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Waste Management Policy: Hazardous Waste Management

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Abstract

This paper deals with the development of waste management legislation and its impact on the results of waste treatment. Together with the progress that was achieved in waste management, existing problems and new tools that are needed to meet them are examined. An overview of hazardous waste management regulations in the EU and Lithuania is made. It was found that the tax on waste products encourages recycling of hazardous waste (scrap tires) thus saving money for transport companies and ensures successful operation of waste recycling companies.

Keywords: environmental policy, waste management legislation, waste management regulations, hazardous waste treatment, hazardous waste recycling.

Introduction

For quite a long period of time waste legislation like much of environmental legislation was a low political priority in many EU countries. This approach can be traced to many factors, in particular to the attitude that the first that is necessary to achieve is economic prosperity, and afterwards we will take care of environment. In some cases / states the enforcement of waste legislation is inappropriate because it is not enough to make correct transposition of Community law into national laws and regulations, it is necessary to observe them in practice.

Waste affects the interests of many stakeholders. It is a relevant issue for businesses, as they have an economic interest to reduce waste amounts to pay for treatment less, also business is related with stringency of waste regulations. It affects a wide range of public authorities and organizations, from the smallest municipalities to international organizations, as well as households as they are directly involved in reduction of the impacts of waste, and are affected by pollution resulting from inadequate waste management. Waste management also accounts for a great number of jobs in the state economy.

Waste management has experienced significant changes during the last thirty years. As waste was generally viewed in negative terms due to cost, pollution of environment, impact on human health, currently the attitude is changing. First off all, waste management is increasingly under control and negative impacts are monitored, furthermore, different waste streams now are sold to waste treatment companies, when previously business/households had pay for their handling. Therefore attitude to waste as an urgent environmental problem (i.e. something that is a substantial burden to society) is changing with the increasing evidence that waste is an important resource that must be exploited. Waste utilization decreases the need for natural resources, reduces the threat of pollution by dumping, opens up opportunities to reduce processing costs, and creates new jobs in economy.

Research subject is hazardous waste management.

Research aim is to analyze evolution of waste management legislation by emphasizing particularities of hazardous waste treatment and to assess benefits of hazardous waste recycling.

To achieve the aim, the following **objectives** were set:

- to review waste management policy in the EU;
- to assess waste management outcomes;
- to overview waste management legislation in Lithuania;
- to evaluate advantages of waste (scrap tires) recycling.

Theoretical framework

The idea of harmonizing economic growth with the laws of development of society and the environment is expressed in the concept of sustainable development. In the frame of sustainable development an especial importance is attached to studying material flows, therefore management of waste flows must not contradict the principles of sustainable development. In agreement with M. Jacobs, it is possible to affirm that waste management in the context of sustainable development means using materials in closed cycles (Jacobs, 1991). The results of resource use in production processes and the national economy are mainly analyzed from the viewpoint of the financial costs and the amount of natural resources used, however, direct and indirect effects of the resource exploi-

tation on global and local environment is still not sufficiently linked to the production process and the scale of economic damage (Bargigli, 2003).

The relationship between economic activity and environment is revealed by S. N. Bobiliov's "black box" model, where natural resources are inputs that are turned into the finished products, waste and pollution, which eventually are returned back to the environment (Bobiliov, 1994). R. U. Ayres and U. E. Simonis called this process the "industrial metabolism" (Ayres and Simonis, 1994). It is obvious that the increasing productivity of "black box" activates the exchange with the environment, the material flows from and back to the environment becomes more intensive and threatens ecosystems and society.

With the development of industrialized society the extent, specificity and nature of effects on environment have become more complex, deeper and comprehensive. S. Karlson, J. Jr. Cairns, O. Kinne pointed out four significant environmental changes: 1) local issues have become global; 2) specific problems turned diffused; 3) short-term problems changed into long-term ones; 4) simple problems became complex (Karlson, 1997; Cairns, 2002; Kinne, 2003; Cairns, 2004). The changing nature of environmental problems means that the resource use and waste generation issues are complex, related to public social and economic life. This led to national and Europe-wide environmental policy; legal measures were adopted to control corporate activities to reduce the impacts on environment.

When environmental concerns arose at a public level and environmental regulations were imposed, discussion about "a big burden on companies' financial position and competitive loss against companies from unregulated areas" began (Bresciani, Oliveira, 2007). Plenty of research works are done on the issues of what direct economic benefits companies can gain from integrating environment concerns into business functions (Pearce, Barbier, 2000; Staniskis, Stasiskiene, 2003; Staniskis, 2005; Staniskis, Stasiskiene, 2006; Bresciani, Oliveira, 2007), parallel investigations into the reasons that may force companies to submit environmental regulation are carried out (Vastag et al., 1996; Pearce and Barbier, 2000). The increasing pressures from different stakeholders as a motive to bring environmental issues into business operation were explored by D. Pearce and E. B. Barbier (2000), A. A. Thompson and A. J. Strickland (2001), S. B. Banerjee (2002), C. Hibbitt and N. Kamp-Roelands (2002). "Environmental" reputation or the costs of companies' image is currently also a relevant area of research. According to J. S. Toms (2002), corporate reputation can be analyzed as an intangible asset, and he analyzes the environmental reputation creation process, while D. A. Rondinelli and M. A. Berry argue that many consumers and business customers often seek to align themselves with firms that have a reputation for social responsibility in enhancing companies' attractiveness to employees and in having a more favourable treatment by regulators (Rondinelli, Berry, 2000). Corporate environmental management is more and more considered an essential management function. In all of these tasks, environmental concerns must play a key role as an ethical, operational or competitive view (Jansson et al., 2000; Banerjee, 2002).

All listed research works concern environmental issues and waste management items as waste has high environmental impacts and its amounts are increasing. Other scientific works focus on treatment of different waste streams (Silvestraviciute, Sleinotaite-Budriene, 2002; Ulinskaite, Staniskis, Motiejunas, 2006; Savage, 2006; Juskaite-Norbutiene, Miliute, Cesnaitis, 2007; Unger, Schneider, Salhofer, 2008; Baltrenas, Zigmontiene, 2009), analyze waste treatment options and facilities (Cepinskis, Jankauskas, Ubartas, 2001; Zidonyte, Maciulyte, 2007; Salhofer, Wassermann, Binner, 2007), issues of integrated waste management (McDougall, White, Franke, Hindle, 2001; Clark, 1993; Staniskis, 2004; Luoranen, Horttanainen, 2008), carry out life cycle assessment studies (Cesnaitis, 2007; Spengler, Stolting, 2008).

This paper focuses on waste management regulations, especially on hazardous waste as it faces a number of new legislative regulations today. Additionally, recycling of hazardous waste (scrap tires) seems to be an interesting recovery option to both waste holders and recycling companies.

Research methodology

The methods of a system approach and comparative analysis were applied. In addition**,** different databases were used: the data of National Waste Accounting, Waste Managers Register, data from Eurostat, and Department of Statistics of Lithuania, different legislative acts and various scientific research works were analyzed.

Waste management policy in the EU

Environmental policy in Europe has developed significantly since the 1970s and now waste management is recognized as a major environmental challenge at international level.

The EU Member States began taking legal national measures to control and manage waste in 1975 when the first Directive on waste (Dir. 75/442/EEC) was issued. The revision of Directive 75/442/EEC in

1991 provided a legal framework for the avoidance, management and disposal of waste as was set out in the Commission's Waste Management Strategy of 1989. The updated Directive 91/156/EEC is often called the Framework Directive on Waste as it includes links to more detailed directives. Two types of detailed directives exist in the EU waste management: 1) establishing the requirements for the permitting and operation of waste disposal facilities; 2) related with disposal options for specific types of waste.

Seeking for greater harmonization in the management of hazardous waste between Member States the hazardous waste Directive 91/689/EEC was introduced. It lists wastes that can be classified as hazardous, and includes their components and properties. This directive also asks national authorities to publish a hazardous waste management plan which can be a part of the general waste management plan drawn up under Directive 75/442/EEC.

More strict environmental regulations in developed countries led to a great increase in hazardous waste disposal costs. Seeking cheaper ways to dispose of hazardous waste companies started shipping hazardous waste to developing countries and to Eastern Europe. Seeking to restrict such activities international outrage led to the drafting and adoption in 1989 of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. The Basel Convention has been ratified by around 56 nations. Movements of waste to non-signatories of the Basel Convention are prohibited. The Basel Convention was further reinforced by the Decision C(2001)107/FINAL of Organization for Economic Co-operation and Development (OECD). The OECD Decision creates a streamlined system for regulating movements of hazardous waste for recovery between OECD countries in obeying the framework established by the Basel Convention. Export of hazardous wastes to non OECD members for disposal or recovery is prohibited. Further Regulation 259/93/EEC established a system for controlling the movement of waste within, into and out of the European Union.

Waste Framework Directive and the Hazardous Waste Directive, subsequent Waste Shipment Regulations generated the basis of the regulatory structure on waste. They define wastes and other key concepts, assure that waste is handled without damage to public health and to environment, and indicate controlled terms for moving waste throughout the EU. Unfortunately these Directives did not specify the parameters of environmental contaminants that occur during waste landfilling, incinerating and recycling. A number of problems including pollution from incinerators and landfills, and from recycling facilities called for further actions. The existing Directives have been supplemented by the Landfill Directive (1999/31/EC) finally adopted in 2001, Waste Incineration Directive (2000/76/EC), Incineration of Hazardous Waste Directive (94/67/EEC).

According to Landfill Directive, certain hazardous wastes, liquid wastes and tires are forbidden for landfilling. The directive also establishes the requirement for allocating the separate sites for hazardous, non-hazardous and inert wastes. The Directive as well points out that waste should be treated before landfilling in order to reduce the risk to human health and the environment and to reduce waste quantity.

The Waste Incineration Directive deals with standards requested by the EU for the practice and technology of incineration. The Directive aims to reduce the impact of unfavorable environmental effects on the human health and environment resulting from emissions to air, surface and ground water, and soil. Incineration of Hazardous Waste Directive regulates operational standards and emissions for new and running hazardous waste incinerators, which Member States control through permits listing the types and quantity of hazardous waste that can be incinerated. Hazardous waste incineration plants must act in a way that ensures that as much waste is incinerated as possible.

In addition, the Directive on Integrated Pollution Prevention and Control (IPPC) (96/61/EC) that introduced a permit system to solve problems of pollution from industrial and agricultural facilities was adopted. Integrated pollution prevention and control concerns new or existing industrial and agricultural activities with high pollution potential. The Directive 2008/1/EC, which replaced Directive 96/61/EC, requires industrial and agricultural activities with a high pollution potential to have a permit. This permit can only be issued if certain environmental conditions are met, so that the companies themselves bear responsibility for preventing and reducing any pollution they may cause.

The other important step was the promotion of recycling, re-use and energy recovery over the disposal of waste. The 1996 Waste Strategy Communication from the European Commission: 1) reinforced the notion of waste hierarchy; 2) re-affirmed the "polluter pays" principle with regard to waste; 3) developed the concept of priority waste streams (European Commission, 2007). Some specific waste streams which had a high environmental impact and their quantities were increasing, for quite a long time had no individual regulations. The reason was the difficulties to organize the funding of recycling despite the clear environmental benefits. During the last years situation changed and resulted in legislation on packaging and packaging waste (Directive 94/62/EC), on

end-of-life vehicles (Directive 2000/53/EC) and on waste electrical and electronic equipment (Directive 2002/96/EC).

The European Commission proposed seven thematic strategies during 2005 and 2006. They address different environmental issues and form a part of new approach to environmental policy-making. The strategies are the main tools implementing the goals established in the Sixth Environmental Action Program (6th EAP) adopted by the Council and Parliament for the period of 2002-2012. The strategies are detailed and cover four main priorities: climate change, biodiversity, health, and resource use. The seven thematic strategies are prepared: air quality, marine environment, sustainable use of resources, waste prevention and recycling, pesticides, soil quality, urban environment. The thematic strategy on prevention and recycling of waste was adopted by the European Commission on 21 December 2005. The aim of the strategy is to reduce the negative impact on the environment that is caused by waste throughout its life-span, from production to disposal, via recycling. This approach means that all sorts of waste should be regarded not only as a source of pollution that must be reduced, but also as a potential resource to be used.

It is necessary to emphasize that waste treatment impacts on human health and environment have been reduced in the latter years due to legal acts. Waste management policy is supported through three recently adopted directives: the directive on integrated pollution prevention and control (IPPC) (2008/1/EC), the landfill directive (1999/31/EC) and the incineration directive (2000/76/EC). These directives allow transitional periods for existing facilities, thus the extent of environmental benefits will be revealed in the future.

At present it can be argued that implementation of the landfill directive is one of the most important ones for the development of waste management policies at national level, promotion of the direction of waste towards recycling and biological treatment. The restrictions on landfilling of biodegradable waste and ban on landfilling of certain types of waste, including liquid wastes and tires also encourage material recycling of waste. Community directives on waste oils (75/439/EEC), PCBs/PCTs (96/59/EC) and batteries (91/157/EEC) directed to better management of these peculiar waste streams, also recycling and recovery targets for packaging, end-of-life vehicles and waste electrical and electronic equipment reduce their amounts in landfills, and thus a negative impact on the environment.

Waste management policy is mainly based on administrative (restrictions, targets, standards, etc.) and economic (taxes, credit schemes, subsidies, etc.) instruments, although a number of informative instruments are currently used in waste management. Tojo, N., Neubauer, A., Brauer, I. (2006) pointed out such tools: 1) eco-labelling schemes; 2) green shopping guides; 3) marking of products and components; 4) information campaigns to residents; 5) information provision to treatment facilities. Referred instruments cover different characteristics and there is no legal obligation to use these instruments: producers decide whether it is appropriate for them to participate in the ecolabelling schemes, municipalities can organize information campaigns to community members on waste sorting, non-governmental organizations can initiate publishing of green shopping guides.

Regardless of the progress made in waste management, there are still some current problems and new tools are needed to resolve them (European Commission, 2007):

1. The legislation on waste adopted by the EU addressed visible problems, such as pollution by incinerators and landfills, and required only limited amounts of information. Waste generation and management, recovery and recycling are complex issues and there is a need for more detailed information on their environmental impacts. For instance, recycling is one of the best solutions for waste management but it is not necessarily the most favourable way, as recycled materials are of lower quality and have limited application, or they replace other less polluting materials.
2. The amounts of waste generated have close links with economic growth. Preventing waste has the potential to reduce the burden on the environment and resource use. As it is impossible to prevent and reduce all wastes immediately, and as different wastes are not equally polluting, policies need to be developed that address the wastes which have the biggest environmental impact.
3. Despite the fact that recycling rates are improving and increasing amounts of energy are recovered from waste, the amounts of recyclable or energy-rich materials that are landfilled or burned in low energy-efficiency facilities are still high and in some cases are not decreasing. Thus there is potential to increase the use of the resources existing in the form of waste and to reduce the need for virgin materials, the extraction and use of which may have environmental impacts.
4. The existing waste management policy model is based on the need for regular controls, in particular on shipments of waste between EU Member States. This model was relevant when only limited environmental controls on the waste management sector and manufacturing industry were used. Now stringent EU environmental standards

are imposed on most of waste management practices, likewise manufacturing industry is also subject to environmental standards. Therefore, excessive control of waste management can have unfavourable effects and limit the recycling and recovery of waste under environmentally acceptable conditions. Thus it is necessary to review the legal framework that applies to waste management activities and focus on new models that are the most appropriate to better recycling markets.

Waste management policy is constantly evolving, taking into account the changes in waste amount, type and composition, as well the real financial potentialities to apply different waste treatment methods. The European Council (meeting in Goteborg, June 2001) concluded that "the relationship between economic growth, consumption of natural resources and the generation of waste must change" (Plan of implementation, 2002). Strong economic performance must go hand in hand with sustainable use of natural resources and levels of waste (Bulletin EU 6-2001). European Union strategy for sustainable development also stresses the need to break the link between the economic growth, the use of resources and the generation of waste.

Waste management statistics

The European Parliament and the Council adopted the regulation (EC) No. 2150/2002 on waste statistics. Regular Member States statistics on the production and management of waste from businesses and households are required by the Community for monitoring the implementation of waste policy. By this means the basis for monitoring compliance with the principles of maximization of recovery and safe disposal is built up. Statistical indicators are necessary for evaluation of compliance with the principle of waste prevention and establishment of links between waste generation data and global, national and regional resource use data. Overall statistical system ensures the comparability of results of waste statistics among Community and enables the assessment of waste management progress/backwardness in the context of other countries.

Data analyzed in this chapter is taken from Eurostat database.

Waste production is usually broken into two large sources: waste from households and waste from different sectors of economy. Households and businesses in the European Union (EU27) produced on average six tones of waste per person in 2006. The "leaders" were Bulgaria with more than 30 tones and Luxembourg with more than 20 tones, while Belgium, Greece, Germany, Spain, Portugal, Slovenia, Slovak Republic, Italy, Cyprus, Czech Republic, Denmark, Lithuania, Hungary, Norway, Latvia did not reach the average level.

Waste produced by municipalities ranged from 294 kg per capita in Czech Republic to 824 kg per capita in Norway in 2007, when an average of the EU27 was 522 kg per capita. Municipal waste in Lithuania reached 400 kg per capita and was less than the EU27 average. Denmark (801 kg per capita), Ireland (788 kg per capita), Cyprus (754 kg per capita), Switzerland (724 kg per capita), Luxembourg (694 kg per capita) generated much more municipal waste than the EU27 average.

Waste produced by households varied from 181 kg per capita in Poland to 576 kg per capita in the Netherlands in 2006, with an average of 423 kg per capita. Households in Italy, Spain, Slovenia and the United Kingdom generated much more waste than the EU27 average. Households in Finland and Malta generated much less waste than the EU27 average. Households in Lithuania produced about 380 kg per capita and did not reach the average. The differences reflect diversity in waste collection organization. In some countries households throw away discarded vehicles, electric and electronic equipment and mineral waste from construction activities and sewage sludge to the same stream, while in other countries specialized services take care of these waste streams. The differences can be explained by the problems in some countries in separating the waste generated by households and municipal waste, which also includes similar waste produced by businesses, offices and public institutions (Kloek, Blumenthal, 2009).

The volume of waste generated by economic activities can be classified into four economic sectors: industry, construction, agriculture and services. Industry and construction produced the highest volume of waste in 2006, together making up 82.7% of all waste produced by economic activities, while services accounted for 11.6% and agriculture for 5.8% of the total waste. Significant differences from averages are observed when analyzing countries' statistics. Some countries reported substantially higher percentage of waste in one of the four sectors comparing with the EU27 averages. Industrial sector generated the largest amount of waste in Romania (95.6%) and Bulgaria (98.7%), substantial volumes of waste from agriculture were in Cyprus (23.5%) and Lithuania (30.5%), while Belgium (36.7%), Denmark (33.4%) and Slovakia (36.7%) declared high volumes from the services sectors, and Malta pointed out 90.3% of its waste to be from the construction sector. For manufacturing waste several EU15 Member States report high rates of recovery and recycling, with landfill rates close to 10%. In the new EU10 this waste is most-

ly landfilled. The observed differences can be explained at least in part by diverse structure of states economy, also by particular management systems used.

Hazardous waste amounts only to 3% of all waste. The manufacturing sector produces about 40% of all hazardous waste generated. The high percentage of hazardous waste was in Estonia (35%) and Norway (8.2%), Bulgaria, Romania and Greece generated the lowest amount of hazardous waste (0.3%, 0.3% and 0.5%), Lithuania – 1.8% of all waste.

Waste recovery in EU27 comprised 44% of waste generated: 4.9% of waste was incinerated, 43.6% recovered and 51.5% deposited in 2006. The largest amounts of waste were landfilled in Bulgaria and Romania (about 98% of their waste), and Sweden, Denmark and Finland incinerated a higher percentage of their waste compared with the EU27 average. Lithuania landfilled about 60%, incinerated about 3% and recovered about 36% of total generated waste.

EU-wide statistics on waste treatment are available only for municipal waste. The proportion of municipal waste sent to landfill has been declining over the years but this has been offset almost completely by the increase in the amount of generated waste and as a result landfill is diminishing only slowly. EU27 average of landfilled municipal waste was 213 kg per capita (41%) in 2007 and decreased by 76 kg per capita compared with 1996. Cyprus had the largest landfilling amounts per capita – 658 kg per capita (87%), Ireland – 467 kg per capita (59%), Bulgaria – 388 kg per capita (83%), Iceland – 380 kg per capita (67%), Lithuania – 368 kg per capita (92%), Turkey – 359 kg per capita (83%), Spain – 350 kg per capita (59%), Slovenia – 342 kg per capita (78%), UK – 324 kg per capita (57%), while Switzerland does not use landfilling since 2007, Germany landfilled only 3 kg per capita (0.5%), Netherlands – 14 kg per capita (2.2%), Sweden – 21 kg per capita (4%), Belgium – 21 kg per capita (4.3%), Denmark – 41 kg per capita (5.1%).

Incinerated municipal waste amounted to 104 kg per capita (about 20% of all generated municipal waste) in 2007 and increased by 38 kg per capita during the last eleven years. Some countries do not use this method of waste management: Bulgaria, Ireland, Greece, Cyprus, Lithuania, Malta, Romania, Slovenia, Turkey, Switzerland, others incinerate very small quantities: Estonia – 1 kg per capita, Poland – 1 kg per capita, Latvia – 2 kg per capita. Completely different situation was in Denmark where 53% of municipal waste were incinerated, Sweden came up to 46%, France – 36%, Luxembourg – 35%, Germany – 34%, Netherlands – 32%, Austria – 30%.

Waste treatment methods differ among countries and depend mostly on economic structure and financial possibilities of a state to introduce environmentally friendly waste management options.

Waste management regulations in Lithuania

Waste management in Lithuania is the priority environmental protection area, importance of which is indicated in the State Environmental Protection Strategy. The Law on Environmental Protection came into force in 1992 (was updated several times) and became the basis for the adoption of any other legislation. Subsequent legislation regulating the use of natural resources and environmental protection had to be adopted on the basis of this Law. The Law on Environmental Protection has placed the responsibility for household waste management on municipalities. The framework for Lithuanian waste legislation was set by the Law on Waste Management in 1998 (updated in 2002) and waste management regulations were accepted in 1999. The waste management regulations contain provisions on waste management plan, registration of waste managers, waste statistics, hazardous waste management and documentation of waste management activities (Ulinskaite, Staniskis, Motiejunas, 2006).

A series of other legal acts were introduced in the recent years: Law on Environment Pollution Taxes (1999) and updated Law on Environment Pollution Taxes (2002) which imposed a fee for products and product packaging, National Hazardous Waste Management Program and Action Plan for 1999-2003, The Rules for Setting Up, Operation, Closure and Aftercare of Waste Landfills and Strategic Plan of the Network of Landfills for Nonhazardous Waste in 2000, Strategic Plan for Recycling of Municipal Waste (2000), Law on Packaging and Packaging Waste (2001) and Regulations on Packaging and Packaging Waste Management (2002), Waste Batteries and Accumulators Management Program (2002), National Strategic Plan for Waste Management that emphasized the importance of the establishment of regional waste management systems (2002), Regulations on End-of-Life Vehicle Management came into force in 2004 and Regulations on Electric and Electronic Equipment and Electric and Electronic Equipment Waste came into force in 2005, State Hazardous Waste Management Program 2006–2008, Asbestos Removal Pprogram (2008) and others.

The development of waste management system in Lithuania was extremely important for the integration into the European space and now Lithuania like other Member States must comply with the EU requirements for waste management. However, the implementation of the EU Directives and series of legal acts requires substantial investment, which would

have been unbearable burden on the Lithuanian economy without EU assistance.

EU support for Lithuania's waste management activities in 2000-2006 was derived through ISPA, Cohesion Fund, structural funds. ISPA (Instrument for structural policies for preaccession) support for waste sector (2000-2003) went to implementation of the most expensive EU directives, to realization of "polluter pays" and sustainable development principles, construction of regional landfills and closure of old landfills and dumpsites, construction of civic amenities sites, establishment of composting sites, building up the transfer stations, development of hazardous waste management infrastructure etc. ISPA support during this period of time was approved for 8 projects and total value amounted to about 97 mln. Euro.

Cohesion Fund support in waste sector (2004-2006) was granted for 3 projects, and total value of the projects was about 51 mln. Euro. ISPA project "Hazardous Waste Management in Lithuania" (2003) was supplemented with a new component "Treatment of Past Pollution" in 2006. The value of this component amounts to 10 mln. Euro.

Structural funds (European Regional Development Fund) supported management of polluted areas and their clean-up or / and re-cultivation, purchasing of relevant equipment, education and information of society, introduction of measures to enhance the accessibility to information sources, creation of environmental management information systems, introducing training programs and etc. (Zidonyte, Maciulyte, 2007).

Hazardous waste management

Diplomatic efforts to achieve international and/or regional hazardous waste management agreements and treaties are continuously preoccupied with clarifying each participating government's notion of what wastes are being discussed. Some nations work with highly sophisticated definitions, others simply resort to the rationale that any chemical that is discarded is a hazardous waste (Blackman, 2001). At present hazardous waste is defined as waste that is dangerous or potentially harmful to people's health and/or the environment. Hazardous wastes can be liquids, solids, gases, or sludge. They can be discarded commercial products, such as cleaning fluids or pesticides, or the by-products of manufacturing processes.

Generators of hazardous waste are usually divided into three categories: households, commercial activities and industry. Different regulations are applied to each category of generators. Hazardous waste is typically the subject of special registration and requires special management arrangements to ensure that hazardous waste is kept separately and treated differently from non-hazardous waste. The main methods of management of hazardous waste are recycling, incineration, physical or chemical treatment, storage and landfill. Relatively high proportion of hazardous waste is recycled or burned as a fuel. When hazardous materials are mismanaged or poorly managed, they have the potential to cause much greater damage to the environment and human health than the non-hazardous waste (Valstybine pavojingu atlieku tvarkymo programa, 2006).

In recent years considerable attention in Lithuania was given to waste management policy and practical actions – waste collection, recycling and disposal systems were rapidly developing. The development of waste management infrastructure is encouraged by European Union financial support, the improving responsibility of producers and importers for waste management (Baltrenas, Zigmontiene, 2009).

Hazardous waste amounts only to 3% of all waste in the EU and about 1.8% in Lithuania (Kloek, Blumenthal, 2009). Lithuania's economy generates from 100 to 160 thousand tones of hazardous waste per year. In order to ensure the responsible management of hazardous waste, National Hazardous Waste Management Program and Action Plan for 1999-2003 was adopted, some years later State Hazardous Waste Management Program for 2006–2008 started.

In 2003, Lithuania has developed the project "Hazardous Waste Management in Lithuania", which has been recognized by the European Commission as eligible and is financed from the Cohesion Fund. The total value of the project is 28 mln. Euro, 73% of which is the EU support. This project is a part of long-term hazardous waste management program in Lithuania, and consists of the following main components: construction of hazardous waste incineration facilities, construction of hazardous waste landfill, and closure of leather industry landfill (closing works already started).

After a certain time the detailed assessment of situation in hazardous waste management indicated that pesticide waste treatment is still uncompleted, about 2 thousand tones of hazardous waste are stored at bankrupt enterprises, therefore the modification of application of "Hazardous Waste Management in Lithuania" was submitted to the Cohesion Fund. After the European Commission's decision CCI20036/LT/16/P/PE/017 of 2006 06 29 the project application was supplemented by the fourth component "Liquidation of past pollution". The main goal of this part is to finance collection and treatment of pesticides, put in order contaminated sites and warehouses, handle hazardous waste in bankrupt enterprises.

At present Lithuania has no officially operating hazardous waste incineration plants, only JSC "Akmenes cementas" uses scrap tires as fuel. It is planned that the incineration plant shall start its operation in the beginning of 2010. The regional hazardous waste storage site was constructed in Siauliai in 2001; similar storage sites are constructed in Alytus, Klaipeda and Vilnius. The biggest amount of hazardous waste is stored until the incineration plant and landfill for hazardous waste will start to operate. With reference to a pyramid of waste hierarchy, the prevention and reduction of waste is given priority, then goes its reuse and recycling and last but not least is the optimization of its final disposal. The prioritization of hazardous waste management is possible only if it is economically efficient (Ulinskaite, Staniskis, Motiejunas, 2006). The case study made by T. Spengler and W. Stolting (2008) has shown that remanufacturing turns out to be a profitable recycling option for capital goods of higher value. Its advantageousness mainly depends on the realization of high amounts of returned products, on the condition of the returned products and on the stability of the secondary market. The implementation of incentive systems in order to influence product return is an option to support product take-back and to reduce uncertainties regarding amounts and conditions of returned products (Spengler, Stolting, 2008). Therefore, the last part of the paper deals with the economic effects gained in scrap tires recycling.

The effects of scrap tires recycling

The management of scrap tires in Lithuania varies due to the regulations imposed by the EU. The recycling of scrap tires began only in 2004, while their incineration for energy production – in 2006. Landfill Directive (1999/31/EC) imposed a ban on all landfilling of scrap tires in 2003, and on landfilling of cut scrap tires in 2006, exception was made only for tires that are used for engineering-structural purposes. In Lithuania landfill disposal is forbidden since 2000. Accordingly for several years the primary method of scrap tires management was storage.

The amount of scrap tires is about 15 thousand tones per year, which makes 5 kilograms per capita, while developed countries generate more scrap tires – 95 kilograms per capita. Economic growth and improving living standards in the future may result in 30 thousand tones of scrap tires, while the available capacity in 2006 allowed organizing processing of more than 48 thousand tones of such waste per year, and in the foreseeable future they may increase to 70 thousand tones. Lithuania has sufficient capacity to recover and recycle all waste tires (Aplinkos bukle, 2006).

Currently, 5 companies are registered as operators in scrap tires recycling sector: JSC "Metaloidas" (mechanical processing), JSC "Dormeka" (primary crushing and use in Lithuania), JSC "Kuusakoski" (primary crushing and export), JSC "Ekoela" (thermolysis), JSC "Torgita" (mechanical processing). In fact, only JSC "Metaloidas" works in recycling sector, as JSC "Kuusakoski" and JSC "Dormeka" have facilities for primary crushing only.

JSC "Metaloidas" recycles scrap tires since 2004, when the first processing line started to operate, the second line was launched in 2006, and this extended the company's mechanical processing capacity to 11 000 tones per year. Reprocessed raw material (rubber granules) is sold in Lithuania and abroad, and in 2007 the company started producing rubber pads by using rubber granules obtained by recycling scrap tires. As JSC "Akmenes cementas" uses scrap tires as fuel, both companies recover more than a half of all imported tires.

Environmentally friendly recovery of tires is a difficult technological process as a tire is complex rubber product reinforced with steel wire and cotton cloth (Silvestraviciute, Sleinotaite-Budriene, 2002), but experience gained by JSC "Metaloidas" ensures the safe production and benefits for company, importers and environment.

The economic analysis of companies' activity shows that recycling of scrap tires was profitable during the analyzed period (see Table 1).

Table 1

Key performance indicators of JSC "Metaloidas"

Indicator	2005	2006	2007	2008
Recycled tires, t	5680	10421	10102	10436
Sales revenue, LTL	3 265 000	4 582 000	5 920 000	7 381 000
Cost price net, LTL	2 305 000	3 182 000	4 621 000	5 662 000
Net profit, LTL	574 000	778 000	550 000	769 000
Net profit per tone, LTL	101.1	74.6	54.4	73.7
Equipment use, %	99.7	99.9	99.9	99.7

The amount of recycles tires increased in 2006 when the second recycling line was launched and remained stable in all subsequent years. Net profit per tone varied and was the lowest in 2007, but reached the level of 2006 in 2008. Equipment has been full-time loaded, so the increase of recycling amounts can be realized only by the acquisition of new equipment line.

Table 2

Profitability indicators of JSC "Metaloidas"

Indicator	2005	2006	2007	2008
Gross sales profitability, %	29.4	30.6	21.9	23.3
Operating profitability, %	23.7	25.8	18.1	20.1
Net sales profitability, %	17.6	16.9	9.3	10.4
Return on capital, %	38.8	34.5	19.6	21.5
Asset profitability, %	8.6	10.7	8.1	10.6

The company achieved high profitability results during the review period. Gross sales profitability exceeded 20% and net sales profitability passed 10% threshold (with exception in 2007). Net sales profitability in the period under investigation fell by 7.2% because of increase of financial investment (interest on loans for equipment purchase).

Importers of tires have special tasks for scrap tires recycling/recovery and it amounts to 80 percent of weight. If determined quantity of tires is given back to waste handlers, importers have tax exempt (exempt from tax on taxable goods).

Table 3

The benefits gained by importers in the case of tires processing 2005-2008

Indicator	Imported tires, t	Recycling task, t	Pay for JSC "Metaloidas", Lt	Tax on taxable goods, Lt	Benefit of recycling, Lt
JSC "Lytagra"	5605.9	4484.7	1 031 481	2 018 115	986 634
R. Ragausko company "Autokamera"	4198.4	3358.7	772 501	1 511 415	738 914
JSC "Nevetas"	2476.6	1981.3	455 699	891 576	435 877

Examples given in the table show that the analyzed company "Lytagra" gained 986 634 LTL because of scrap tires delivered to recycling company, "Autokamera" saved 738 914 LTL and "Nevetas" saved 435 877 LTL. During the period of 2005–2008 JSC "Metaloidas" reprocessed 3 663 924 tons of scrap tires, receipts for admission (50 LTL per tone) and recycling (180 LTL per tone) amounted to 8 427 025 LTL. As recycling also generates waste, the cost for residual landfilling made up 164 600 LTL and in total, "Metaloidas" earned 8 262 425 LTL. Companies that delivered scrap tires for recycling saved 8 060 615 LTL. as they were exempted from tax.

In summary it can be argued that state grants, such as tax exemptions for the proper management of product waste, supports companies and encourages better waste management, herewith provides the opportunity to develop profitable waste recycling business.

Conclusions

1. Legal national measures to control and manage waste evolved from ordinary rules of safe waste disposal to strict regulations for disposal options for specific types of waste. Progress in waste management legislation is associated firstly with the need to better protect society and the environment from the adverse effects, and secondly with the need to create a legal environment enabling treatment of waste as substantial resource.
2. Diverse legal ways of waste treatmen result in different waste management options in Member States. The ways of waste treatment mostly depend on economic structure, financial potentialities, and habits. Herewith EU Directives impose the tasks on particular waste streams and restrictions on particular waste management options, ensuring the safety inside and outside the state.

3. Hazardous waste management regulations are stricter, therefore treatment of such waste is more expensive than that of non-hazardous waste. This factor initiates prevention of hazardous waste, reduced use of hazardous materials, use of less dangerous substances, replacement of hazardous products by non-hazardous ones. As it is very complicated to prevent and reduce all sorts of waste simultaneously, new waste management instruments need to be directed at wastes that have stronger impacts on environment.
4. Environmental tax on waste products increased producers' and importers' responsibility and enlarged expenses of treatment of waste products. Economic calculations showed that company's expenses on scrap tires recycling are twice lower than the amount of waste product tax. State grants such as tax exemptions reduce the costs of waste management and creates favourable conditions for the recycling business.

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S. Žičkienė

Atliekų valdymo politika: pavojingų atliekų tvarkymas

Santrauka

Straipsnio ***tikslas*** – išanalizuoti atliekų tvarkymo įstatymų raidą išskiriant pavojingų atliekų tvarkymo juridinius aspektus ir įvertinti pavojingų atliekų (panaudotų padangų) perdirbimo naudą.

Išteklių naudojimo gamybos procesuose ir nacionalinėje ekonomikoje rezultatai dažniausia tiriami finansinių sąnaudų ir fizinių panaudotų išteklių apimčių aspektu. Deja, tiesioginiai ir netiesioginiai išteklių naudojimo poveikiai globaliai ir lokaliai aplinkai vis dar nepakankamai siejami su naudojamais gamybos procesais ir ekonominės žalos mastais (Bargigli, 2003). Ūkinės veiklos ryšius su aplinka atskleidžia S. N. Bobiliov sukurtas „juodosios dėžės“ modelis, kur gamtos ištekliai, patekę į „dėžę“, virsta gatava produkcija bei atliekomis ir teršalais, kurie ilgainiui

vėl yra sugrąžinami į aplinką (Bobiliov, 1994). R. U. Ayres ir U. E. Simonis minėtą procesą pavadino „industriniu metabolizmu“ (Ayres and Simonis, 1994).

Poveikio aplinkai mastai, specifika ir pobūdis, vystantis industrinei visuomenei, pakito, aplinkos problemos tapo sudėtingesnės, gilesnės, visuotinės. Išskiriamos tokios reikšmingiausios aplinkos problemų pasikeitimų kryptys: 1) lokalinės problemos tapo globalios; 2) specifinės problemos virto difuzinėmis; 3) trumpalaikės problemos tapo ilgalaikės; 4) paprastos problemos transformavosi į sudėtingas (Karlson, 1997; Cairns, 2002; Kinne, 2003). Besikeičiantis aplinkos problemų pobūdis reiškia, kad išteklių naudojimo, atliekų susikaupimo ir aplinkos išsaugojimo klausimai yra sudėtingai susiję su visuomenės socialiniu ir ekonominiu gyvenimu ir reikalauja politinio reguliavimo.

Aplinkosauginis reguliavimas sukėlė daug diskusijų dėl papildomų investicijų aplinkos apsaugos reikalavimams įgyvendinti ir įmonių galimybių investuoti bei investicijų įtakos įmonių konkurencingumui. Atliktos mokslinės studijos, susijusios su ekonomine nauda integruojant aplinkosaugos problemas į įmonių valdymo funkcijas (Pearce, Barbier, 2000; Staniškis, Stasiškienė, 2003; Staniškis, 2005; Staniškis, Stasiškienė, 2006; Bresciani, Oliveira, 2007), taip pat analizuojamos priežastys, verčiančios įmones paklusti aplinkosauginiam reguliavimui (Vastag et al., 1996; Pearce and Barbier, 2000). Mokslininkai nemažai dėmesio skiria suinteresuotų grupių įtakos, keičiant įmonių aplinkosauginę elgseną, analizei (Pearce, Barbier, 2000; Thompson, Strickland, 2001; Banerjee, 2002; Hibbitt, Kamp-Roelands, 2002) ir „aplinkosauginės“ reputacijos kūrimui (Toms, 2002; Rondinelli, Berry, 2000; Jansson et al., 2000; Banerjee, 2002). Kiti mokslininkai dėmesį sutelkia į atskirų atliekų srautų tvarkymo specifikos tyrimus (Silvestravičiūtė, Šleinotaitė-Budrienė, 2002; Ulinskaitė, Staniškis, Motiejūnas, 2006; Savage, 2006; Juškaitė-Norbutienė, Miliūtė, Česnaitis, 2007; Unger, Schneider, Salhofer, 2008; Baltrėnas, Zigmontienė, 2009), analizuoja atliekų tvarkymo būdus, naudojamas technologijas, įrenginius (Čepinskis, Jankauskas, Ubartas, 2001; Židonytė, Mačiulytė, 2007; Salhofer, Wassermann, Binner, 2007), integruoto atliekų valdymo klausimus (McDougall, White, Franke, Hindle, 2001; Clark, 1993; Staniškis, 2004; Luoranen, Horttanainen, 2008), atlieka gaminio gyvavimo ciklo tyrimus (Česnaitis, 2007; Spengler, Stölting, 2008).

Aplinkos įstatymams, taip pat atliekų tvarkymo reglamentavimui gana ilgą laiką ES įstatimdavystėje nebuvo skiriamas pakankamas dėmesio. Tai galima paaiškinti keletu priežasčių: pirma, stengtasi pasiekti ekonominės gerovės, tik po to imtis spręsti aplinkos problemas; antra, atliekų tvarkymo juridinio reglamentavimo pobūdis paliečia daugelio interesus: įmonių ir namų ūkių, nes nuo jo priklauso atliekų tvarkymo išlaidos; savivaldybių, kadangi jos įpareigojamos organizuoti atliekų tvarkymo sistemas, rengti atliekų tvarkymo planus; vyriausybės, nes ji prisiima atsakomybę dėl ES direktyvų, tarptautinių susitarimų įgyvendinimo. Ilgą laiką atliekos buvo traktuojamos kaip neigiamas reiškinys, našta aplinkai ir ekonomikai, tačiau išplėtojus reguliacinius mechanizmus ir atliekų tvarkymo technologijas, atliekos pradėtos vertinti kaip išteklius, o atliekų tvarkymo veikla – visų pirma naudojimas ir perdirbimas – kaip verslas kuriantis naujas darbo vietas ir mažinantis neigiamą poveikį aplinkai.

Pirmieji ES žingsniai atliekų tvarkymo srityje buvo daugiausia skirti skirtingoms atliekų rūšims ir jų perdirbimui, o bendrosios atliekų tvarkymo ES nuostatos įtvirtintos Pagrindų direktyvoje 75/442/EEB dėl atliekų. Atnaujinus šią direktyvą 1991 m., ji suteikė teisinį pagrindą reglamentuojant atliekų vengimą, valdymą ir tvarkymą, kaip buvo nustatyta 1989 m. Europos Komisijos Atliekų valdymo strategijoje. Galima teigti, kad iš esmės visa ES valstybių narių teisė atliekų srityje yra paremta ES teise. Valstybės narės nustato ir vykdo savo strategiją atliekų srityje, atsižvelgdamos į savo prioritetus ir laikydamosi ES nustatytų ribų ir užduočių.

Atliekų tvarkymo sistemos tobulinimas buvo svarbus Lietuvos integracijos į ES aspektas ir dabar Lietuva, būdama ES nare, privalo laikytis ES reikalavimų. ES direktyvų ir kitų teisės aktų įgyvendinimas susijęs su didelėmis finansinėmis investicijomis, todėl be ES paramos juos įgyvendinti būtų labai sudėtinga. ES parama Lietuvai atliekų tvarkymo srityje 2000–2006 m. buvo vykdoma naudojant ISPA, Sanglaudos fondo ir struktūrinių fondų lėšas.

Pastaraisiais metais atliekoms tvarkyti Lietuvoje skiriama daug dėmesio: sparčiai plėtojamas atliekų surinkimas, perdirbimas ir šalinimas. Atliekų tvarkymo infrastruktūros plėtrą skatina ne tik ES finansinė parama, bet ir gamintojų bei importuotojų atsakomybės už atliekų tvarkymą didinimas.

Tačiau problemų pakanka: jos susijusios ne tik su antrinių žaliavų surinkimo užduočių vykdymu, bet ir su pavojingų atliekų tvarkymu. Pavojingos atliekos Lietuvoje sudaro apie 1,8 proc. viso atliekų kiekio (ES vidurkis – 3 proc.), t. y. apie 100–160 tonų kiekvienais metais. Siekiant atsakingai ir saugiai tvarkyti pavojingas atliekas, parengta Pavojingų atliekų tvarkymo programa 2006–2008 m.

2003 m. gautas finansavimas projekto „Pavojingų atliekų tvarkymas Lietuvoje“ vykdymui. Šis projektas yra ilgalaikės (20 m.) pavojingų atliekų tvarkymo programos Lietuvoje dalis, kurią sudaro šie pagrindiniai komponentai: pavojingų atliekų deginimo įrenginio statyba, pavojingų atliekų sąvartyno statyba, odų pramonės atliekų sąvartyno uždarymas, praeities taršos sutvarkymas.

Naudotos padangos yra viena pavojingų atliekų rūšių, jos Lietuvoje tvarkomos deginant, t. y. naudojant kaip kurą (AB „Akmenės cementas“), perdirbant (UAB „Metaloidas“, UAB „Dormeka“, UAB „Kuusakoski“, UAB „Ekoela“, UAB „Torgita“), dalis padangų sandėliuojama ir saugoma. Ekologiškai švarus padangų sutvarkymas yra sunkiai sprendžiama technologine problema, nes padangos yra sudėtingas gumos gaminys, armuotas plienine viela ir medvilniniu audiniu. Realiai padangas perdirba tik UAB „Metaloidas“, nes UAB „Kuusakoski“ ir UAB „Dormeka“ jas tik smulkina.

Naudotų padangų perdirbimo ekonominiai rezultatai analizuoti remiantis UAB „Metaloidas“ veiklos rodikliais. Įmonė naudotas padangas perdirba nuo 2004 m., maksimali perdirbimo apimtis – 11 tūkst. tonų per metus. Visu analizuojamų laikotarpiu (2005–2008 m.) įmonės veikla buvo pelninga. Grynasis pardavimų pelningumas svyravo nuo 17,6 proc. 2005 m. iki 9,3 proc. 2007 m., 2006 m. siekė 16,9 proc., o 2008 m. – 10,4 proc. Grynojo pelningumo sumažėjimą lėmė išaugusios finansinės investicinės

veiklos sąnaudos (įmonė skolinosi iš banko lėšų antrajai perdirbimo linijai įsigyti). Įrengimų apkrovimas visą nagrinėjamą laikotarpį viršijo 99 proc., tai rodo, kad perdirbimo apimčių didinimas galimas tik plečiant techninę bazę. Įvertinus naudą, kurią gauna įmonės, pristačiusios naudotas padangas perdirbimui, nustatyta, kad mokestis UAB „Metaloidui“ už atliekų priėmimą (50 Lt / t) ir perdirbimą (180 Lt / t) yra beveik du kartus mažesnis nei „gaminio mokestis“ valstybei. Tuo atveju, kai padangos yra pristatomos perdirbimui, įmonė moka tik už 80 proc. importuotų padangų, kai mokestis valstybei mokamas už visas įvežtas padangas (360 Lt / t).

Per 2005–2008 m. UAB „Metaloidas“ perdirbo 36 639 24 tonas naudotų padangų. Už padangų priėmimą ir perdirbimą uždirbo 8 427 025 Lt pajamų. Įvertinus perdirbimo metu susidariusių atliekų šalinimo sąvartyne išlaidas (164 600 Lt), įmonė uždirbo 8 262 425 Lt pajamų (neįvertinus pajamų už parduotą produkciją). Įmonės importuotojos įvežė į Lietuvą 45 799 tonų padangų. Mokestis už aplinkos teršimą prilygtų 6.487.640 Lt, sutvarkiusios 80 proc. naudotų padangų įmonės buvo atleistos nuo mokesčio ir sumažino išlaidas 8 060 615 Lt. Galima teigti, kad valstybė, suteikdama mokesčio už aplinkos teršimą lengvatą įmonėms, importuojančioms padangas, kartu jas remia ir skatina tvarkyti padangų atliekas, mažinti neigiamą poveikį aplinkai ir gyventojų sveikatai, kartu suteikia galimybę sėkmingai plėtoti atliekų tvarkymo verslą, kurti naujas darbo vietas.

Prasminiai žodžiai: aplinkos politika, atliekų vadybos įstatymų leidyba, atliekų vadybos taisyklės, pavojingų atliekų apdorojimas, pavojingų atliekų perdirbimas.