The economic basis of municipal waste management
A comparison between Poland, Sweden and Lithuania

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Summary

Adequate municipal solid waste management (MSWM) is required as the volume of waste is increasing in the countries. Today, the MSWM in Poland Sweden and Lithuania is more concentrated on waste treatment than prevention. Most of what we throw away is either burnt in incinerators (Sweden), or dumped into landfill sites (Poland and Lithuania). But both these methods create environmental damage. Landfilling not only takes up more and more valuable land space, it also causes air, water and soil pollution which is harmful to human health, as well as to plants and animals. Incinerating recyclable material is waste of nature resources.

The EU Directive on waste requires all member countries to follow the waste hierarchy where waste prevention, re-use and recycling of waste are prior to thermal treatment, composting and landfilling. To make reach higher levels of recovery and recycling of certain waste is impossible to achieve without the prior segregation of waste at the level of each citizen (to separate recyclables from other waste at home). An increasingly important task in this aspect is to spread environmental awareness among the public. The economic aspect is important; it has to cost money to generate waste. These economic tools look different in different countries. All the three countries have collection fees. Sweden also has incineration tax and landfill tax. If high price is put on landfilling there must also be a good controlling system so that the waste is not dumped on illegal dumpsites.

The EU waste hierarchy is not followed in any of the three countries and too much is put on landfills and incinerated meanwhile too little is recycled. Still, the countries are slowly making progress by following EU directives.

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1. Introduction

The generation of waste is becoming an increasingly serious problem worldwide due to population growth, increase in the production of consumer goods and technological progress, which causes a shorter and shorter lifetime for certain groups of products, especially those of universal service. Solid waste is quantitatively an important material flow in the Baltic Sea region since each person generates about a tonne waste per year (including industrial and agricultural waste). (Rydén 2003) Within the European Union the average amount of municipal solid waste generated was half a tonne per person in 2007. (Eurostat 2009-03-09) But the volume varies between the countries; each Swede annually produces more than 500 kg, the Lithuanian 400 kg, while the Polish generated least in the whole Union, a bit more than 300 kg per person.

Problem formulation

Growing amounts of waste call for good waste management and the main goal of modern municipal solid waste management (MSWM) is not to only get rid of the waste, but to treat the waste in a way which could save natural resources. The MSWM has changed through time, parallel to population increase, growing industrialisation, urbanisation and ecological awareness. The households produces approximately one-third of the waste and two-thirds are produced by industry. However, variations are high between the countries. In Sweden the distribution is 50-50, half from household, half from industry, while in Poland the industry accounts for 90% of the total waste generated (Rydén 2003).

The basic principles of waste management should be:

1) Waste prevention and reducing the volume and the negative environmental impact and increasing the use of products with longer lifetime;
2) Ensuring recovery of environmental protection law,
3) Ensuring that that waste disposal follows the environmental principles.

(Ekoportal)

The MSWM is carried out in varied ways in the countries in the Baltic Sea region. Still, there are similarities between the management systems.

Aim of the study

The goal of this study is to compare the municipal solid waste management (MSWM) situations of three countries in the Baltic Sea region; Poland, Sweden and Lithuania. The main idea is to compare the organisational and technical aspects of MSWM and also to compare the funding system in each country. To specify the aim of the study the following questions have been formulated:

1) How is the solid waste management organised in Poland, Sweden and Lithuania?
2) What problems are related to the present solid waste management?
3) What are the major similarities and differences between the solid waste management in the three countries?

2. Background

Solid waste can be divided into three groups; municipal, industrial and agricultural waste. Municipal waste mostly consists of waste generated by households, also called domestic waste. Municipal waste also includes similar waste generated by small businesses and offices and is collected by the municipality or on the behalf of municipal authorities. The content of municipal waste may vary from municipality to municipality and from country to country, depending on the local waste management system. (Eurostat 2009-03-09) If not taken care of properly, municipal waste can be a serious threat to health, due to the dispersed nature of forming in the area of human settlements and because of the high proportion of organic matter which increases the establishment of pathogenic micro-organisms and pests.

Industrial waste is generated in large volumes and creates a major threat to the environment and human health due to toxicity, flammability, explosiveness and carcinogenicity. A separate fraction consists of wastes from agriculture and farming, where much is re-used, requiring disposal because of the serious threat to soil and ground water. (Ekoportal)

Table 1: Basic facts about the countries

	Poland	Sweden	Lithuania	EU27
Population (millions)	38	9.2	3.4	499.7
Area (km^2)	312 679	450 000	65 200	4 324 782
Density (persons/km^2)	122	20	52	114
GDP per person (dollars)	13 798	52 789	14 086	33 400

Table 1: Basic facts about the countries. (Wikipedia)

Table 1 presents some basic facts about the three countries in the study. Poland is the most densely populated country (122 people per km^2) and is also the one with the largest population (38 million inhabitants). Sweden is the largest country but the population density is very low (20 per km^2), while Lithuania with its 3.4 million people has more than 50 inhabitants per km^2. The economic situation of the country is comparable to the generation of waste. The GDP in Sweden is the highest and the country also produces most household waste per person (see figure 1). This is not the whole truth since Lithuania has less GDP per person than Poland but still generates more waste per person. Different calculation methods can be the reason for these differences since reliable waste statistics are very difficult to make.

Maybe all waste generated is not collected by the official collectors (and therefore not included in the statistics). Figure 1 presents the amount of waste generated per person is the three countries. In Lithuania each person generates quite much waste per person compared to the GDP per person average in the whole EU27.

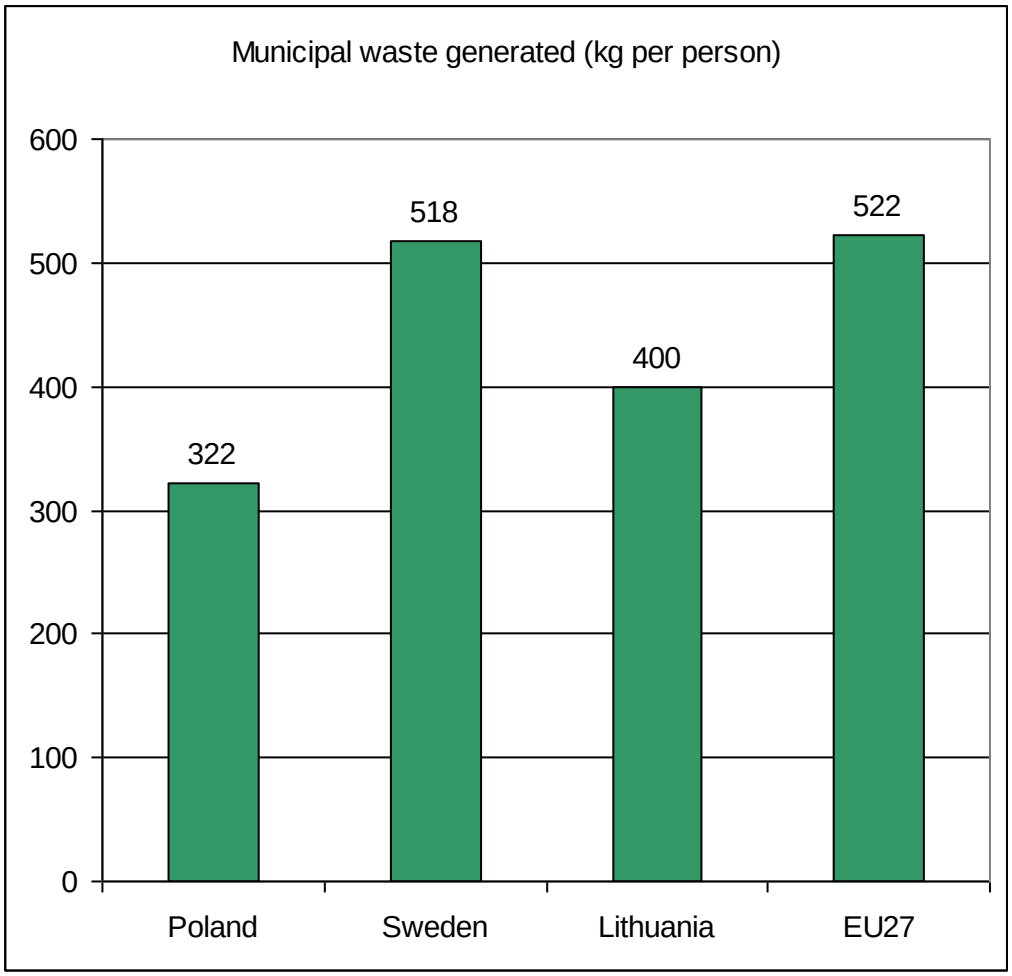

Figure 1: Municipal waste generation in the countries (Eurostat 2007)

Incineration (waste-to-energy) is a good treatment method for municipal waste but the incineration rate in Sweden is 47 % and very high compared to the average in EU27. Lithuania and Poland burns nothing but puts more than 90 % of the waste in landfills. Poland has a higher recycling rate than Lithuania. Sweden has the highest and has been recycling for most time. Poland is more densely populated which makes it easier to collect big amounts of recyclables compared to both Lithuania and Sweden. Figure 2 shows the different treatment methods used in the three countries. The official composting rate for Lithuania is only 2 %. This number is probably higher in reality. If people have their own house with a garden they

compost grass, leaves, branches and use the product as fertilizer in the garden. The same happens in Sweden and Poland, where garden waste is burned or composted unofficially.

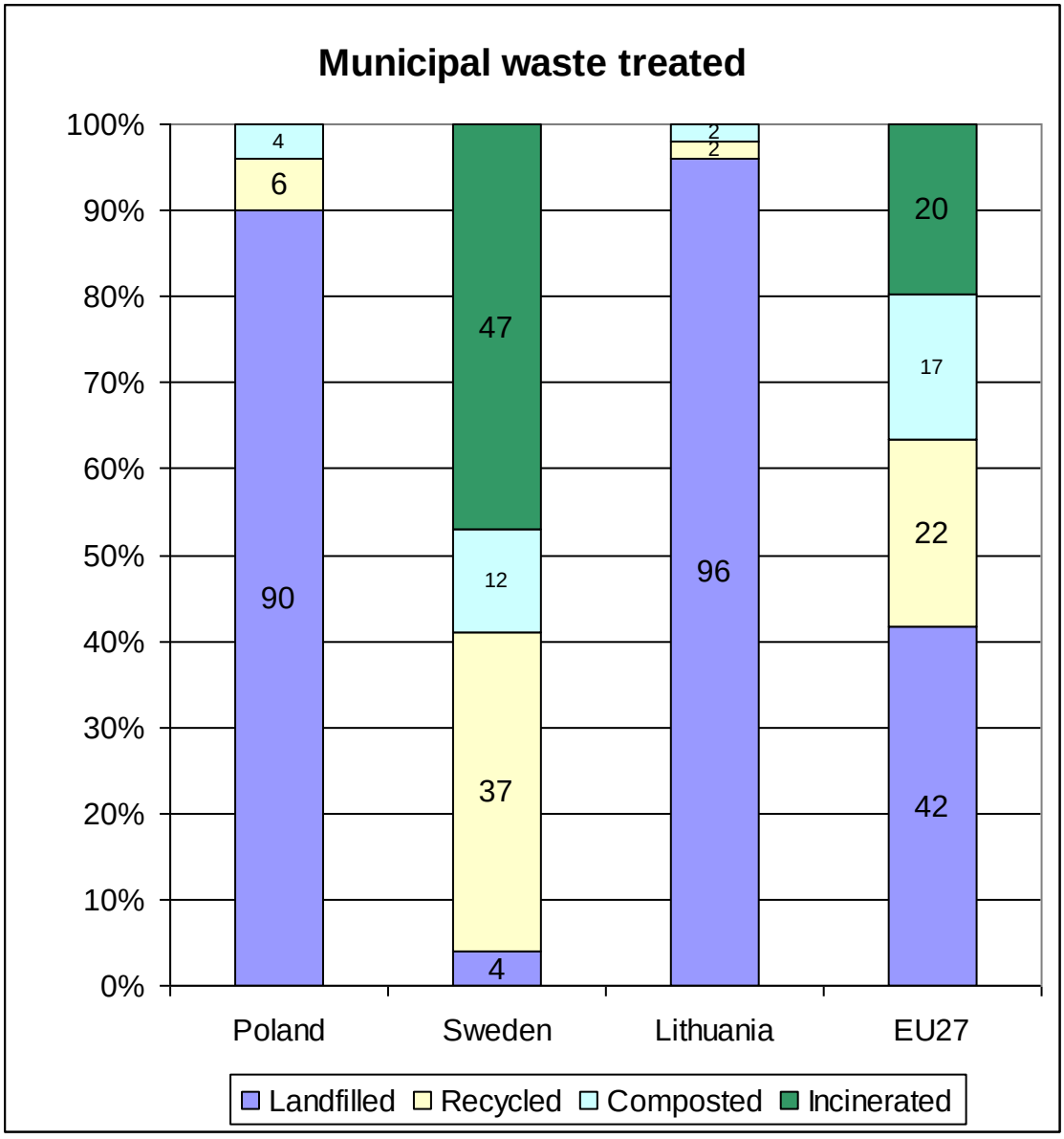

Figure 2: Treatment methods of municipal waste in the countries (Eurostat 2007)

The waste hierarchy

The EU waste hierarchy is a guide to the proper management of waste in the EU. The most preferred option in sustainable MSWM is to not produce any waste i.e. waste prevention and minimizing the generation of waste. This is followed by reuse of waste. These measures take priority over recycling which means that you remould the material into new products. Next step down in the hierarchy is to compost or recover heat and energy from waste, which can only be done once. The least favoured option is final disposal, i.e. landfills and dumpsites.

3. Legislation

Poland

The main legislation concerning the waste management in Poland is the Act on waste from April 2001. (Dz.U. 2001 nr 62 poz. 628) The Act sets out rules for dealing with waste in a manner which ensures protection of life and human health and environmental protection in accordance with the principle of sustainable development. It is fundamental to prevent the formation of waste, reduce its negative impact on the environment as well as improve the material recovery avoid final disposal of waste.

In order to achieve the objectives established in the Environmental Policy waste management plans are developed in order to realize the basic principles of rational waste management, to create a national integrated and adequate network of installations, and introduce equipment for recycling and disposal of waste at the national, regional, district, and municipal level.

These plans specify the following:

1) The current status of waste management
2) Projected changes in waste management
3) Actions to improve the situation regarding waste management
4) Financial instruments for the achievement of the goals
5) Monitoring and evaluating the implementation of those objectives.

At the state level the manager of the other plans is the National Waste Management Plan. Regional Waste Management Plans should reach regional targets in this area of the total operation of the municipalities, which in turn should create municipal waste management plans included in the mandatory tasks.

Sweden

In Sweden, great improvements have been made in the solid waste management over the past ten years. The resource efficiency of waste has increased and the negative environmental impact has been reduced as a result of powerful policy instruments; including producer responsibility, restrictions on landfilling, landfill taxes. Also the entry into the EU has had an

impact on the MSWM in Sweden. Until the financial crisis in 2008, the volume of waste kept growing steadily. (Naturvårdsverket)

The Environmental ministry has the main responsibility of Swedish MSWM and the Swedish Environment Protection Agency (EPA) produces regulations and guidance on waste management. The Swedish EPA produces waste statistics which are reported to the EU every two years and it also has a monitoring role in ensuring that waste management is environmentally acceptable, socially efficient, and straightforward for the consumer. (Naturvårdsverket)

According to the law "Ordinance of Producers responsibilities for packaging", the so called producer responsibility, all companies that produce, import or sell packaged goods has to use the national recycling system. (Repa) The law is in use within five areas: packaging, tyres, newsprint, vehicles, electrical and electronic products. The producer responsibility makes the producer of the goods responsible for the collection and disposal of their discarded products. The intention is to reduce waste volumes and encourage cleaner production. (Naturvårdsverket) The national recycling targets and the producer responsibility are powerful policy instruments. For example in 2005, 69 000 tonnes of tyres was converted into scrap material instead of being dumped on a landfill.

In Sweden a recycling tax is included in the price when you by packaged products. EU regulations govern incineration, landfilling and hazardous waste management, while for biological treatment there is national guidance for minimizing the environmental impacts. Some waste is reprocessed into products for road building and other types of construction. Dumping waste in the Baltic Sea is prohibited, but exemptions can be obtained under certain conditions. New legislation for landfills was introduced in 2001. There are hundreds of lanfills in use in Sweden and there are several thousands that are no longer in use. The can contain anything from mining waste to old household waste.

Lithuania

Municipalities have to prepare waste management plans, which must include:

- The possibility for all people to separate waste products;
- The possibility for all people to separate recyclables;

- To guarantee space for containers and reassure that the special containers for recyclables are placed out, and also provide possibility to use other devices; places must be clean and suitable for people, and must pass public health service;
- If there is no possibility to build special containers or there is no need to use them, there must be other ways to solve the problem (by putting the recyclables in to special bags, or should be collected from people in other ways);
- Until 2009 municipalities should reassure that a special waste collection place is provided for big size waste products (furniture, building and destroying material, electric and electronic devices, used tires, dangerous municipal waste products, organic waste products), available for 50000 people. In towns as Alytus, Klaipeda, Kaunas, Marijampole, Panevezys, Siauliai and Vilnius, the distance to such places should not be more than 5 km, for other towns not more than 10km;
- Until 2013 to reassure, that eliminated waste was not bigger than 50 % of the municipal area per year. Other municipal waste products must be remade or used in another ways;
- To close the old landfills and use modern technique when constructing new landfills, with infrastructure system for separation and collection. The priority will be given for the organic waste management (mechanical treatment, biological treatment, biogas production, digestion), for specific waste collection and management (tires, batteries and accumulators and electronic devices).

(Atliekos)

At present municipalities have some specified rules, which have valid regional managing system. The rules regulate the following:

- How the waste management system should be organized;
- What companies will take care of each service in different areas;
- How the waste products should be managed;
- What is needed from all participant of that system (waste generator, municipality, administration, regional waste management centers) for the system to operate well;
- What kind of rights and duties the citizens have.

4. Economic aspects

There must be a price on waste generation; otherwise people are not encouraged to take care of their waste. Waste treatment is very expensive and landfilling is the cheapest option today. An incineration plant with potential for energy recovery costs about one million euro to install in Lithuania which is much money.

A landfill tax is efficient only in a country that already has good control of the waste treatment and waste streams (works in Sweden but not yet in Lithuania and Poland). If there is no good control and no good alternatives, the tax can promote "wild dumping" (happens in Poland). If other alternatives are not promoted, like waste prevention, the tax will lead to more waste going to incineration instead of recycling (the case in Sweden) It is also difficult for the government to know what should be the price of the tax.

Poland

What is the expected element of the market game - the price of the balance of supply and demand, is determined in the market of waste as a result of the companies' civil agreements in export of waste from residents of the civil law, who pay them for disposal of waste. Thus, in the stream of money from this type of service budget bypasses the village. In Poland there are no good economic motivations for people to separate the recyclables from the waste since they know it will be done at the waste treatment plant, before landfilling. In Poland private companies administrate the collection of waste. This money stays within the company and the municipality gets very low benefits from this system. The effect of this is that the municipalities have less money to fulfil their duties (to organise systems for waste separation and collection of recyclables). This treatment of mixed waste leads to the recovery of only a small percentage of useful elements. In Lithuania the same situation occurs as in Poland; there are yet no good systems for separating recyclables why people do not source separate.

Sweden

In Sweden the national waste fees are included in the price of the products why people don't even notice they are paying for their waste. This does not encourage people to create less waste but it is good for the municipality since this finances the collection and maintenance of recycling plants.

The waste management fee is about 80-160 euros per household per year. It consists of the basic fee (covers costs for the maintenance of the recycling stations) and the waste collection fee. The waste collection companies have to pay for the treatment:

- Landfill fee: 80 -130 euros / tonne
- Incineration fee: 30 – 70 euros / tonne
- Biological treatment: 40 – 110 euros / tonne

Lithuania

Charge for mixed municipal waste management depends on the size and types of container, but cannot be bigger than the fixed maximum tariffs. Depending on container type and size, for the mixed municipal waste management, the Lithuanians will have to pay from 5,8 – 16,2 euros for each collected m^3 and exported waste to landfills and will also have to pay for the containers used. Lithuania wishes that municipal waste managers gave their service for the lowest price, for an afforded service level. Fixed maximum tariffs and valuations are set not the particular future taxes, but just the upper limit, which cannot be exceeded by waste managing operators. Today Lithuanians should be motivated to separate their waste, because separated waste (paper, glass, plastic) is collected and exported for free. (Kratc)

5. Main problems

The waste hierarchy is not followed in any of the three countries. In Sweden, each person generates overall too much waste. In Lithuania and Poland the treatment is a big problem since most is dumped on landfills. According to the waste hierarchy more waste should be re-used and recycled. To make recycling successful, people must participate in the separation of recyclables.

Poland

The regulations and methods for MSWM used in Poland have been discussed. At present the most often applied methods for municipal waste are the selective collection (the use of materials which with the present state of technique and technology can be recycled) or segregation of the collected waste. This is the first stage – besides landfilling – on the way to make the municipal waste harmless. An insignificant increase of the amount of waste subjected of various treatments outside landfills, which has been observed in recent years, result from the fact that a very small amount of waste has been obtained from segregated waste products and those selected from mixed waste. The currently available techniques enable effective treatment of waste; however in Poland there is a lack of such installations. Another barrier to the use of these methods is created by people themselves. It often happens that they oppose the building of municipal waste incineration plants and the plans remains only on paper. The possibility of using thermal treatment for municipal waste, both segregated and not-segregated, would enable a considerable decrease in the amount of landfilled waste, the best available techniques having been maintained. (Kulczycka 2008)

The crucial problem in Poland is to guarantee the appropriate level of the recycling waste, such as packaging-waste, end-of-life-vehicles, electrical and electric equipment, and these problems should be solved by creating a network installation and equipment for recycling and disposal. All these problems are regulated in the acts of the Minister of the Environment. Another problem is the growing number of illegal dumps and even if the municipalities remove the dumps on regular basis, new ones are created very quickly.

Sweden

The Swedish people generate too much waste and the trend seems to strongly follow the economy. When economy is good in Sweden people throw away more goods.

Another problem is that the recycling rate is lower than the incineration rate. Of course it is good the waste is not dumped on landfills, but much more could be recycled than what is done today. The recycling goals are set too low. For example the material utilisation rate target is 65 % and is easily met, why it should be set higher. It is important that the targets follow the development of waste management behaviour.
There are still many types of waste that cannot be recycled easily, for example since they are not fractioned as packages (and are not included in the producer responsibility for packages and newspapers). This waste is today incinerated (shoes, toothbrushes, bulky waste)

Lithuania

Most of the waste is disposed in landfills since it is still the cheapest method of waste management. There are weaknesses in the waste management planning in the municipal and regional levels. Mostly the waste management is not a priority for the municipalities and there is a lack of environmental knowledge among the responsible workers. The MSWM varies a lot between the cities and the countryside, because of a different economic basis and environmental knowledge. The municipality cannot make sure that the waste is being separated. And there is no competition between companies that collect waste (in Kaunas only one company in operation). Not enough control on waste separation

Dangers of improper MSWM are a weakening quality of the environment and the potential adverse effects on human health. If municipal waste sorting is not developed, non-hazardous waste will continue to be disposed in landfills. Municipalities that lack attention to the municipal waste management and ensuring proper control of public utilities for waste management services in the price and quality may be unacceptable to the consumer. Without public municipal waste management and general waste collection service, the social division between rural and urban will not be minimized.

6. Solutions for the future

Poland

Waste should first of all be recycled or treated at the point of its generation, or it should be brought to the nearest place where it can be recycled or treated. Treatment is applied to the waste from which recyclable waste has been separated. In the case of waste collected separately, the possibilities of using various recovery and treatment methods are considerably greater, beginning with simple composting technologies and ending with thermal processes, such as pyrolysis or gasification.

Sweden

The objectives of the MSWM in Sweden are that less waste should be deposited on landfills, and more should be recycled. In 2008, 78,4 % of all packages and newspapers were recycled. This is the highest recycling rate since the producer responsibility for packages and newspapers was introduced in 1994. The total number of recycled packages and newspapers was 1 252 820 tonnes. The biggest increase was within the paper packages and paperboard fraction. (Ftiab)

In Sweden the recyclables are divided into too many fractions which make recycling more complicated. With the new waste separation technology available, it could maybe be more efficient if the household waste could be segregated into fewer fractions, i.e. dry and wet waste, instead of containers for each package.

Lithuania

Characteristics of a better MSWM system include the development of regional waste management systems, the promoting for private investments in these activities, which in turn will be an opportunity to improve public services in the MSWM quality. The capacity of municipalities and counties in the regional waste management systems should be strengthened, with special focus on municipal waste management organized by the municipal systems and municipal waste management regulations set out the requirements of supervision and control.

Lithuania should participate in various EU-funded programs to finance the waste management. The agreement of the existing environmental and public health protection requirements do not comply with the start of the operation of landfills and regional non-hazardous waste landfills,

the possibility of better control of waste taken to landfill by encouraging waste separation and recycling or other uses. Widespread application of environmental education and public awareness on waste management will make the public participate more actively in waste management.

The most important measure to reduce the quantity of municipal waste is the recycling. In Lithuania recycling is increasing because here is more and more recycled paper and cardboard. Glass and plastic waste recycling volumes are unchanged. The processing capacities of the most popular recyclables (paper, glass, some plastics) should be used to make sure less recyclables are not put on landfills. (Archyvas)

Environmental awareness

To increase environmental awareness and to make people separate waste at home; some rules have been set up in Lithuania recently, gives the correct information about for the citicens about their rights and duties, when they are provided the waste management services. From these rules people will find information about address of waste collecting places, where and what kind of waste products to put or to bring and what to expect from the waste companies. To improve environmental knowledge among the citizens, all the three countries have national websites with information about how to separate the different waste fractions.
Poland: http://www.odpady.org.pl, especially for Krakow: http://www.ekocentrum.krakow.pl
Sweden: http://www.sopor.nu
Lithuania: http://www.svara.lt

Conclusion

The municipal solid waste management in Poland Sweden and Lithuania is more concentrated on waste treatment than prevention. The EU waste hierarchy is not followed in any of the three countries and too much is put on landfills and incinerated meanwhile too little is recycled. Still, the countries are slowly making progress by following EU directives.

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