K. Veidemane
M. Lindert
I. Bremere

Organizational and management recommendations for future regional waste management in Macedonia

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Kristina Veidemane[1], Mark Lindert[2], Ingrida Bremere[1]

[1] Baltic Environmental Forum Latvia
[2] City of Dusseldorf, Germany

Organisational and management recommendations for future regional waste management in Macedonia

With a special focus on the South East Region

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Authors:

Kristina Veidemane
Senior Environmental Expert
Ingrida Bremere
Senior Environmental Expert
Baltic Environmental Forum Latvia

Contact: kristina.veidemane@bef.lv

Dr. Mark Lindert
Head of Waste Management Section

Environmental Office
City of Düsseldorf
Contact: mark.lindert@duesseldorf.de

Project Management and local project coordinator in Macedonia

Philipp Engewald

Baltic Environmental Forum
Deutschland e. V.
Osterstr. 58
D-20259 Hamburg
Germany

Contact: philipp.engewald@bef-de.org

Kornelija Radovanović

Regional Environmental Center for Central
and Eastern Europe
Country Office Macedonia
Ul. Ilindenska 118
MK-1000 Skopje

Contact: kornelija@rec.org.mk

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List of Abbreviations

EU	European Union
NWMP	National Waste Management Plan
PPP	Public-private partnership

Executive summary

Since several years, the local government is intensively working in close cooperation with the Ministry of the Environment and Physical Planning to establish a regional waste management system in the Republic of Macedonia. The aim is to create sustainable structures which ensure reaching waste management policy targets of the European Union (EU) and the national level in the most efficient way.

These recommendations are the final output of a small-scale assistance project “Strengthening waste management planning at regional level in Macedonia” which was financially supported by the German Ministry for the Environment, Nature Conservation, and Nuclear Safety together with the Federal Environment Agency with funds from the Advisory Assistance Programme for the Countries of Central and Eastern Europe, the Caucasus and Central Asia. The objectives of this paper is to highlight the key organisational and managerial aspects to be considered in coming months of 2010 when the key decision on regional waste management systems have to be taken jointly by the government and municipalities.

The recommendations cover such aspects as the establishment of a regional waste management system, including landfilling and waste collection. In the long-term the municipalities of the Republic of Macedonia will close all existing dump-sites and landfills, consequently, the recommendations address also this issue. Furthermore, the paper addresses the separate waste collection needs and particularly the handling of biodegradable waste as it is a priority waste stream with growing political attention in recent years in the EU. Although the development of waste recycling capacities is not the primary task for municipalities, the issue is relevant with regard to the establishment of the separate waste collection system. Therefore, the recommendations briefly touch this waste management aspect too.

Finally, the paper presents conclusions emphasising the need to take a step by step approach in building a new system. The potential role of the existing waste management companies in the conditions when the landfilling will be contracted to a foreign company with required capacities is also indicated. In future, it is also important to streamline the cooperation between the municipalities and the Ministry of the Environment and Physical Planning towards partnership in the implementation of the waste management system.

Introduction

Since several years, the local government is intensively working in close cooperation with the Ministry of the Environment and Physical Planning to establish a regional waste management system in the Republic of Macedonia. The aim is to create sustainable structures which ensure reaching the waste management policy targets of the EU and of the national level in the most efficient way.

This process, however is resource and time demanding considering the current status of the development of the country and the status of the environmental protection, in particular. The national government has undertaken strategic planning efforts by elaborating the National Waste Management Strategy 2008-2020 and the National Waste Management Plan 2009-2015 (*further in the text* -NWMP). Now, the relevant infrastructure needs to be set up regionally and locally. Public-private partnership (PPP) is one of the possible approaches in the present financial conditions. As stated in the Communication of the European Commission (19/11/2009), the proper use of public-private partnerships will support to meet existing and future needs for investment in public services, infrastructure and research in Europe.

Having regard for the limited experience of the country and acknowledging the established contacts between German, Latvian and Macedonian waste experts, managers and municipal representatives, a small size and short term assistance project was launched with the financial support of the German Federal Ministry for the Environment, Nature Conservation, and Nuclear Safety and the Federal Environment Agency. The project called as “Strengthening waste management planning at regional level in Macedonia” was implemented in December 2009 – September 2010.

During the project time the foreign experts visited the South-East Region[1] of the Republic of Macedonia twice. They had meetings with the Ministry of Environment and Physical Planning as well as with representatives of the relevant municipalities. The Latvian and German experts shared their knowledge on waste management practices and discussed the options for the development of a regional waste management system in the South-East Region of the country.

These recommendations are the output of this small-scale assistance project. It is the objective of this document to highlight the key organisational and management aspects to be considered in coming months of 2010 when the key decision on regional waste management systems have to be taken jointly by the government and municipalities of the Republic of Macedonia.

As the South-East Region is a pilot region where the approach of public-private partnership is explored in the country for the first time, the recommendations are largely considering the directions of the national waste policy as well as specifics and conditions of this region.

[1] When speaking about regions, it should be noted, that the current political system of Macedonia does not have regions as intermediate political entities between the national and local levels. Regions are created only for statistical purposes and have been used also with regard to organizing the waste management in the country. There is however, no legislative or executive political body that would be involved on behalf of the municipalities that are part of a statistical region.

Relevant waste policy issues in the EU and the Republic of Macedonia

European waste management policy has been evolving over the decades and it started in the 1970's with setting the general legal framework to ensure environmentally sound waste management. Although the attention was on setting up a waste management system and to establish permitting and control of waste, the first Directive on Waste (75/442/EC, Article 3) already stated that the EU Member States shall encourage the prevention, recycling and processing of waste, the extraction of raw materials and possibly of energy there from and any other process for the re-use of waste. The EU waste policy in the 1970's already stressed as well the need to reduce quantities of waste generated by economy and households. However, until now, it has not been so successful in all countries (see Fig. 1 below).

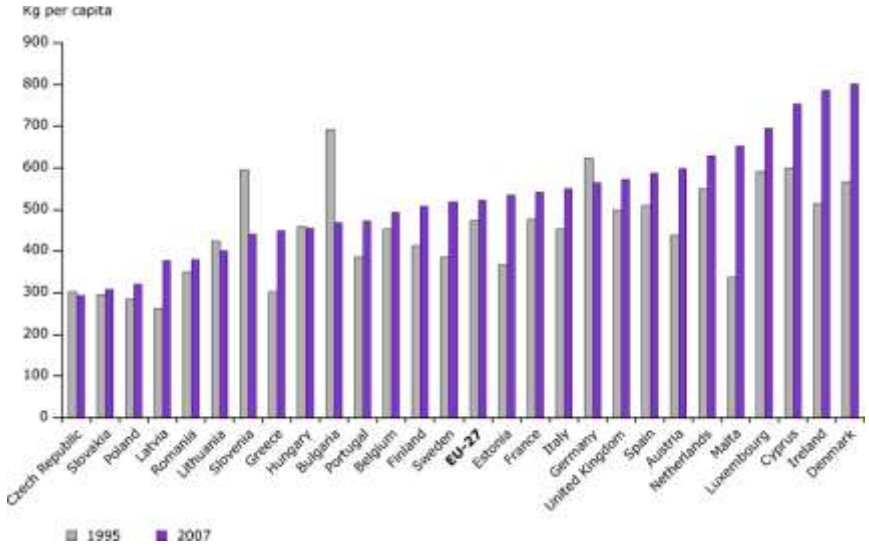


Fig. 1: Generation of municipal waste, 1995 and 2007 (Source: European Environment Agency, http://www.eea.europa.eu/data-and-maps/figures/generation-of-municipal-waste-in-the-eu-27-1995-and-2007www.eea.eu).

To strengthen the waste prevention, reuse and recycling, the Directive (94/62/EC) on Packaging and Packaging Waste was adopted in 1994. The Directive introduced the principle of the producer responsibility to minimise the environmental impact of packaging or similar actions adopted, if appropriate in consultation with economic operators. Moreover, the requirement to achieve recycling and recovery targets in a given time scale are mentioned there. This means that less waste shall be disposed at landfills.

Another Directive (1999/31/EC) adopted five years later requires the reduction of the amount of biodegradable waste going to a landfill significantly. Hence, the overall objective of the Directive was to prevent or reduce as far as possible negative effects on environment by introducing stringent operational and technical measures on the waste and landfills. Furthermore, the Directive requires that the waste must be treated before being landfilled.
The new Waste Framework Directive (2008/98/EC) clarifies waste concepts, specifies the waste hierarchy, the extended producers' responsibility and the polluter pays principles. A demand for separate waste collection systems has been endorsed as part of the overall system. The EU Member States shall set up separate waste collection systems for paper, metal, glass and plastic by 2015. This shall cover larger amounts of the waste compared to the treatment of the

packaging waste streams. These four waste streams shall be reused and recycled up to a minimum of overall 50% by weight. Another re-use, recycling and other material recovery target of 70% of generated waste shall be achieved for non-hazardous demolition and construction waste.

The Directive introduces the requirement for national waste prevention programmes to be established by 12 December, 2013. Now, the countries have to specify which measures will be taken and the indicators to monitor the progress shall be identified too.

In the Republic of Macedonia, objectives, principles and tasks of the above mentioned Directives have been integrated largely into the National Waste Management Strategy 2008-2020 and National Waste Management Plan 2009-2015. The transposition of EU legislation into national laws is an ongoing process and lead by the Ministry of the Environment and Physical Planning. The Law on Waste Management is the national umbrella law which provides general rules applying to the following issues: definitions and applicability of types of waste, strategy, formulation of plans and programmes at different levels; waste management procedures and issuing of permits; landfills; incineration and co-incineration of waste, import, export and transit of waste; monitoring, reporting, and data management; supervision of competent authorities, as well as punitive provisions.
The adoption of EU waste management targets on reuse, recovery and recycling is planned to happen only in the long-term, since many of the targets are scheduled beyond 2015. Currently, no ambitious recycling targets are set and the focus is rather on the establishment of a proper collection system to avoid illegal dumping and to encourage and ensure safe waste disposal. However, during the workshops held in the frame of the project, the representative of the Ministry of the Environment and Physical planning mentioned that the discussion on recycling and recovery targets recently started at the policy making levels.

Considering that the establishment of waste infrastructure takes time, the NWMP aims to achieve the compliance of landfilling requirements for 50% of municipal waste by 2014. In numbers, it is envisaged that two new landfills would be constructed and that the landfill “Drisla” in the capital Skopje would be upgraded. In total, there are five waste management regions including landfills planned to be established in the country. A division into six or even eight regions is still possible and subject to the further development process. The actual number is dependent on which municipalities will eventually cooperate with each other.

Municipal waste generation and collection in the Republic of Macedonia

Data on municipal waste generation has been presented in the NWMP. Since there are no weighing bridges and the recording of waste is only undertaken at the landfill in Skopje, the given amount of 253-313 kg/capita per year shall be treated rather as estimation than as actual volume available for waste collection, hence, disposal. A recent study [2] indicates that the South-East Region would generate about 40 000 tones/year or ca. 234 kg/capita in 2011.
A similar situation could be observed also in Latvia in the middle of the 1990s. The estimated figure of waste generated in the country was about 220-250 kg/capita per year[3]. The statistics were rather based on recorded numbers of trucks entering a landfill and counting their respective capacity. The actual measurements of the waste disposed at landfills were undertaken when new landfills were constructed and opened. The first new regional landfills and regional waste collection services started their operation in 2004. In 2006, the waste amounts increased to 411 kg/capita which were about 60% more than 10 years earlier. Due to the economic crises in 2008-2009, it reduced to 330 kg/capita per year. According to Eurostat data, even the peak was still far below the average level in the EU– which is around 520 kg/capita.

The waste composition is essential to plan and to develop waste treatment options. Depending on lifestyle habits and economic welfare, the share of different types of waste might vary. In Latvia, the share of packaging waste (particularly plastic) increased with the introduction of habits of packaging food as well as due to an increasing potential of larger portions of the population to purchase more new goods. The share of waste packaging is also increasing in the old Member states (see Fig. 2 below).

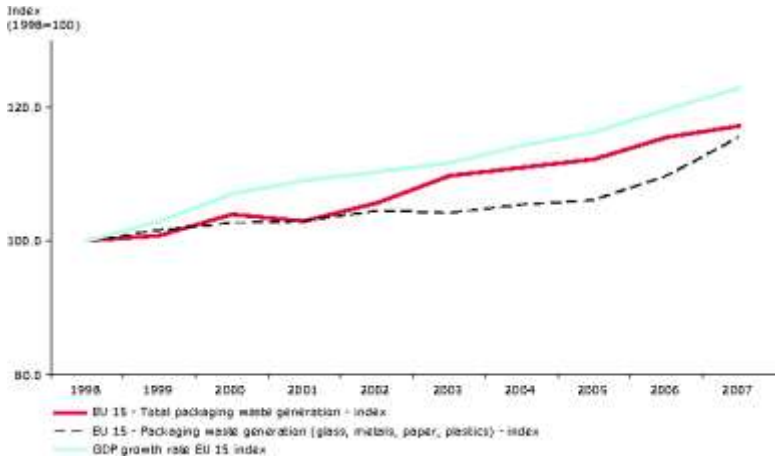


Fig. 2: Generation of the packaging waste in EU (Source: European Environment Agency, www.eea.eu).

[2] Ministry of the Environment and Physical Planning of the Republic of Macedonia, February, 2009. Study on issuing concession for regional integrated solid waste management in the South-eastern planning region in The Republic of Macedonia

[3] Baltic Environmental forum, 1998. Baltic State of the Environment Report, Riga.

Table 1: Estimated composition of municipal waste in Macedonia, 2005 and comparison with Latvian collected (incl. separated) municipal waste in Latvia, 2008 (source: NWMP and Latvian Environment Agency)

Classification number	Type of waste	Macedonia: Estimated quantity (t/year)	(%)	Latvia: Collected and reported quantity (t/year)	(%)
20 01 /2 0 02	Biodegradable (organic) waste	148,819	26.0	16,207	1.54
20 01 01	Paper and cardboard	68,113	11.9	33,573	3.18
20 01 02	Glass	20,033	3.5	7,109	0.67
20 01 11	Textiles	16,599	2.9	16	0
20 01 38	Wood	15,454	2.7	4,014	0.38
20 01 39	Plastics	54,949	9.6	6,972	0.66
20 01 40	Metals	14,882	2.6	*	0
15	Separately collected Packaging waste			263,933	25.03
15 01 05	Composite packaging	12,592	2.2		0
	Other waste (complex products, inert material, other categories)	42,929	7.5	8,611	0.82
20 01	Hazardous household waste	1,145	0.2	1,847	0.18
200307	Bulky waste			36,776	3.49
20 01/02/03	Fine mixed particles (< 10 mm)	176,866	30.9	675,444 (Mixed waste)	64.05
Total MSW		**572.381**	100,0	997 613.00	100

* Not counted seperately

In Latvia, biodegradable waste separation is not yet well developed. Therefore the share of this waste stream is very small in the overall waste balance. According to estimations, in Latvia about 70% of generated non-hazardous waste is biodegradable waste.

RECOMMENDATION

The actually collected **waste amount increases** when setting up a new municipal waste management system which covers the waste collection service for the whole region. Other factors influencing the increase in generated municipal waste amounts are economic development, demographic trend, and waste handling habits in rural areas. This increasing trend needs to be seriously considered when estimating the equipment needs for a collection system (containers and trucks).

The increasing trend might also lead to a **substantial surplus** amount of waste disposed of in the several local dump-sites. On the other hand the waste undergoing treatment resulting in recovery or recycling will lead to **less waste to be disposed** in landfills in the future.

Development of a regional waste management system

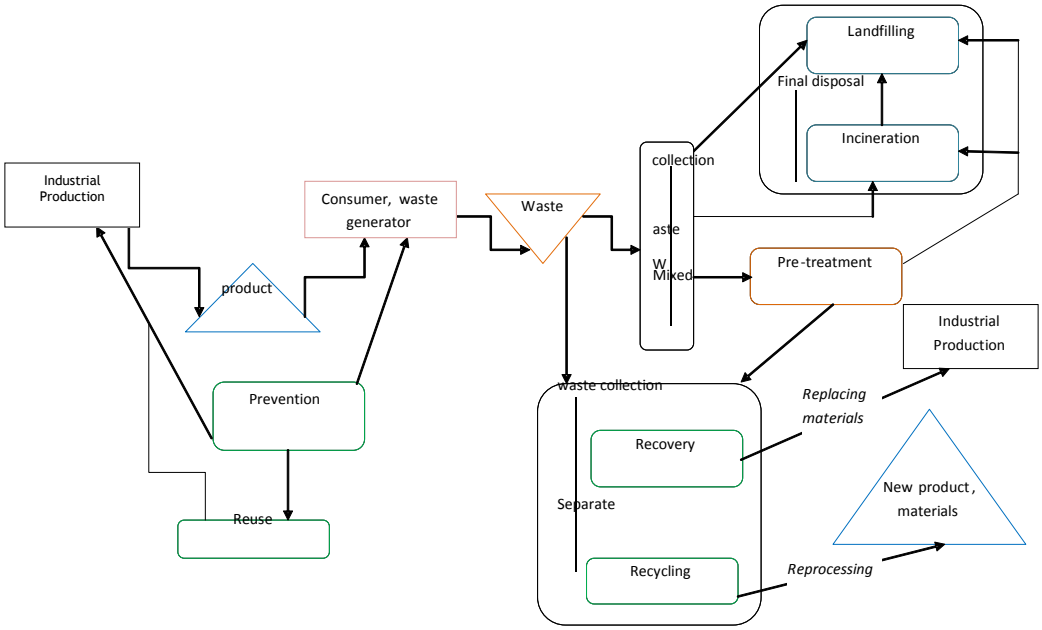
The concept of the regional waste management system was introduced by the NWMP of the Republic of Macedonia. Due to the high costs of an environmentally sound waste management, the regional instead of local approach to municipal waste management is preferred in the majority of EU Member States. However, components and responsibilities vary between the regional systems in the EU (see Fig. 3). The area and number of inhabitants served by the regional system differs as well. In Latvia, the Latvian Waste Management Plan defines the regions, which vary from 60-800 thousand inhabitants depending on population density and location of larger towns. In Germany the number is up to few millions of inhabitants. For example, the Waste Management Plan for Dusseldorf's region (2004) serves for 5.3 million inhabitants.

The prevention which is the most preferred operation in the waste management hierarchy is aiming at the implementation of the measures that promote that materials or products do not become waste. One of these measures is to re-use products or to use components that are not waste again for the same purpose for which they were conceived. These waste management approaches are important to be taken in the same way on national level. For example, glass bottles shall be taken back in any supermarket all over the country.

A need for cooperation is also important for the implementation of recycling and recovery operations in a cost-effective way. In addition to having demand for recyclable waste (plastic, paper, glass), there is a need to have sufficient amounts of such wastes to organise separate waste collection. The transportation costs also play a key role in the profitability of the system, thus, the routing of the separate waste sorting and collection sites has to be planned carefully.

A similar approach is also to be taken regarding disposal operations (mainly lanfilling or incineration). The construction and maintenance of an environmental sound waste incinerator or landfill is calculated in million euros. Regardless of which final disposal option is chosen, only large cities having enough amounts of waste can ensure cost recovery of the system which requires several millions of investments.[4] Hence, a regional approach is essential in the biggest part of the country.

[4] Eunomia Research & Consulting, 2001. Costs for Municipal Waste Management in the EU. Final Report to Directorate General Environment, European Commission



Picture 3. Waste management system (author: K.Veidemane).
Fig. 3: Waste management system

Waste landfilling and pre-treatment

The landfilling of waste is considered as the least preferred waste management option in the waste management hierarchy. In Europe, it is emphasised that all efforts shall be taken to reduce waste going to landfills. However, the practise is not so straightforward in many EU countries, particularly in new Member States where the majority of waste amounts are landfilled (see Fig. 4 below).

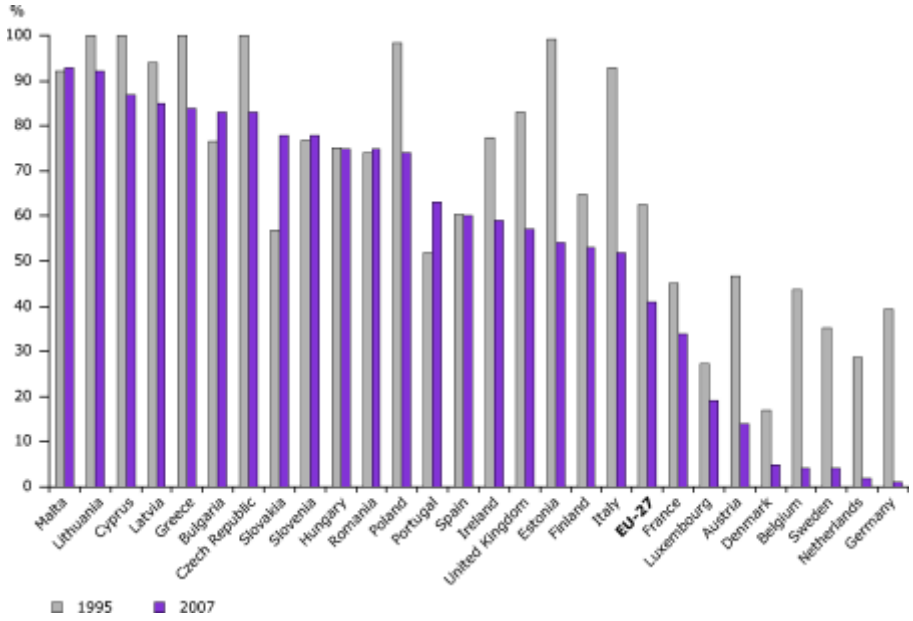


Fig. 4: Percentage of municipal waste that is landfilled in the EU-27, 1995 and 2007 (Source: European Environment Agency, http://www.eea.europa.eu/data-and-maps/figures/percentage-of-municipal-waste-that-is-landfilled-in-the-eu-27-1995-and-2007)

Building a new landfill is a time and resource consuming process. From site selection until opening the landfill, it takes about 6-7 years, provided there are no specific obstacles. One of the criteria for a suitable location of a landfill is to find a space/area which would satisfy the need for deposition for about 25-30 years. A typical landfill has several deposition cells and each of them can be used for 7-10 years.

The technical standards are defined in the EC Directive on Landfills (1999/31/EC) and the following elements must be set up at a municipal landfill:

- Control the water and leachate from the body of the landfill;
- Protect the water and soil by a combination of geological barrier and bottom liner;
- Treatment of contaminated water and leachate;
- Control the accumulation and migration of the landfill gas;
- Collection, treatment and use of landfill gas;
- Measures against nuisances and hazards (e.g. emission of odours and dust);
- Fences, barriers and lockable gate to prevent free access;
- Access road;
- Receiving, measuring and inspecting the waste at the entrance gate;
- Administrative building;
- Workshops for maintaining equipment and vehicles (optional);
- Facility for washing vehicles and containers (optional).

Table 2: Costs for constructing a regional landfill in Latvia, 2009 (Source: Piejura regional waste management project).

No	Position	Total, EUR
1.	Outline and Technical design	355,373
2.	External Utilities (roads 1,2 km, comunications)	1,432,286
3.	Landfill cell 5,5 ha with leachate collection and purification system	1,056,937
4.	Inner roads and areas (incl. water supply, sewerage and storm water collection and purification system)	1,727,486
5.	Weighing bridge (18 m) including waste registration system	70,000
6.	Other (Fire fighting water basins, Landfill gas utilization system, Ancillary works, planting, fencing, monitoring system)	299,227
	TOTAL	4,941,309

Recommendation

As costs for the construction and managing of a landfill in an environmentally sound way is rather substantial, it is important to ensure that the waste is not illegally dumped in the inappropriate places or burnt at local spots once the landfill is in operation. Legal and enforcement measures shall be established on different levels as a precondition for successful landfilling.

The national legislation shall establish a provision, which ensures that as soon as the new regional landfill is opened all other dump-sites and landfills are closed. The bringing of waste to old and other 'wild' sites shall be forbidden by law and relevant penalties shall be set for those which violate the law.

As seen before in other countries, it is a crucial point to ensure law-enforcement on local or rural level to stop 'wild dumping', i.e. regular inspections must be carried out. The structures established on state level must ensure that an appropriate share of the turnover, e.g. of official landfill sites, are passed to the supervising authorities. This might be a share of special taxes, some licence fee for a concession, or other, so that they can perform their tasks.

After various treatment, recovery, and recycling processes the landfill is the unavoidable disposal option for the remaining part of generated waste or for waste residues. Therefore, the relevant waste recovery or disposal operator will have a smaller or larger amount of waste which must be disposed of at the landfill.

To save dump-site or future landfill volume, municipalities and rural districts should initiate recycling measures. Regarding the actual level of waste management, this should happen in a way of 'cherry-picking': In the first step this would be focussed on a few fractions of waste which can be

- treated with an efficient use of already available equipment, or low investment into new equipment, for example with front loaders and mobile crushers/screens,
- used as secondary material in the local surrounding (or can easily be sold everywhere).

Later it will be necessary to find appropriate solutions for handling

- Paper and packaging waste: collection, pre-sorting and recycling (either own recycling or export), for pre-sorting and storage own facilities are necessary; if a full recycling facility is not feasible in Macedonia, paper and packaging waste can be exported;
- Electronic scrap, i.e. collection and taking apart; this requires specialized facilities and specially trained personnel.

The last two steps require higher financial investments but are unavoidable in the long-run.

The first steps are suitable for materials like construction waste, metal scrap or garden/agricultural waste.

Mobile crushers are used in many countries to treat mineral construction and demolition waste on the site of deconstruction. The crushed minerals are usually sorted according to diameter of the pieces. They can be used as additional material in concrete or as rubble in various construction processes in the local area.

Collection and composting of garden and agricultural waste might be interesting for municipal waste management companies or for agricultural farming businesses either, just to produce fertilizer and "structure material" for the soil. Especially when bio waste/kitchen waste is excluded, composting is a relatively easy process that requires little space, a front loader, a mobile drum-screen and maintenance equipment. Here, too, it would be important to bring the municipalities or rural districts into a position that they are able to stop wild dumping or the "wild burning" of such waste.

The EU directive on the landfill of the waste (1999/31/EC) demands to carry out **treatment before landfilling** aiming at the reduction of the quantity of the waste to be disposed of or to reduce hazards to environment and human health. Treatment is defined as physical, thermal, chemical and biological processes, including sorting, that change the characteristics of waste in order to reduce its volume or hazardous nature, to facilitate its handling or to enhance recovery. One of the key driving forces to introduce different treatment technologies is a lack of space to build landfills and the costs related to the building of landfills. Moreover, the scarcity of resources is among the driving force at the European level to promote prevention and recycling instead of disposal.

Depending on the processes, treatment before landfilling can be classified as follows:

- **Mechanical-biological treatment**: a combination of mechanical processing with separation of high calorific fractions (called as "refuse derived fuel" to be used for incinerators) as well as the valuable material for material recycling and the biological treatment (decomposition, digestion) of the fine fraction;
- **Mechanical-biological stabilisation**: the entire waste stream is dried biologically before the mechanical processing (under use of the self-heating) and the organic components are reduced.
- **Mechanical-physical stabilisation**: mechanical processing with subsequent drying process (e.g. by means of drum dryer), here fossil fuels are used for the drying process.

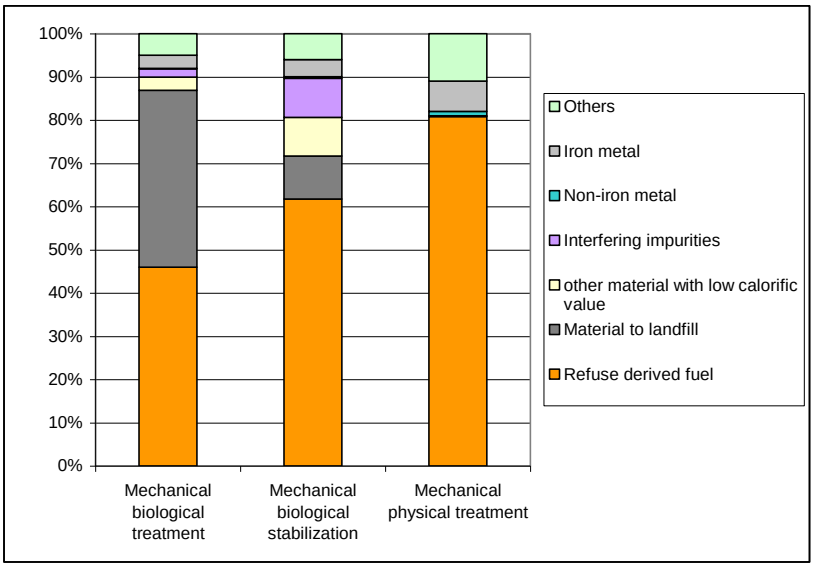


Fig. 5: Typical output of pre-treatment facilities in Germany. (Source: the German Advisory Council on the Environment, Report 2008; www.umweltrat.de).

In case of the smaller volumes of mixed waste, one of the cost-effective measures is to establish a mechanical pre-treatment facility either directly at the landfill site or at a transfer station where mixed waste is brought for treatment. Having equipment which is shredding and sorting waste according to fractions ensures that shares of 40% of recyclable materials and 30% of composting materials can be achieved, while only 30% go for final deposition to the landfill.

Fig. 6: Mechanical pre-treatment of the mixed municipal waste (Graph: A. Sirmais, Latvia)

In countries like Germany, where waste incinerators are available, the mechanical treatment is organised to sort out the biological fraction and high calorific fractions which can be incinerated. During this treatment, waste containing metal is separated as well.

Recommendation

To prolong the operational time of a landfill, it is important to install a pre-treatment facility for mixed and unsorted municipal waste. Such pre-treatment facilities reduce the amount of the waste to be deposited on the landfill to 30% of the initial amount. However, the efficiency of the sorting of the recyclables might not be sufficient to reach the new recovery targets of 50% for paper, plastic, glass and metal set by the EU Waste Framework Directive. Therefore, separate waste collection at the source of generation of these waste streams should be preferred.

The use of Mechanical-biological treatment leads to the generation of "refuse derived fuel" which must to be incinerated somewhere. Therefore, thermal capacity with appropriate exhaust-gas-cleaning is necessary. It must be stated that an expensive combination of technologies is necessary to achieve basic improvement of waste management in the Republic of Macedonia.

The EU policy on landfill management demands to collect, treat and **use landfill gas**. The requirement is imposed as one of climate change mitigation measures to reduce emissions of greenhouse gases such as methane (CH_4) and carbon dioxide (CO_2).
Since a landfill where biodegradable waste is disposed of is constantly generating gas it might be economically viable to set up an energy production facility at the landfill. Depending on the composition of the waste (share of biodegradables) and access to the electricity grid, the landfill gas can be used to produce electricity. Another option is to use the gas to generate heat for the administrative or waste sorting buildings as well as for the leachate treatment plant located by the landfill area. In many cases, the processes are combined in a heat and electricity production plant. The landfill gas is considered as alternative energy source and thus some countries have energy policies to pay higher fee to producers of such energy source. In Latvia, the investment payback period for landfill gas production to energy is 4-5 years.

Recommendation

Since EU technical standards on landfills demand to collect and use landfill gas, and provided that conditions are favourable, it is important to install a system which generates income to reduce the landfill disposal fee. However, before planning to install such equipment for gas treatment, it is important to **carefully calculate the capital costs and potential for income.** In Latvia, it has been beneficial to set up gas collection facilities due to a favourable electricity purchase price for such energy source due to the big share of biodegradable waste in the disposed waste amounts. While in Germany it is expensive, and the income from selling energy might cover only a minor share of the costs of the collection system.

Waste collection system

The aim of the waste collection system is to ensure the gathering of waste for the purpose of transport to a waste recovery or disposal facility. Traditionally the collection of the municipal waste has been a responsibility of municipalities. They shall ensure that the number and quality of equipment is sufficient in relation to the waste generated and they shall ensure participation of all stakeholders involved, e.g. waste generators, collection and treatment companies.

In order to establish a cost-effective waste collection service it is important to consider the following basic criteria which influence the fee to be paid by municipal waste generators:

Table 3: Criteria influencing the calculation of fees of municipal waste generators

Category	Positions
Logistics for collection	• Frequency of emptying of containers (daily to once per month) • Size and type of containers • Quality standards (e.g., need to clean the space around the containers)
Personnel costs	• Salaries for staff • Allocation to pension funds
Materials	• Fuel consumption • Amortisation, spare parts for containers, vehicles and other equipment
Administration costs (including inspecting/supervision by authorities)	• Managerial staff • Premises • Training of staff
Costs for public relations	• Information in media • Direct communications to customers • Information materials (printing and dissemination) to customers

The collection costs depend on the travelling distance from the waste source to the place of treatment. Therefore, it is more efficient to establish logistics which offer higher flexibility in route planning.

To motivate people to become a part of the waste collection system, it is important to provide **flexible waste collection services**. The possibility to choose the size of containers or to use plastic bags is one of the issues. The customer shall be able to adjust the frequency of the emptying of the containers according to their amount of waste generated. For example, seasonal variation of waste generation is observed in touristic areas and residues from individual heating occur in the winter season. However, municipalities shall set the minimum amount of waste to be handled per inhabitant on their territory which would reduce illegal littering and dumping, because generators have anyway paid for the minimum amount.

Separate collection means such collection where a waste stream is kept separately by type and nature so as to facilitate a specific treatment. The variety of the collected separated waste types depends on the possibility for treatment. If these wastes are used for recycling, then the market of the recyclable materials influence the development in this waste management sector. However, EU waste policy defines which municipal waste shall be collected separately. This shall be considered when planning the future infrastructure for separate waste collection. The packaging wastes have been the first group of waste for which recovery and recycling targets were set up. This covers such packaging as paper and cardboard, glass, plastic, metal, and

wood. Since such type of waste is more than packaging, waste producers often are placing the waste in the same containers as for packaging. The new Waste Framework Directive (2008/98/EC) has set the objectives of recovery of four categories of wastes (paper, metal, glass and plastic) at a minimum of 50% of weight.

The system of separate waste collection differs from country to country. Traditionally, separate containers in different colours (paper, plastic, glass) are placed next to mixed containers. Additionally, collection yards are set up where a wide variety of separately sorted waste can be brought by inhabitants or companies. Special attention needs to be paid to bulky waste and construction wastes.

Many countries are using economic instruments to encourage achieving the recovery and recycling targets. On the one hand it helps to support financing the system of separate waste collection, and on the other hand packaging producers are also able to take voluntary actions to collect their waste for recycling if profitable. The role of public awareness and educational activities on waste sorting should not be underestimated.

Recommendations

On the one hand, the use of the waste collection service shall be a mandatory duty, and on the other hand the service shall provide a range of products which would satisfy the needs of different customers. The customers shall be able to optionally bring waste to the landfill directly. In this case proper documentation is necessary.

It is very important for municipalities to decide whether separate waste collection, which is partly the obligation of packaging producers and partly of general waste generators, will be organised as a separate system or whether it will be a part of the common waste collection system. From logistics and economic aspects it has been beneficial in Latvia to have one regional company managing both mixed waste and separate waste collection. In Germany, the responsibilities between the collection of packaging waste and other municipal waste have been clearly separated — which, however, leads in some cases to very complicated systems.

Biodegradable waste

The importance to deal with biodegradable waste separately was highlighted with the adoption of the Directive on Landfill 1999/31/EC. The Directive demands to reduce the amount of biodegradable waste which is going to the landfill through composting, biogas production, or material/energy recovery. The reduction shall be made gradually, eventually aiming at a target of 35% of the biodegradable waste going to landfill in relation to the baseline year which is 1995 for old member States. The target shall be achieved by July 2016. By 2009, the 50% reduction target should be achieved.

The Directive indicates the ways of treatment of biodegradable waste, but it is up to each EU Member State to decide which measures to choose and to promote. The treatment option depends on the amount and spatial distribution of biodegradable waste in the country.

In average, biodegradable waste accounts for 50-65% of the total non-hazardous waste generated. As shown in selected countries (see Fig. 7) the trend of biodegradable waste has been rather stable.

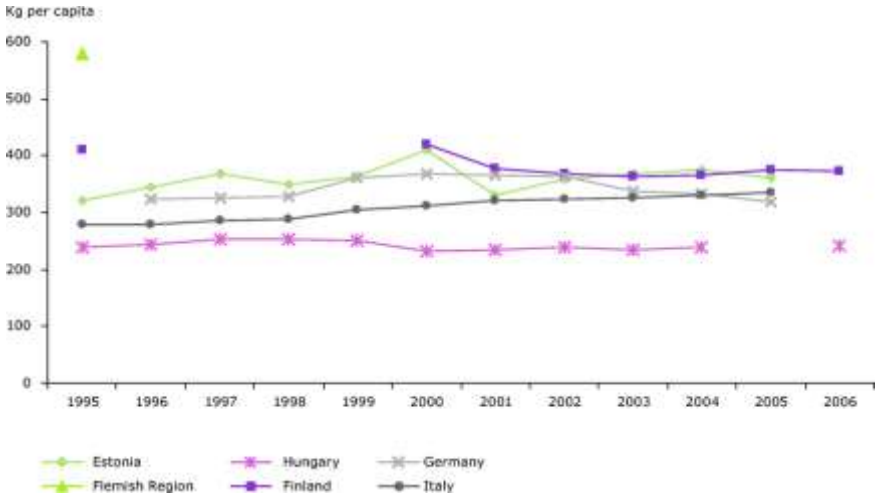


Fig. 7: Generation of biodegradable municipal waste per capita (Source: European Environment Agency, http://www.eea.europa.eu/data-and-maps/figures/generation-of-biodegradable-municipal-waste-per-capita) .

Park and garden waste is a significant waste stream in many countries and options for the treatment of these wastes, particularly in urban areas, shall be looked for. Composting is one of the most frequent and less costly measures if an area for composting is available. Nowadays, also manure from agricultural/industrial livestock farms can be treated as biodegradable waste as amounts are more than those needed for fertilizing the soil. Therefore, it is getting popular to use biodegradable waste for the production of biogas, while the residues are composted and used as fertilizer or, if these residues do have the quality to be used as fertilizer, they are used for the management of the landfill, e.g. covering material.

While food waste from public catering businesses is easy to collect for treatment, in contrast, separate kitchen waste from households requires higher efforts in many countries. Separation must be carried out by inhabitants themselves and convincing them may be a long process. Strong economic incentives encourage households to have an additional container for bio-waste, e.g. reduced municipal charges or taxes.

Treatment of biodegradable waste shall be reviewed from two aspects: commercial source and individual inhabitants. The commercial source can be considered as rather homogenous, thus as easier to treat either for composting or biogas production. Because inhabitants generate biodegradable parts of waste as a part of mixed waste, pre-treatment processes must be applied to separate the relevant parts.

Recommendations

The main precondition for establishing cost-efficient separate waste collection for biodegradable waste is to have proper knowledge of the waste stream: sources, amounts, seasonal characteristics. Careful planning allows establishing and promoting energy generation facilities based on biodegradable waste treatment. From the practical point of view, it is important to improve the system step by step, beginning with material that is easy to collect separately and to treat.

Waste recycling

The waste recycling and recovery targets have been set for many waste streams in the EU. Therefore recycling operations are an essential part of the system. However, the market demand for recycled products influences the development of the recycling facilities. Consequently, municipalities should not be involved directly in performing recycling operations. The relationship between recycling and waste management services is recognised through the development of separate waste collection systems. A set of services established on top of the basic waste collection service is another important income for waste management companies on the one hand and shows professionalism in the business on the other hand. However, it is important to know if the country has capacities to treat all relevant waste streams and whether it is feasible to collect waste separately. In case there are no facilities, different support mechanisms (economic or legal) shall be established on national level to push the process towards recycling.

Recommendation

The economic mechanisms are either taxes/charges on specific products or special grants established to co-finance treatment facilities which are essential to increase waste recycling on national level. The national government may set up earmarked taxes to generate additional income for a special budget which later is allocated to grants for treating certain waste streams. In Latvia, this approach was used to support building a factory for plastic recycling, tyre recycling, etc.

An alternative is the legal mechanism which requires product producers to comply with the recycling and recovery targets. In case a product producer does not achieve the target set, penalties are imposed. These legal measures shall be taken on national level.

Another important role for the promotion of recycling might play the new landfills itself. If proper landfills are in operation and “wild dumping” is cut down, the price level for waste disposal will rise. For this purpose a sustainable cost and tariff system must be established and this should be in the responsibility of the local authority. Further, this process only works properly if it is controlled and enforced by the authorities. At first, citizens will not appreciate this kind of development. The rising price level will make it, however, lucrative for companies to invest in recycling technology, and to offer cheaper options.

Closure and remediation of the former dump-sites and landfills

In case an existing landfill can be upgraded to the defined standards and requirements of the Directive 1999/31/EC, the competent authority may grant a permit to continue to operate. However, this option is not used so frequently in the new EU Member States where landfills or dump-sites do not comply with any requirement of the Directive.

Given the long time needed for the construction of a new landfill, countries need to have interim solutions. Usually, those landfills which are causing serious threats to environment and human health are closed while those having fewer risks are still operating until a new one is constructed. Since closure and remediation are costly, a long term plan needs to be adopted specifying how and when each landfill shall be closed. Such a plan also provides an indication for municipalities on when the financial means shall be allocated for this action.

Remediation actions are designed, depending on the size, location and the composition of the waste in the old dump-site. Hence, the work plan and costs for closure of a dump-site/landfill can be elaborated after investigations and sampling of waters at each site individually.

In general three approaches can be distinguished:

- If a site is small and has not yet caused any impacts on surface waters or groundwater, it may be less expensive to take the disposed waste to another (new) landfill. The costs depend on the amount to be transported and the distance to the new landfill. This cleaning action allows reducing costs related to long term monitoring as waste has been removed.
- Recultivation is another option, which involves the following steps: compacting the waste in a hill; covering it with a clay layer (about 0.5 m); covering with fertile soil; landscaping (grass, trees, etc). Wells for groundwater monitoring shall be built and regular monitoring must be ensured.
- Remediation is necessary if the landfill contaminates groundwater due to the disposal of industrial hazardous wastes.

In Latvia, for example, the costs for recultivation/remediation of a landfill can vary from 16.5-150 thousand euros per hectare.[5]

When recultivating old landfills, it is wise to consider the **production of biogas** from the waste. In that way a part of the costs can be recovered by selling electricity. For example, in the landfill for the Latvian city of Liepaja (about 6 ha, waste deposited since the 1960s, from approx. 115,000 inhabitants) the income from selling electricity was 85,000 EUR in 2009.

[5] Informatīvais materiāls „150 realizēti projekti: Kur un kā tika iztērēta vides infrastruktūrai paredzētā Eiropas Reģionālās attīstības fonda nauda?" [*Information guide "150 Projects for promotion: Where and how European Regional Development Fund money was spent on environmental infrastructure?*"] (www.esfondi.lv)

Recommendation

Since landfills have been under the responsibility of municipalities so far, they should also decide how the remediation should be organized. Since the issue is common for the whole country it is important that municipalities cooperate with the Ministry of Environment and Physical Planning and ask for technical and financial support. In the first step, it is necessary to define the necessary steps for each dump-site or landfill. If needed, remediation tasks are set and relevant costs identified, then the financial means can be attracted to implement the works.

Organisational and contractual aspects

Waste management is a complex system with a lot of actors involved. Therefore it is very important to set clear duties (tasks and responsibilities) and rights for all actors. The experience shows that the national legislation (laws and regulations) shall establish the rules for the system, while the local municipal regulations or rules are required to define the activities and behaviour in a particular area.

Table 4: Key actors, responsibilities, and tasks

Actor	Responsibility	Tasks
Municipal waste generator/inhabitant (house owner or via house unions)	To participate in the municipal waste management system	• To sign a contract with a municipal waste management company which is appointed by the municipality; • To place waste into waste containers; • To separate waste (if system is established); • To pay for the waste collection service
Municipal waste generator/commercial company	• To participate in the municipal waste management system	• To sign a contract with the municipal waste management company which is appointed by the municipality or to sign a contract with a landfill operator; • To deliver waste to the waste management company or to bring waste to the landfill; • To pay for waste collection service
Municipal waste company	• To perform waste collection service according to the quality standards set by the legislation and as defined by the contract with the municipalities	• To set up the waste collection system; • To carry out waste collection in accordance with contracts
Municipalities	• To organise municipal waste collection on their territory	• To sign a contract (via tendering) or assign tasks for their local company on waste collection service; • To inform inhabitants about local rules on waste collection; • To cooperate with other municipalities for establishing collection systems (joining municipal companies / administration union / special purpose association)
	• To organise waste landfilling	• To cooperate with other municipalities for establishing a regional landfill;

Actor	Responsibility	Tasks
Government	• To establish national legislation on landfilling	• The law shall state that when a new regional landfill is opened the old dump-sites and landfills shall be closed; then the waste for final disposal shall be brought to the new landfill; • To establish penalties if the waste is illegally dumped
	• To establish national legislation on separate waste collection	• The law shall set the relevant recovery and recycling targets
	• To plan national waste management strategies	• To elaborate a national waste strategy and a national waste management plan • To set the legal framework for an efficient and independent system of supervision of the waste management "on site", including mechanisms of funding
Landfill operator	• To operate the landfill	• To sign contracts with waste management companies; • To accept the relevant waste; • To record the waste amounts; • To treat waste for landfilling
Environmental authorities	• To control and monitor waste management	• To control that waste is not brought to illegal dump-sites • To control if also commercial companies are having contracts for waste management service.

Apart from the legislation which is clearly defining the responsibilities and tasks for all stakeholders, the contracting between individual actors is another essential factor to have a successful implementation of a waste management system.

The municipality can be the central player of the waste management system. In this approach, the municipality signs contracts with all stakeholders (see Fig. 8). The municipality defines tasks, controls the quality of the waste management service and collects money from waste generators. This approach could be selected by bigger municipalities (larger towns) where the human and financial capacities are sufficient to be in charge of the whole system. Smaller municipalities often delegate the waste management functions to the waste management company (owned or selected in a tendering procedure) (see Fig. 9).

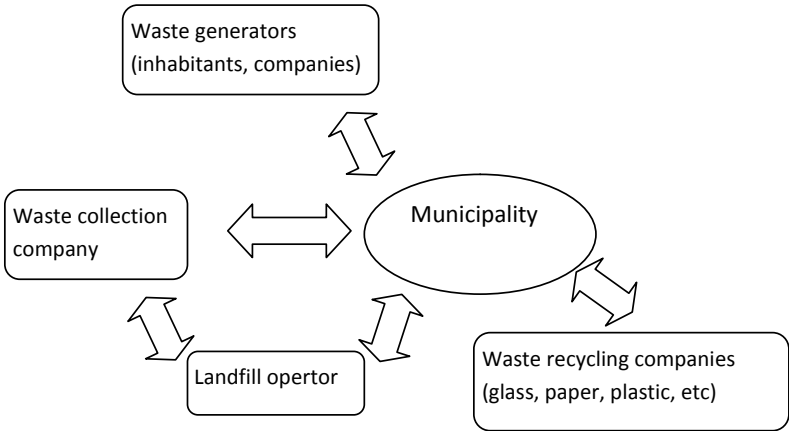


Fig. 8: Contracting scheme with municipalities playing a central role (Author: K.Veidemane)

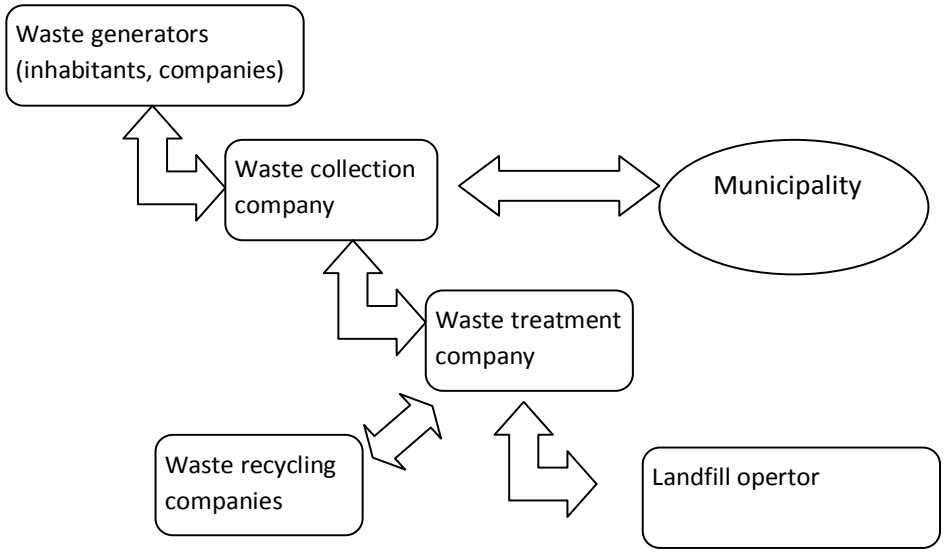


Fig. 9: Contracting scheme where a municipality signs a contract with a waste management company which plays the central role in the waste management system as the company collects money from waste generators and organizes an efficient waste management accordingly (Author: K.Veidemane)

Another aspect is the separate waste collection and disposal of packaging, electronic, batteries, and end-of-life vehicles. In the European Union the management of these waste streams is in the responsibility of the manufacturer of a particular product. However, contracts need to be made between the municipality and the operating company for locations where the separated waste containers shall be set up (see Fig. 9). The financing of the separate waste management system is ensured by the consumers of the products who pay a waste management fee when purchasing the product. A special label on the product indicates that consumer already pays for the waste management when buying the product.

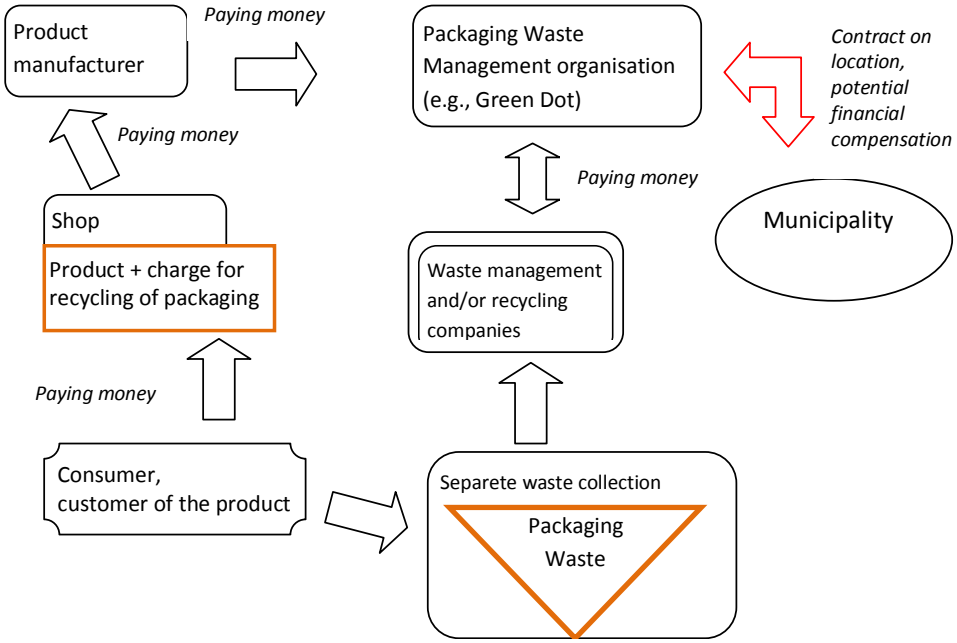


Fig. 10: The contracting scheme where municipalities assign the contract with packaging waste management organization on location (Author: K.Veidemane)

The waste management system which is built on the principle of the producers' responsibility can also be based on a stronger responsibility of municipalities. For example the municipality can cover the costs for maintenance of the collection sites, e.g. for electronic waste or hazardous waste.

Recommendations

The national legislation shall specify the tasks and responsibilities for each of the actors. It is insufficient to have just a statement that municipalities are in charge of organising the management of waste. Nevertheless, the decision on how the system technically and organisationally shall be evolving on local level is up to each municipality. The important factor is that all actors keep their roles and perform their assigned task so, that the objectives and targets for the waste management system are achieved according the relevant standards in the given time.

IMPORTANT!

What must be ensured politically and legally is that municipalities have sufficient legal and/or financial means that ensures a functioning waste management also in case of failure of a private operator. The future operator should be contractually bound to have sufficient assets to mitigate the risk of failure. In addition there should be a clear procedure and sufficient means available for the local and the national level and it should be clear which side will bear which share of the costs and which obligations to continue the waste management operations in the worst case.

Economic aspects

Generally, the costs for the municipal waste management services shall be covered by waste generators, e.g. inhabitants and commercial companies. The fee paid by waste generators shall be sufficient to cover the costs for the collection and the disposal of waste. On the other hand, the fee shall not be higher than 1% of the household income; otherwise people will not be able to pay for the services.

Conclusions and outlook

As stated above, it is important to develop the system step by step.

The very first step is to stop “wild dumping” and to establish proper landfills to avoid environmental pollution. The investments must be combined with an efficient law-enforcement “on site” and with effective public relations activities to make clear that Macedonia does not intend to become a “littered” country.

The Ministry of the Environment and Physical Planning and the South-East Region have launched a tender on the construction and operation of a landfill by private companies, which are potentially foreign companies, as there is no local company that would be capable of taking over these tasks. This is in so far understandable as landfills are complex establishments, their set-up und operation needs a specific knowledge and they require high initial investments. A strategic problem might be that Macedonia gets into a position of dependency from international waste management companies, if the majority of landfills are built and operated by foreign private companies.

The currently on-going tendering process is complex and new for municipalities. They are hesitant to continue with the process and they may feel overrun by the whole process. Municipalities have to make it clear to themselves that economic prosperity and “wild dumping” of waste do not go together. It will be easier to understand if local businesses and/or municipal companies participate in the evolution of the system. They must be the local “crystallization points” for a growing industry of resource-recovery, including respective job opportunities.

Currently, the local waste management companies operate with a relatively small volume of waste turnover. They need to grow to cover new tasks like (separate) collecting and recycling. This means to select the ‘easier’ manageable pieces first – but start!

It is assumed that, during the following years, the smaller companies will merge, for example on a rural or regional scale. Cooperation between municipalities – at least between the smaller ones – will be a “must”. The alternative would be to be ‘taken over’ by some international waste management company some day. The local waste management companies need to widen their field of operation step by step – and thus might become some important local or rural counterweight to the international companies which potentially operate the landfills.

Government and municipalities need to act as partners in this process. It is important to understand that waste management and “keeping the landscape clean” needs a commitment on the local level, in the local population. Therefore, the municipalities must be given a context to fulfil their tasks, including legal framework and funding.

Implementing organizations:

Baltic Environmental Forum
Germany
www.bef-de.org

Baltic Environmental Forum
Latvia
www.bef.lv

Regional Environmental
Center for Central and East-
ern Europe Country Office
Macedonia
www.rec.org.mk

waste
management

Baltic Environmental Forum
Deutschland e. V.
Osterstraße 58 | 20259 Hamburg | Germany

www.bef-de.org