies and it is difficult to find answers that will satisfy everyone. Including as many stakeholders and citizens as possible from different fields is crucial, because in many cases, engagement is also part of the solution (Australian Public Service Commission 2007, 27).

4. There is no immediate and no ultimate test of a solution to a wicked problem (p. 163)

In policy settings you do not have laboratories to do experiments until you find the perfect "compound". "[A]ny solution, after being implemented, will generate waves of consequences over an extended – virtually an unbounded – period of time" (*ibid*).

Furthermore, it is not possible to foresee all consequences nor determine them afterwards. Nevertheless, there are ways to minimize them for example with feasibility studies or by learning from other cases.

GAIA made a report in 2013 on incineration overcapacities over Europe. The report has found that some Member States already have overcapacities, but capacity is still expected to grow (Jofra Sora 2013). WFD allows waste shipment across countries except for disposal. Hungary already imports waste to burn at power plants from Italy and Slovenia. Overcapacity has high impacts on recycling and waste prices as investments on incinerations must be paid back and can be done by feeding them with waste (diversion from recycling and prevention) or by increasing waste charges paid by households and commercial activities (*ibid*, 14). The synthesis report by the European Environment Agency also states overcapacity to be competitive to recycling which makes moving up the waste hierarchy challenging (EEA 2015, 91). Once the capacities are built, they have to be used throughout their lifetime – around 20 years – to be able to pay the money put in their investments, called the lock-in effect.

It is also important to understand that incineration does not solve the landfill problem. Although through the operation the original waste amount reduces to the third, the rest still needs to be landfilled. Though "additional investments to further increase regional waste incineration capacity could alleviate the need for waste landfills" (Wilts et al., II). Predicting the future for Hungarian overcapacities is difficult, but case studies could be used as lessons showing results and trends in other countries in Europe.

5. Every solution to a wicked problem is a "one-shot operation"; because there is no opportunity to learn by trial-and-error, every attempt counts significantly (p. 163)

Proposition 4 leads to the fact that every decision is a one-shot operation. Furthermore, "every attempt to reverse a decision and or to correct for the undesired consequences poses another set of wicked problems, which are in a turn subject to the same dilemmas" (Rittel and Webber 1973, 163). Let me introduce some of the consequences waste incineration poses and have been identified. (To list and detail all of them is outside the scope of this

thesis, however a few ideas are necessary to understand the opposition towards waste incineration.)

One of the problems most researched is air pollution. An incineration with a capacity of 100.000 tons emits 70 000 m^3 of flue gas in every hour (Szuhi 2008, 10). However, liquid and solid wastes are produced, as well. The former includes scrubber water (from air pollution control equipment) and the latter fly and bottom ash (filter cake) that is later landfilled (Tangri 2003, 9). Pollutants are dioxins and furans, heavy metals (e.g. lead, cadmium, mercury), particulate matters, other halogenated hydrocarbons, acid gases and greenhouse gases, just to mention a few. Human health impacts caused by the abovementioned pollutants are summarized in a report made by Greenpeace called 'Incineration And Human Health' (Allsopp et al. 2001).

Adequate – and expensive – equipment is needed to reduce emmissions to air. Nontheless, pollutants form during incineration, but now concentrate in the fly ash making them more hazardous, thus requiring further treatment. The problem is therefore not solved, but moved from air to land (and landfills do leak and pollutants are released back to the air). Monitoring of emmissions are not continuous, either, underestimating the real numbers. The other problem is the assumption that "there are acceptable emissions levels for all the pollutants released by incinerators" (Tangri 2003, 19).

Incineration is the most expensive waste treatment option (including both building and operation) and they produce less job opportunities per ton of waste than other alternatives (*ibid*). "Cheap" incinerators mean that equipments to filter and monitor pollutants are missing. Investments usually come from public money or EU funds, but private companies operate the incinerators (Szuhi 2008). If the incinerator is producing energy, the municipality is obliged to accept the generated power with a higher price compared to the market – and usually the state pays for the difference (*ibid*). At the end, the costs are to be paid by the citizens.

Thermal treatment of waste is renewable energy source – according to the Hungarian government. There are waste to energy plants all over the world providing energy and heat. However, it is debatable whether more energy is gained from the operation as lost. Looking

only at the technology, it is known that auxiliary fuel is used to reach the standard temperature required (over 850 °C do dioxins break down). Furthermore, waste is not considered as a fuel with high calorific value. In a standard WtE plant maximum 35% of the calorific value of waste can be recovered to electric power which can be increased to 40% when linked to district heating system (Tangri 2003, 32). In the case of mixed municipal waste components of low or no calorific value (glass, metal, organics) are burned, as well. Think about all the energy wasted to half-melt metals or to burn organics with high water content (energy is needed to vaporize the water)! Moreover, life cycle assessments show that the energy that can be recovered are far less than the "embodied energy" a product represents (extraction and procession of raw materials, production, transportation) (*ibid*). Thus, recycling saves more energy than energy recovery produces, meaning that waste to energy is more like "waste of energy".

6. Wicked problems do not have an enumerable (or an exhaustivetly describable) set of potential solutions, nor there is a well-described set of permissible operations that may be incorporated into the plan (p. 164)

Mentioned already in Proposition 1 and 2 the possible solutions are unlimited. It depends on the decision-makers' judgement which solution should be implemented or whether to look for new options. Even within waste incineration there are more technologies depending on the waste source (mixed or RDF), places to burn them (MSWI, power plant, cement kiln) and utilization (co-incineration, electric and heat energy recovery). In the operational programs or OHT there are no specifics set regarding operations within recovery showing that possibilities are still left open.

7. Every wicked problem is essentially unique (p.164)

They are unique, because there may be similarities in the problem definition, the circumstances are never the same, requiring different solutions. Case studies can be helpful, but one must also keep in mind that solution that seem to be or not to be working will not necessarily be true for other cases.

8. Every wicked problem can be considered to be a sympton of another problem (p. 165)

The problem formulation could become broader and more general when going into the details of the definition. Finding the "real problem" is difficult, but later consequences can be avoided if not only the symptoms are cured. The waste hierarchy follows this principle by putting prevention on the top. "If […] the problem is attacked on too low a level (an increment), then success of resolution may result in making things worse, because it may become more difficult to deal with the higher problems" (Rittel and Webber 1973, 165). Waste incineration deals only with the waste already generated (end-of-pipe solution) not promoting their reduction – on the contrary.

9. The existence of a discrepancy representing a wicked problem can be explained in numerous ways. The choice of explanation determines the nature of the problem's resolution (p. 166).

Every decision can be explained in a way that suits the decision-maker best. In comparison to sciences, reasoning and argumentation is much more permissible when dealing with wicked problems. For instance, in the case of packaging waste in OHT we could see the argument made for co-incineration and RDF due to the amount of contaminated waste that cannot be recycled. However, the problem could have been defined in a way that explains that citizens are still not familiar with selective collection, the system is not clean enough, etc. Though implementation of a new system takes time, the opportunity for improvement should be given before "giving up" on it. In the beginning the amount of non-recyclables may increase. However, if money is put into education, people would learn with time which waste can be put into which container – and which packaging to avoid. Instead of investing into a system (incineration) that destroys resources, the rate of recycling would increase.

The definitions used by the Hungarian government are misleading and/or incorrect supporting their argumentation. Calling the municipal waste incinerator in Budapest *"Hulladékhasznosító Mű"* (that is waste recovery plant) tricks the public. In Hungarian people use the term *újrahasznosítás* (recovery) for recycling, reuse and any other actions that is somehow connected to waste and its saving from dumping in everyday context. Even experts in waste management prefer to use the word *újrahasznosítás* for recycling when the official term would be *újrafeldolgozás*. Although citizens know that waste is being incinerated at HUHA and technically the name is correct as energy and heat is

recovered there, we can say that it certainly has a better ring to it than ‘waste incinerator’ making the idea sound more positive. (The plant started operation in 1982, but flue gas filter equipments were added only in 2002.)

Waste is not a renewable energy source no matter what the Hungarian government states. Explaining that by burning waste we solve energy and waste problems is a wrong approach. As explained in the earlier section, it is not a favorable solution for waste management. In a short term waste as an energy source may seem feasible, but only as long as waste is relatively cheap. As soon as resources become so scarce that even stakeholders realize that keeping them in a circle i.e. recycling should be priority, energy recovery will loose its position. Nonetheless, if people start to think about waste as renewable source (especially if it will be teached at schools as such), they will not oppose incineration after a time.

10. The planner has no right to be wrong (p. 166)

Every decision made determines the future. In the case of wicked problems the consequences are even more severe, especially if a government makes that decision as the number of people affected are greater. Decision-makers usually have to work with time constraints and in many cases the available money is also limited. However, it is no excuse to make the wrong decisions. On the contrary, the necessary time should be taken to properly define the problem, map the solutions and involve stakeholders, experts and citizens. Furthermore, with a new EU funding period (OP 2014-2020) a huge opportunity is given to invest in a more sustainable future. Hopefully, the money will be allocated to the right places.

Alternatives to incineration already exist. A new approach in waste management has spread called ‘zero waste’. Zero Waste is a philosophy, a strategy, and a set of practical tools seeking to eliminate waste, not manage it.[5] The definition of Zero Waste International Alliance:

> Zero Waste is a goal that is both pragmatic and visionary, to guide people to emulate sustainable natural cycles, where all discarded materials are resources for others to use. Zero Waste means designing and managing products and processes to reduce the

[5] http://www.zerowasteeurope.eu/about/principles-zw-europe/

> volume and toxicity of waste and materials, conserve and recover all resources, and not burn or bury them. Implementing Zero Waste will eliminate all discharges to land, water, or air that may be a threat to planetary, human, animal or plant health.[6]

The idea behind zero waste is a cultural change from linear economic thinking to a more sustainable one where citizens can actively engage through communities and waste infrastructure represents the highest levels of the hierarchy: prevention, separate collection and reduction of residual waste. To achieve zero waste, a more holistic approach is needed that goes beyond waste management and empowers people. Luckily, there are already case studies all over the world showing that the concept is not only dream, but reality (http://www.zerowasteeurope.eu/case-studies/; http://zwia.org/zero-waste-business-2/case_studies/).

Conclusion

The "rumours" that were brought to the attention of Humusz about new waste incineration facilities or solutions and the overall advancement of thermal recovery of waste appear to be true. Hard evidence could not be found in the official documents analysed in my research to come to any conclusions decidedly. Nevertheless, the trends and especially the exceptional use of terms by the government indicate that in Hungarian waste management waste incineration will have a special place. I would like to add that even during my time of analysis more information came to the attention of Humusz confirming that new policies are being drafted to further support energy recovery. Unfortunately, as these documents are only drafts and thus not official, could not be used to my research. However, I believe that I could gather enough evidence to demonstrate my thesis.

The National Waste Management Plan turned out to be more of a set of data and statistics than an actual plan. No specifics could be found regarding treatment options and the term 'recovery' was misused in many occasions. In the case of packaging waste further advancement of co-incineration of non-recyclables is projected. On the other hand, the National Collection and Recovery Plan of 2015 provides more information. As it contains the

[6] http://zwia.org/standards/zw-definition/

rates of different waste streams generation and recovery together with the financial plan, the OGyHT reflects the government's intention regarding waste management. The numbers show that in the case of paper packaging waste the incentives for sorting (that is sorting out non-recyclables from waste already collected separately) are higher than collection and recovery (in this case: recycling). Due to the fact that the fractions sorted out are suitable for alternative fuel (RDF) production, with the incentive huge amount of refuse derived fuel for co-incineration is anticipated.

Operational Programmes KEHOP and TOP were analysed afterwards. In the case of priority area 3 (waste management and remediation) in KEHOP, we see that development of collection and sorting systems is expected. However, priority area 5 (increase of energy efficiency and the use of renewable energy sources) held more information regarding energy recovery. Together with a presentation from a conference on *Thermal Recovery of Waste* the plan to establish a second waste incinerator in Budapest to burn sewage sludge and municipal waste to generate energy for district heating was confirmed. In TOP "municipalities are given the opportunity for thermal recovery of wastes and to treat residuals and mixed waste with incineration" (TOP, 84 and 190). RDF will be produced in sorting facilities for co-incineration.

The idea of waste being a renewable energy source first appears in a table in KEHOP, but here it is only idicated. Hungary's National Energy Strategy 2030 is the documents where this notion occurs repeatedly. Development of WtE facilities are listed under renewable energy sources throughout the strategy meaning that the government will invest in waste incineration in the future (increase of renewables is a priority in OPs).

To demonstrate why I find the trends alarming, I introduced the theory of wicked problems. Wicked problems are public policy planning issues with certain characteristics. For example their definition is ambiguous as it is closely connected to solution formulation, they are only a one-shot operation with no possibilities to test their solutions, are a symptom of another problem and they always bring unpredictable consequences. Waste incineration is a wicked problem, as well, therefore decision-makers ought to be particularly prudent. There are already studies available indicating the negative environmental, social and economic implications of incineration that should be taken into consideration when campaigning for

waste as a renewable energy source. Waste is mostly produced from non-renewable sources and though it is constantly generated that does not make it any more renewable. Energy efficiency can only be reached by saving through sustainable production, waste prevention, reuse and recycling. Zero waste is a new philosophy providing truly sustainable framework for waste management.

Throughout my thesis I applied a human ecological framework to be able to approach the topic from a holistic perspective. Critical thought was necessary to find the connections between the two "different" fields waste management and energy sector represent (different and unconnected for non-human ecologists). I believe that I found the critical points in Hungarian waste incineration policies and demonstrated that policy analysis is a useful tool in social sciences, as well. Policy analysis is relevant in human ecology to understand why certain decisions are made and how they effect our future. To power ourselves againt wrong decisions, information is needed. As a result of my research, Humusz and any other organization interested in the topic have now the necessary information to take the next step to ensure that waste management in Hungary will stay on its right course.

All Hungarian texts were translated by the author

Abbreviations

EEA – European Environment Agency

EEB - European Environmental Bureau

EPR – Extended Producer Responsibility

EU – European Union

EWC - European Waste Catalogue

GAIA - Global Alliance for Incineration Alternatives/Global Anti Incineration Alliance

GINOP – Gazdaságfejlesztési és Innovációs Operatív Program (Hungarian, Economic Development and Innovation Operational Programme)

HUHA – Fővárosi Hulladékhasznosító Mű (Hungarian, the name of the municipal solid waste incinerators of Budapest)

IPPC – Integrated Pollution and Prevention Control

KEHOP – Környezeti és Energiahatékonysági Operatív Program (Hungarian, Environment and Energy Efficiency Operational Programme)

KSZGYSZ – Környezetvédelmi Szolgáltatók és Gyártók Szövetsége (Hungarian, union of environmental services and industry)

KvVM – Környezetvédelmi és Vízügyi Minisztérium (Hungarian, former Ministry of Environment and Water)

LCA – Life Cycle Assessment

MBT – Mechanical Biological Treatment

MSW – Municipal Solid Waste

NES – Nemzeti Energiastratégia (Hungarian, National Energy Strategy)

OGyHT'15 – A 2015. évre vonatkozó Országos Gyűjtési és Hasznosítási Terv (Hungarian, National Collection and Recovery Plan for year 2015)

OHT – Országos Hulladékgazdálkodási Terv (Hungarian, National Waste Management Plan)

OHÜ – Országos Hulladékgazdálkodási Ügynökség (Hungarian, former National Waste Management Agency)

OKTF NHI – Országos Környezetvédelmi és Természetvédelmi Főfelügyelőség Nemzeti Hulladékgazdálkodási Igazgatóság (Hungarian, National Environmental and Nature Protection Inspectorate National Waste Management Directorate

OP – Operational Programme

RDF – Refuse Derived Fuel

TOP – Terület- és Településfejlesztési Operatív Program (Hungarian, Regional Development Operational Programme)

WFD – Waste Framework Directive

WtE – Waste to Energy

ZWE - Zero Waste Europe

ZWH 6 – Zero Waste Hierarchy of Higher and Best Use 6.0

ZWIA – Zero Waste International Alliance

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