PERIODICA POLYTECHNICA SER. SOC. MAN. SCI. VOL. 13, NO. 2, PP. 181–192 (2005)

ALTERNATIVES FOR THE GOVERNMENTAL POLICIES OF THE SUSTAINABLE WASTE MANAGEMENT IN HUNGARY

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Received: Sept. 12, 2005

Abstract

The most fashionable political slogan of present environmental protection is without doubt sustainability and sustainable development. There cannot be any international agreement, European Union policy or Hungarian act without mentioning or referring to the principle of sustainability. Science at the same time is trying to fill this notion with a theoretical and practical content with all available instruments, in order to be able to provide a designable and measurable professional background for environmental policy planning, implementation of regulatory instruments and the monitoring of human activity. The present article is looking for the answer to the question by analysing mostly Hungarian but partly European waste management regulation, what kind of so far not exploited regulation opportunities are available in order to realize a sustainable waste management practice.

Keywords: sustainability, waste management, governmental policies, waste tax.

1. The Interpretation of Sustainability in the Field of Waste Management

Although it is not the direct purpose of the present paper to give a precise and final definition for sustainability (to close the debate about this topic), naturally it is still necessary to define the notion – at least as a working hypothesis – in order to assess the efficiency of governmental interventions from the aspect of sustainability.

In the common sense, waste management is the treatment of solid or possibly liquid by-products and used products of consumption and production, without causing environmental damages. In wider sense, however, waste management cannot be separated from other elements of the material converting activity of the economy. *Fig. 1* shows the simplified scheme of the material converting activity of the economy.

Fig. 1 shows, among others that the distinction of waste from other by-products (air and water pollution, noise) is rather arbitrary, but apparently serves the administrative efficiency of legal and scientific work. It can also be seen in the figure that besides the problems related to returning waste and other pollutants to the environment there is another confrontation point of the economy-environment relation, namely the exploitation of natural resources (shrinkage of stocks and the often extensive pollution caused by the exploitation).

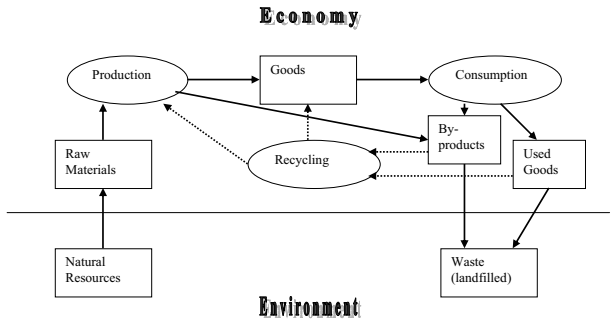

Fig. 1. Material Flow Scheme of Human Activities

It can be a major conclusion that although usually only the lower left-hand corner of the figure is considered as waste management (waste management = what should be done with used products), it can be necessary to intervene at any point of the material conversion chain in order to solve waste management problems efficiently. Governments accordingly usually apply regulations or economic incentives that concern the waste already produced. Technological specifications of landfills or waste burning plants or regulation (obligatory recycling ratio) and incentives (product fee) of recycling belong to this type of regulatory instruments for instance. We can find less instruments that try to intervene at early stages of the material usage chain (e.g. natural resource extraction taxes).

We suggest using the following sustainability criteria that are only hypotheses and not proved in the framework of this article because of space limitations:

1. The optimal (that is sustainable) level of waste generation is the quantity of waste, for which it is true that the marginal cost of waste management equals marginal cost of waste generation prevention, if both marginal costs include all external costs.
2. The optimal (that is sustainable) rate of possible waste management techniques (recycling, burning, landfill) is determined by considering which type of management technique has a minimal marginal cost in case of different Q_i waste quantity units if external costs are also included.

We consider a waste management system sustainable if both of these criteria are fulfilled at the same time.

2. Alternative Opportunities to Support the Realization of Sustainable Waste Management

With the help of the logic demonstrated in *Fig. 1* it is easy to categorize the possible measures of waste management to achieve social optimum (see *Table 1*) by the point of intervention on the material use chain.

Table 1. Waste management regulatory measures

Point of intervention:	Regulatory measures (examples):
Natural resource exploitation (mining, logging etc.)	Resource tax (rent) Quality control of exploitation (quota system)
Conversion of raw materials into products (production)	Best Available Techniques (BAT) Integrated Pollution Prevention and Control (IPPC) Waste Tax / Advanced Disposal Fee (ADF)
Recycling	Product Charge Subvention of investment in recycling Mandatory Recycling Targets
Waste burning	Emission norms Burning Tax
Landfill	Quality Standards Landfill Tax

Direct regulations are dominant for waste management planning and regulation in Europe and also in Hungary. In case of hazardous waste there is only direct regulation while there are more and more economic instruments in the case of non-hazardous waste management regulation.

Economic measures are also applied in Central Eastern European countries. The most common measures are naturally user fees, those instruments that make the waste producers pay the cost of waste collection, transport and disposal. Some countries apply deposit on beverage containers and products fees on e.g. batteries and accumulators.

Theoretical research (PALMER and WALLS, [13]; FULLERTON and KINNAMAN, [8]) shows that input-side regulation is appropriate to set the optimal share of primary and recycled raw materials in case of a given output or waste quantity, but these measures are not useful to optimize the quantity of waste. The optimal level of waste generation can only be obtained by a policy that combines the above-mentioned measures with product taxes (product fees) or subsidy (subvention of environmentally friendly products). In most cases the common application of product taxes and the subvention of recycling is the most advantageous solution. The common application of product taxes and tax allowance of investment in recycling and the taxation of primary raw materials are also suggestible. The regulation of recycling rates with norms is considered to be the less effective solutions. Subvention is furthermore especially reasonable where there is a danger of illegal waste deposal because of low willingness to pay.

In spite of this, as a consequence of the EU directive on packaging and packaging waste, the recycling rate regulation has become widespread and obligatory in EU member states including Hungary.

It is apparent that the contradiction between the recommendations about regulatory forms considered optimal by scientists and actual regulatory practices implemented by governments is becoming more and more obvious. Consequently, as inefficient regulation will not result optimal waste management practice (or only accidentally), there will be a contradiction between stated political aims of governments and actual results of governmental arrangements, too. The development of a sustainable waste management system is therefore hindered by governments as well (among several other factors).

3. Opportunities of a Possible Alternative: the Implementation of Waste Tax in Hungary

We investigate in the present article whether there is a realistic alternative of suboptimal regulatory measures. We analyse the implementation possibilities of a Pigovian tax on the basis of the landfill tax applied in several countries but it would also be imposed on wastes disposed of in waste burning plants. The basis of the discussed tax would be the quantity of by-products not prevented or recycled and used products (waste) not considering whether it is disposed of in landfills or through burning. (The rate of tax naturally could – or in order to reach the optimal solution should – depend on the way of disposal.)

3.1. European Experience of Landfill Tax

Landfill tax has become a more and more widely used measure in Western Europe. In 2001–2002 nine (old) EU member states applied landfill tax, with a total of 1.7 billion EUR income. It is a good indication of the development that while in 1990 only two countries applied landfill tax, it was introduced in seven further countries between 1992 and 2000 (EEA, [7]).

The implementation was explained by several motives: intent to motivate the reduction of waste flow to landfills, the promotion of prevention and recycling, the consideration of external costs of landfill and the generation of additional incomes for the budget. The latest assessments have found that the effect of landfill tax on the quantity of household solid waste is quite questionable, landfill taxes still function as price indicators and incentives to develop a more sustainable waste management practice.

The aim, operational theory, practice and amount of landfill tax are very variable and there are significant differences between various landfill taxes.

The general aim of landfill tax is to internalize the environmental costs of landfill. Furthermore, in Denmark and the Netherlands landfill tax is part of the green taxation system and contributes as an income to the replacement of other, primarily employment-related taxes. In Austria and Switzerland the income is used to the elimination of pollution caused by old, improperly built and operated landfills.

Table 2 shows EU member states where landfill tax is applied by the ratio of the tax. The highest tax on waste is imposed in the Netherlands. The tax can be different based on the type of waste as in Italy or Great Britain or unified as for instance in Sweden.

In Denmark and in (the non-EU member) Norway there is a tax imposed also on burnt waste. In Austria the ratio is different depending on whether the burning plant has a system to recover energy from landfill gas or not.

Table 2. Landfill tax rates in EU member states

Landfill tax (/t)	Member States
21 – 80	Denmark The Netherlands Sweden
5–20	Austria Belgium Finland France Great Britain Italy
Not applied	Greece Ireland Luxemburg Germany Spain Portugal

We have detailed experience about French, Austrian and British landfills based on ECOTEC (2001) and OECD (2004) studies.

In France the tax was implemented in 1993 and the operator of the landfill has to pay it after the quantity of household solid waste and mixed industrial waste (deposable together with settlement waste). There is no landfill tax on recycled and burnt waste.

There had been no calculation of externalities, planning or ex-ante analysis in order to set the tax rate until 2002. When implementing the landfill tax the quantity recycled was simply expected to increase with the increase of landfill cost. The tax was 3.05 EUR/ton when it was introduced and as high as 9.15 EUR/ton in 1999. It is 12–15% of landfill cost without taxation, that is, the tax results an increase of landfill cost of about 12–15%.

As a result of the implementation of the tax the quantity of settlement waste did not decrease but the volume of non-hazardous industrial waste started to decrease slowly, as industry realized all waste prevention techniques with lower marginal cost than the marginal cost increase caused by the tax. After the implementation of

the tax in the following four years the quantity of landfilled waste decreased only by 4%. The reduction potential in case of settlement waste would have been low also because in France relatively few settlements apply volume-based waste collection fee system. It was another 'adverse affect' that the landfill tax became an element of the unified emission tax system that enables the reduction of value added tax in some cases. The common effect of landfill tax and reduced value added tax was not investigated (ECOTEC, 2001).

In Great Britain landfill tax was implemented in the October of 1996. The tax was determined based on the estimation of externalities of waste. The amount of tax was 7 pounds (approximately 10.5) per ton at the beginning, by April, 1999 the tax was 10 pounds (16) and it was decided to increase it to 15 pounds (24) by 2004.

The effect of the tax was various in different regions because landfill fee is very variable ranging from 8 to 20 pounds. It means that in some regions the cost of landfill was doubled because of the tax. The main expectation was that as a result of the implementation of tax, more waste would be disposed by burning as there was no environmental tax imposed on that. The tax did not significantly reduce the volume of waste because English households usually do not pay a volume-based fee for waste collection and disposal.

Similarly to French experiences the implementation of landfill tax did not decrease the volume of settlement waste. The rate of recycling increased though from quite a low starting point. The actual effect of the tax was the reduction of landfilled industrial waste in Great Britain, too. The volume of landfilled construction and demolition waste significantly decreased (ECOTEC, 2001; OECD, 2004).

In Austria the landfill tax (*Altlastenbeitrag*) was implemented in 1989 and it is an important element of waste management regulation in spite of that in 1999 only 28.5% of solid household waste landed in landfills. The amount of tax ranged from 7.2 /ton (demolish waste in 'modern' landfills) to 65 /ton (other waste in 'unmodern' landfill) and its average level is the double of the British tax for instance.

They did not investigate the effect of the higher waste fee because of the tax on the volume of generated waste. What is sure is that in the decade of 1990s the volume of waste decreased continuously. Within this the volume of solid settlement waste decreased, recycling rate reached 50% and the share of burning rose from 6 to 16%. It is not clear, what was the role of landfill tax in the increase of utilization, as other very effective measures were also applied to serve this aim (packaging directive, biomass directive, landfill directive, awareness programmes). It seems sure however, that the significant difference in tax rates for 'modern' and 'unmodern' landfills has contributed to the modernization of landfills. While in 1996/97 21 landfills did not satisfy the requirements of BAT, in 1999 there were only 4 such landfills (ECOTEC, 2001).

Based on the experience of EU member states so far, we can state that:

Landfill taxes can be implemented relatively easily, they are general in EU member-states. The basis of the tax can unambiguously be determined, transaction costs are not high and environmental goal can clearly be demonstrated.

The most important effects of the tax are cost internalization ('polluter pays

principle') and income generation. The amount of landfilled waste was not significantly reduced so the incentive function was not detected, especially not in states where there is no volume-based waste collection fee system (as in case of France and Great Britain). In those countries where the amount actually decreased, other measures were also applied, so the effect of landfill tax is not clear (Austria).

The income generated by landfill tax is relatively stable (because of the low incentive effect) therefore such an environmental fee can generate resources for important and urgent state tasks in the short run, primarily for the elimination of past pollutions, recultivation of wrongly built landfills and in the long run – presuming that the planning of environmental expenditures will not be based on the 'remainder principle' – it can be an element of an ecological tax reform package (that is the reduction, replacement of other environmental taxes).

There was no significant macroeconomic effect registered in any state, that is, non of the landfill taxes had any significant effect on the inflation, the number of workplaces or the competitiveness of effected products.

3.2. The Operation Theory of Waste Disposal Tax

According to environmental economics the optimal rate of waste landfill or burning tax equals marginal social external cost of landfill. If the tax is lower, the level of waste generation will be higher than the social optimum. In the reverse case, the volume of generated waste would decrease so much, that the cost of prevention will be higher than the environmental damage would have been caused by more waste. Both divergences from the optimum cause social inefficiency that is pose extra burden on the society by avoidable environmental damages or too high cost of pollution reduction technologies.

The two main elements of regulation planning are the determination of optimal pollution (in our case: waste) emission and the selection of measures which this optimum can be reached the most effectively with.

There has been no comprehensive analysis of waste management externalities in Hungary so far, therefore we primarily use European data, surveys. In the following table we summarize European waste externality estimates.

As the methodology of the Coopers&Lybrand/CSERGE (1997) survey was obviously conservative, we will rather use the other two sources as the basis of our calculations. The external cost of landfill is 9.5–20 /ton, while that of burning is 43–77 /ton. Considering the difference between the EU average of national income and Hungarian we estimated the external cost of landfill as high as 1450–3000 HUF/ton and in case of burning we can calculate with 6500–11500 HUF/ton external cost. The median in case of landfill is 2250 HUF/ton while in case of burning 2500 HUF/ton, that is practically the same value is calculated.

So the optimal tax level is somewhere between 1500 and 2500 HUF/ton. This result correlates well with the tax amounts applied in EU Member States that are mostly between 5 and 20 /ton (that is 1300–1500 HUF/ton calculating with 260 HUF/EUR exchange rate).

Table 3. External costs of waste management (EUR/t waste) (based on [10])

External costs			
Technology	European Commision (2000)	SEDEE et al. [14]	COOPERS et al. [3]
Burning with energy recovery	−43–77	18	−24.8* 14.6**
Burning without energy recovery	N.A.	30	N.A.
Landfill	11–20	9.5	4.4

* as a substitute for coal burning

** as a substitute for average power plant emission

An earlier research (KIS and JÁNOSKA, [10]) assessed the cost of waste management alternatives in case of settlement solid wastes (see *Fig. 2*).

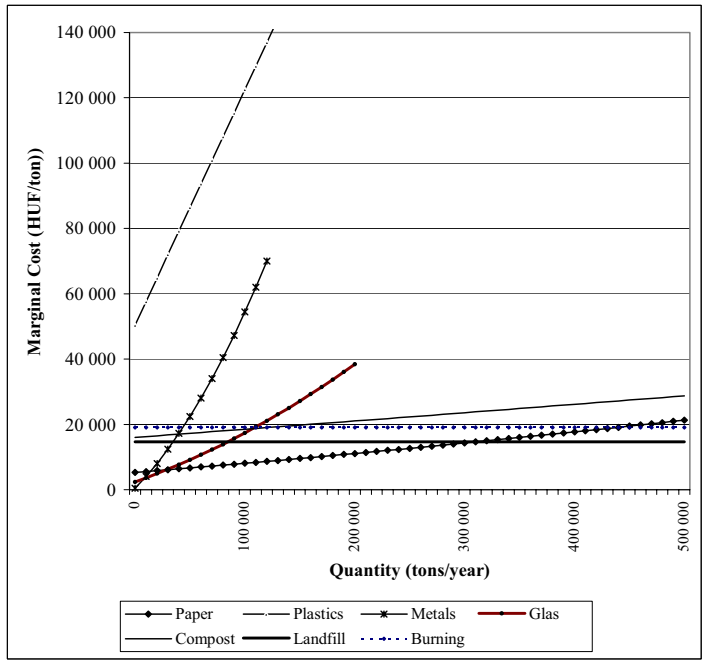

Fig. 2. Marginal cost of waste management alternatives (KIS and JÁNOSKA, [10])

As we can see landfill is usually cheaper than burning and the recycling of

paper, glass and metals is cheaper for certain quantities than the cost of landfill. This observation is in harmony with the experience that paper, glass and metals were utilized in some quantities (or would have been) even before any regulation. In the figure there is the marginal cost of a modern landfill with additional environmental technologies represented, and there were no such landfills built until the 1990s, that is why it is more appropriate to use the conditional clause.

What happens after the implementation of landfill tax? Tax can be interpreted as an additional cost of landfill – if it is imposed on landfills – it will shift the marginal cost curve of landfill 'upwards'. We illustrate the consequences in *Fig. 3*.

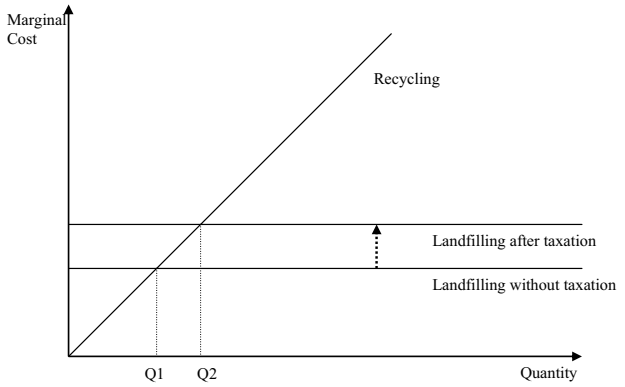

Fig. 3. Impacts of a landfill tax – Example One

In the case of our example the volume of utilization was Q1 before the implementation of the tax, because the marginal cost of utilization was lower than the marginal cost of landfill until this point. Landfill tax will increase the marginal cost of landfill shift its marginal cost curve upwards (in the direction of the arrow). Utilisation will increase from Q1 to Q2 as utilization will become cheaper than landfill. Let us, however, realize that landfill tax will not motivate only utilization or will not always be a good incentive.

In the case demonstrated in *Fig. 4* in order to further increase utilization rate a higher tax is imposed. The volume of utilization still will not increase to Q3 (where the marginal cost of landfill equals the marginal cost of utilisation) because by reaching Q2 burning will become cheaper than utilization. As the cost of landfill will have 'grown over' the marginal cost of burning, burning will be cheaper in general and therefore more preferred than landfill.

Fig. 5 draws our attention on the fact that fee does not similarly motivate the utilization of different materials. In the case of those materials for which the marginal cost curve of utilization is flat (that is with the change of volume the marginal cost of utilization slightly changes) the fee is more incentive (in case of material B utilization will change from Q3 to Q4) than in the case of materials with steep marginal cost curve (in case of material A utilization will change from1Q1 to Q2).

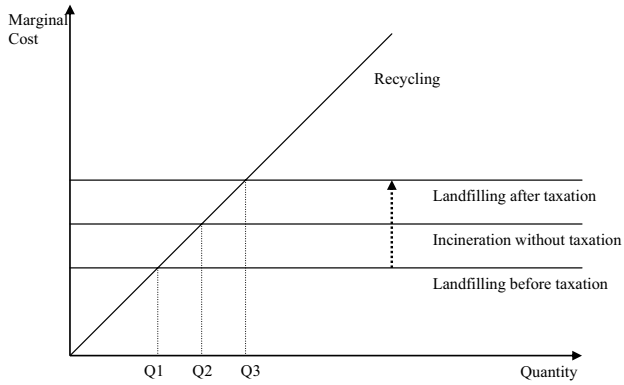

Fig. 4. Impacts of a landfill tax – Example Two

Naturally we also have to take into consideration whether there were any other instruments applied for instance the support of recycling. *Fig. 6* illustrates this case.

In the case of this example, the state that implements the tax has already regulated waste utilization by specifying obligatory utilization rate for certain product types.

Tax theoretically would modify the quantity recycled from Q1 to Q2. However if Q3 was the norm earlier for waste generators, than there will be no effect of the fee as the level of recycling will be Q3 both before and after the implementation of the fee.

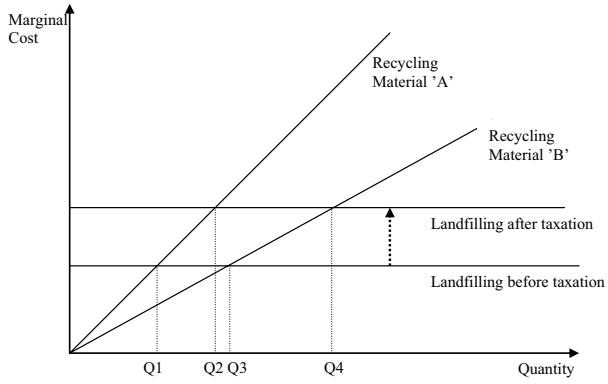

Fig. 5. Impacts of a landfill tax – Example Three

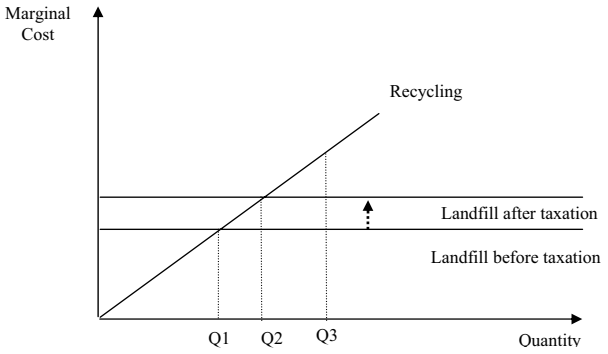

Fig. 6. Impacts of landfill tex – Example Four

4. Conclusions

To sum up, we can state that a waste disposal tax (for landfill and burning) would really rise the quantities recycled if

- it does not influence the relation of landfill and burning costs
- marginal cost curves of recycling are not too steep
- there is no regulation in force to set a relatively high rate of recycling.

We think that it is important that state intervention alone should not change the rate of landfill and burning. We have concluded that the social cost of landfill and burning is almost the same. If a tax would be imposed on landfill and not on burning it would slightly increase the rate of burning. Consequent application of the 'polluter pays principle' and the rationality of environmental economics make us propose the implementation of a tax also on burning.

Unfortunately the case generally is that most marginal cost curves of recycling are steep, moreover there are other regulatory measures in force in the European Union and Hungary (e.g. product fees, the directive on packaging etc.). In these circumstances it is understandable why landfill taxes implemented in some member-states are so poorly or slightly incentive.

Taking into account the present elements of Hungarian regulation and the costs of recycling we can assert that optimal tax rates (that is tax rates equal with calculated external costs) would not motivate recycling in all cases. This is because there is an obligatory recycling ratio for some product groups (e.g. packaging waste). In the case of the combination of a minimal obligatory ratio of recycling and product fee implemented in Hungary, product fee has lost its original incentive function and it functions as a fine in case of not fulfilling the recycling regulation. Although variable theoretical modellings and calculations show that the common application of multiple regulatory measures results in optimal welfare outcome, our practical experience shows that we cannot apply any combination.

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