



Instruments for Waste Prevention and Promoting Material Efficiency

A Nordic Review

Kaarina Huhtinen

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TemaNord 2009:532

© Nordic Council of Ministers, Copenhagen 2009

ISBN 978-92-893-1861-7

Print: Kailow Express ApS

Cover:

Layout:

Cover photo: Picture by Noora Liesimaa. Design aeroplane made of recycled materials.

Designed and made by Noora Liesimaa.

Copies: 180

Printed on environmentally friendly paper

This publication can be ordered on www.norden.org/order. Other Nordic publications are available at www.norden.org/publications

Printed in Denmark



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Comment

This report is a comprehensive review of instruments for promoting waste prevention and material efficiency. The perspective of my comment is based on series of studies on material efficiency conducted by our research group with business enterprises and households. One of our observations is that waste prevention is a problematic term for a number of reasons. Firstly, regardless of the aim of prevention, once the term “waste” is mentioned, psychologically it has already been created. Thoughts turn into ways of treating waste: reuse, recycling, and energy recovery. Strict avoidance and reduction at the source, which are at the highest levels at the waste prevention hierarchy, are easily bypassed. Another problem with the term waste is that in business enterprises waste issues are usually delegated to environmental or EHS personnel, or to facility managers or the like. Managers and experts in these positions have little means to influence at a strategic level to procurement, production and process decisions. These are the levels and areas where the major waste avoidance or source reduction need to take place, because they are tightly interwoven with production, product, and process decisions. Thus major waste prevention potential remains at the discretion of the top and line managers, who in turn consider waste issues outside of their scope of operation – and often also find them uninteresting; a necessary duty, that is best to be taken care of by someone else. Therefore, if any paradigm shift in waste prevention is aimed at, new terminologies such as material efficiency or the like are called for. This report shows the right way by explicitly including material efficiency at the side of waste prevention. As new ways acting upon waste generation are urgently needed, I hope that in the future environmental policy objectives shift from Waste Prevention to Material Efficiency and Sustainable Material Management, helping to frame the problem in a more inclusive fashion.

The instruments for promoting waste prevention and material efficiency range from administrative instruments (e.g. bans, requirements in environmental permits) to economic instruments (charges and taxes) to voluntary and informative instruments. A part of these instruments are directed towards industrial activity and another part towards households. Of these two entities, the biggest gains in material efficiency are likely to occur in and through the industrial sector, since its actors have more means to influence the choices of materials and their use. Our research on material efficiency in business enterprises and households supports one of the main conclusions of this study, namely that some economic and administrative instruments are most effective in reaching the sought waste prevention targets. Particularly ban on disposable packaging, bans or

taxes on hard-to-repair products, requirements in environmental permits, taxes and charges ought to be more systematically and ambitiously applied than at present.

Ban on products hard to repair is a novel means of waste prevention. It sounds promising. Despite the difficulty of implementing the ban, hopefully in the future we will see it tested with some of the most obvious product groups such as electrical and electronic equipment. There are a variety of household appliances that used to be repairable in the past, but are increasingly becoming disposable goods. Market mechanism alone is apparently not going to reverse the trend. Although alternative business models based on sales of utility of appliances are being drafted and tested, they remain marginal. It seems that the push for these business models from the steady increase of prices of materials (such as some metals) during the economic boom, has now been hampered by the global economic recession. In this area innovative entrepreneurs need the support from regulation.

From the area of product policy instruments, the top runner policy of Japan would be a promising and ambitious model to follow. The approach would mean that product standards be defined according to the best product in the group. The standards could then be used as a criterion for other policy instruments such as public procurement programmes or environmental tax schemes.

There are two underutilized mechanisms that could serve the aim of more sustainable materials use and management that I wish to highlight here. One of them is green public procurement. At the moment there are well-intended instructions for including environmental criteria into the invitation to submit tenders, but our sad observation from many procurement decisions is that greener providers loose tenders to those with lower price. It seems that over the years of tender competitions, the public sector procurement has become overly conditionalised by procurement price – which not only means that environmental aspects such as material efficiency suffer but often also leads to economic sub-optimization of parts of a product or service process instead of the total process from the material procurement to waste disposal.

To name another one, Environmental Management Systems (EMS) are a widely used management tool within industry that could be used to promote resource (energy and materials) efficiency. The targets that companies set themselves in EMS usually concentrate on such areas as waste recovery rather than on reducing total material flows by waste prevention. One mechanism is to make external EMS auditors to pay attention to the resource efficiency perspective and make them aware of material saving services. The difficulty here is that auditors get paid by the audited company and there is no legislation for the auditors to lean on. However, due to the wide spread of EMS throughout the industrial sec-

tors, policy makers and regulators should develop ways in which this instrument could be better harnessed to support resource efficiency.

Finally, due to the global recognition of climate change on political and corporate agendas, energy efficiency and sustainable energy provision have received substantial attention in recent years. Some of this attention has been at the cost of attention to material efficiency. Therefore it would be recommendable to make explicit also the - albeit indirect - CO₂ load related to materials extraction, transportation, use and waste treatment in order to give the due weight to the climate effects of materials' use.

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Preface

This project aimed at finding new policy instruments for waste prevention and material efficiency through discussions with Nordic experts. The purpose of this report is to give ideas to Nordic countries for possible policy tools to be introduced and to support the preparation of national waste prevention strategies and other environmental strategies.

The project was financed by the Nordic Council of Ministers working group for Products and Waste and the responsible body for carrying out the project was Finnish Environment Institute. The Nordic co-operation group consisted of Catarina Östlund, Johanna Samanker (Naturvårdsverket, Sweden), Elisabeth Møyland (Statens forurensningstilsyn, SFT, Norway), Jette Skaarup (Miljøstyrelsen, Denmark) and Sigurbjörg Saemundsdóttir (Ministry for the Environment, Iceland). The group members role was to discuss the topic and comment the drafts of the final report and collaborate on finding the relevant documents and experts for interviews. Eevaleena Häkkinen, Jussi Kauppila, Petrus Kautto, Ari Nissinen, Risto Saarinen and Hanna Salmenperä from Finnish Environment Institute acted as a guidance group for the project.

The author would like to thank all the experts for comments and contributions.

Helsinki, February 2009

Kaarina Huhtinen

Summary

The main purpose of the project was to find new policy instruments for waste prevention and material efficiency. Another objective was also to give ideas to Nordic countries for possible policy tools to be introduced and to support the preparation of national waste prevention strategies and other environmental strategies. The project focused on giving a picture of perceptions and views among Nordic experts concerning policy instruments for waste prevention and material efficiency.

According to the interviews of Nordic experts waste prevention has not been in focus in the past years, but this is expected to change due to climate change debate, and also due to the new EU waste framework directive. Some of the interviewees pointed out material efficiency being economically reasonable for companies, so there is a growing interest on the matter.

The experts gave strongest support for economic instruments as they felt that economic instruments are more encouraging than other types of instruments. However, many of the interviewees mentioned also administrative means, such as bans and environmental permit systems. Government-industry dialogues were seen as important but not as very effective tools. The interviewees were also positive towards voluntary and informative tools, although they were mainly considered supplementary to other instruments.

Following policy instruments were considered most potential:

- Setting requirements for material efficiency in environmental permits
- Product policy instruments
- Reduced value added tax
- Taxes on natural resources

The majority of the interviewees expressed great concern about growing consumption patterns. An other sector mentioned relatively often in the interviews is the construction and building industry. Many of the interviewees expressed concern about the barriers against waste prevention and material efficiency.

As a closing comment, further research is required in the area of connecting different policy instruments. In addition to introducing effective combination of policy instruments for waste prevention and material efficiency, the barriers against waste prevention should be analyzed and tackled.

Sammanfattning

Huvudmålet med projektet var att finna nya styrmedel i miljöpolitiken för att hindra uppkomsten av avfall och för materialeffektivitet. Ett annat syfte var att ge de nordiska länderna idéer om möjliga styrmedel och att stöda beredningen av nationella strategier för förebyggandet av uppkomsten av avfall och andra miljöstrategier. Projektet fokuserade på att få en bild av uppfattningar och åsikter hos nordiska experter om miljöpolitiska styrmedel för att hindra uppkomsten av avfall och för materialeffektivitet. De intervjuade experterna ansåg att förhindrandet av uppkomsten av avfall inte har stått i fokus de senaste åren, men att dess ställning väntas förbättras tack vare klimatförändringsdebatten och också tack vare EU:s nya ramdirektiv om avfall. En del av de intervjuade påpekade, att då materialeffektivitet är ekonomiskt förnuftigt, kommer intresset i ämnet att öka.

Utgående från expertintervjuerna fick ekonomiska styrmedel det största stödet, eftersom dessa ansågs mera uppmuntrande än andra typer av styrmedel. Många av de intervjuade nämnde dock även administrativa instrument, till exempel förbud och miljötillståndssystem. Dialoger mellan stat och industri ansågs vara viktiga men inte så effektiva styrmedel. De intervjuade ställde sig också positivt till styrmedel som innefattar frivillighet och information, om också de ansågs för det mesta komplettera andra styrmedel.

Följande styrmedel ansågs ha de största utsikterna:

- Krav på materialeffektivitet inom miljötillstånd
- Styrmedel för produkter
- Lägre mervärdesskatt
- Skatt på naturresurser

Majoriteten av de intervjuade experterna var mycket oroliga över den ökade konsumtionen. Ett annat område som nämndes rätt ofta var byggnadssektorn. Många av de intervjuade uttryckte sin oro över de barriärer som hindrar minskningen av uppkomsten av avfall och materialeffektivitet.

Som avslutning kan konstateras, att det behövs vidare undersökningar i hur olika miljöpolitiska styrmedel kan kombineras. Jämsides med att effektiva kombinationer av miljöpolitiska instrument införs för att hindra uppkomsten av avfall och för materialeffektivitet, borde barriärerna i vägen för hur man kan hindra uppkomsten av avfall analyseras och tacklas.

1. Introduction

1.1 Project Background

The main purpose of the project was to find new policy instruments for waste prevention and material efficiency. Another objective was to give ideas to Nordic countries for possible policy tools to be introduced, and to support the preparation of national waste prevention strategies and other environmental strategies.

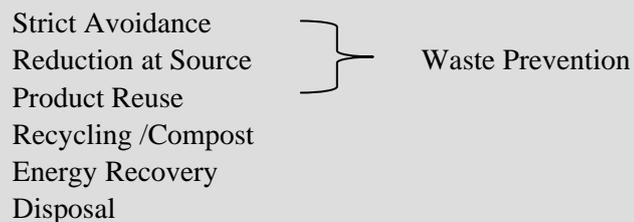
The essential objectives of waste policy in the EU are the sustainable use of natural resources and the protection of human health and the environment against harmful effects caused by the waste sector. Waste quantities in most EU countries are growing. To reverse this trend we need effective waste prevention policy instruments.

In the new waste framework directive (2008/98/EC) the EU demands member states to establish national waste prevention programmes. According to the directive these programmes should include objectives and measures for waste prevention. The waste prevention programme may either be integrated to the national waste management plan or into other environmental policy plan or be a separate programme.

1.2 Definitions

In many previous international studies the focus has been on waste minimization which includes recycling. However this project covers only the top three elements of the EU waste hierarchy (Waste framework directive 2008/98/EC). The project focuses on waste prevention, which comprises the strict avoidance, the reduction at source and the product reuse.

Waste prevention in the Waste Hierarchy



Since most of the environmental benefits from waste prevention stem from the reduced need to produce materials, it is argued that material efficiency is a more adequate environmental policy objective than waste prevention (Ekvall 2008). However, waste prevention is a well-known term among waste policy experts, why both terms were used in this project. Waste prevention aims at reducing the waste amounts and also the hazardousness of waste. A relatively new approach in waste policy is the Sustainable Material Management (SMM). It introduces sustainability and life-cycle perspectives and covers initiatives under sustainable production and consumption, eco-design, integrated product policy, eco-efficiency or sustainable natural resource use. (OECD 2007.)

1.3 Waste Prevention in Waste Strategies in the Nordic countries

In the Danish Waste Strategy for 2005-2008 there is an overall aim to prevent the loss of resources and the environmental impact of waste. In addition the growth in waste must be uncoupled from the economical growth. The Waste Strategy includes an aim, that it should be ensured that consumers have the opportunity to choose products which help prevent waste. Waste prevention measures are proposed initially where the barriers are low and where results can be achieved in the short term. Initiatives are proposed in four sectors: households, the service sector, industry, and building and construction. A new national waste plan is in preparation stage. (Danish Waste Strategy 2005-2008.)

Finland's national waste plan emphasizes the relationship between waste issues and other sectors of environmental policy such as chemical policy, sustainable resource use, climate policy, environmental health, soil protection, and technology policy. The waste plan also includes a separate national waste prevention programme. Waste prevention is promoted by the use of new instruments to increase material efficiency in production processes, construction and consumption, and by making the enforcement of current legislation more effective. The target for waste prevention is that the volume of municipal waste until 2016 will be stabilised and then reduced to the level of the beginning of 2000. (Towards a recycling society -National waste plan until 2016.)

In Iceland the first national waste management plan (2004-2016) was released in April 2004. The plan includes targets for recovery, but not for waste prevention. The objective of the Waste Management Law (no.55/2003) is to decrease the quantity of waste by preventing generation of waste. (Waste Management in Iceland 2006.)

Norway has an overall national target that the growth of waste amounts should be lower than the economical growth. Instruments used for reducing the amount of waste are for example charges for waste dis-

posal and producer responsibility. Also public procurement policy, and environmental technology are expected to have positive effects on waste amounts. (Regjeringens miljøpolitikk og rikets miljøtilstand 2006-2007.)

Sweden's environmental objectives include that the total quantity of waste generated will not increase, and maximum use will be made of its resource potential while minimizing health and environmental effects and associated risks. Systematic approaches such as environmental management, life cycle thinking and sustainable procurement are needed to reduce waste quantities, or at least slow down the increase rate. Both production and consumption need to become more resource efficient to achieve sustainable and definite reduction of waste quantities in line with the interim target under a Good Built Environment. (A Strategy for Sustainable Waste Management; Sweden's Environmental Objectives.)

It can be argued that so far the policy of waste prevention or enhancing material efficiency has not been very systematic in any of the Nordic countries.

2. Results

Nine expert interviews were completed involving representatives of environmental administration, researchers and NGOs in Denmark, Finland and Sweden. Interviews were recorded and analysed thematically and they lasted typically from one hour to two hours. The questions were based on following themes:

1. Material efficiency and waste prevention as a policy objective – existing strategies and targets
2. Experiences of policy instruments in place
3. Opinions on which policy instruments should be in place and why
4. Good examples of existing policies around the world

Themes 1, 2 and 4 were background information and the actual focus was in theme 3. Also many less structured discussions with a variety of people involved in waste prevention or material efficiency were conducted.

2.1 Policy Instruments for Waste Prevention and Material Efficiency

The objective of this chapter is to give a picture of perceptions and views among Nordic experts concerning policy instruments for waste prevention and material efficiency. It can be argued that there is no sense in distinguishing between waste prevention and other environmental policy objectives. However, many of the policy instruments analyzed here promote many environmental issues, not just material efficiency.

2.1.1 Administrative Instruments

Administrative instruments are mandated by law and cover for example the use of bans, prohibitions and standards. Yet many economic or informative instruments are also mandated by law. Administrative instruments discussed in the interviews are presented in the table below.

Bans

- Ban on taking recyclable wastes to landfills
- Ban on trade of products hard to repair
- Ban on disposable packages

Requirements in environmental permits

- Information on possibilities to improve material efficiency
- Demanding waste minimization or material efficiency programs
- Waste limits to environmental permits for industry

Product policy instruments

- Eco-design of Energy-using Products (EuP)
- Top runner

Producer responsibility

Restrictions on the use of natural resources

Restrictions on the production of waste

Bans

According to the interviewees bans are mainly considered efficient for preventing the use of hazardous substances. Some of the experts mentioned the possibility of introducing a ban on products which are hard or impossible to repair or a ban on disposable packages. Some of the interviewees proposed a ban on taking recyclable wastes to landfills.

Waste Prevention in Environmental Permits

Waste prevention has not been a matter of significance in permit procedures in any of the Nordic countries. According to Finnish and Swedish environmental legislation it would already be possible to consider waste prevention in permit conditions. Salmenperä (2004) has stated that waste prevention concerns can be taken into account in each phase of the permit procedure. In the application phase it is essential to collect all information needed. Before the permit-granting authority issues a decision, it can negotiate with the applicant about the possibilities for preventing the generation of waste. The permit decision may include conditions dealing with waste prevention.

The majority of the interviewees said that requirements for waste prevention or material efficiency should be included in environmental permits for industry. How this should be implemented in practice was a difficult question. One way is to demand enterprises to define their possibili-

ties to improve material efficiency and to better explain their use of materials. Also a waste minimization program could be required. Specifically wastes with high environmental burden should be considered in environmental permits. Some of the interviewees proposed setting limits to waste production.

The interviewees raised some problems related to waste prevention in the environmental permit procedure. The permit-granting authorities may not have enough knowledge for setting permit conditions for waste prevention and perhaps not enough resources for control and monitoring. Also poor follow-up of material use and waste amounts in enterprises may be a problem.

Some of the interviewees saw a potential to enhance material efficiency by combining material or waste accounting with the environmental permit procedure. However, some experts were quite critical of combining the Danish Green Accounting System (see 2.1.5 informative instruments) with environmental permit system. They would rather regulate the whole industry sector and not individual companies.

Product policy instruments

All the experts seem to think that product policy should be further developed and used for enhancing material efficiency. They felt that producing sustainable and repairable products is important, and the price of a product should reflect its environmental burden.

The EuP Directive (Eco-design of Energy-using Products 2005/32/EC) sets an obligation on businesses to consider the energy efficiency of energy-using products. A similar obligation could be introduced for other product groups too, for example products related to energy-use. Other environmental aspects than energy efficiency, especially material efficiency, should be emphasized.

One of the interviewees pointed out that directives are not very challenging because they usually set the standard on lowest possible common level. One step forward from EuP-directive could be the Japan's Top runner –policy. In fact there has been discussion on adopting Top Runner –policy to Europe (Nordqvist 2006, 5). Japan's Top Runner is a regulatory scheme used to improve the energy efficiency of selected products, for example household and office appliances and vehicles. Key feature of the Japan's Top Runner scheme is the focus on the supply side. The purpose is to push manufacturers and importers of energy-consuming equipment to make technological improvements to enhance the energy efficiency of marketed goods. The procedure includes a cyclic approach of three phases: standard setting, compliance period and evaluation and revision. Among the targeted products available on the market, the use-phase energy efficiency of the "top runner", the one which achieves the highest energy efficiency, becomes the basis of the standard. The standards set in the Top Runner Program can be used as criteria for other

policy instruments, such as purchasing programmes, environmental tax schemes and the like. (Tojo 2005, Waste reduction 2008, 84-88, Nordqvist 2006, 5- 12.) The Top Runner approach in improving material efficiency would mean defining the product standards for material efficiency after the best producer. According to the interviewees it is important to update standards and target levels all the time to make progress.

Producer responsibility

Producer responsibility obliges producers to organize the reuse, recovery or suitable treatment or disposal of their products and the wastes derived from them, and to cover the related costs. Although waste prevention is a goal for producer responsibility, the experts felt unanimously that in practice it has enhanced recycling but not waste prevention. Almost all of the interviewees mentioned producer responsibility, but concrete answers to how it should be developed to enhance material efficiency were quite hard to obtain. In Sweden there is a project going on about translating producer responsibility on products to material streams (Naturvårdsverket 2008). The focus of producer responsibility has been more on the improvement of end-of-life management than on the promotion of design change. One reason is that producer responsibility scheme based on collective responsibility doesn't offer incentives for an individual producer to do changes in the design phase of products. (Tojo 2004.)

Restrictions on the use of natural resources or on the production of waste
Other examples of administrative instruments the experts mentioned in the interviews are restricting either the use of natural resources or the production of waste. Answers to more specific questions about the implementation of such restrictions were quite difficult to obtain.

2.1.2 *Economic Instruments*

Economic instruments in use in the waste sector in the Nordic countries range from waste taxes (on landfill and incineration) to taxes and charges levied on individual waste types (packaging, tyres, etc.), deposit-refund schemes, taxes on minerals and producer responsibility. (Speck et al. 2006.) The interviews suggest that the greatest potential to waste prevention is in revising and refining existing economic tools and in introducing new ones. The interviewees seemed to consider economic instruments more encouraging than for example voluntary ones. Products and services with high taxes are avoided. Some of the interviewees referred to an ecological taxation reform. Economic instruments discussed in the interviews are presented in the table below.

Expanding the applicability of domestic help credit

Reduced value added tax for fixing and repairing services or products with ecolabel

Taxes on natural resources

Waste tax

Municipal waste charges

- Pay by weight schemes

Green public procurement policies

- Material efficiency as a criterion

Expanding the applicability of domestic help credit

Encouraging households to use repairing services by expanding the applicability of domestic help credit in taxation was proposed in the interviews. Finland's national programme to promote sustainable consumption and production (Getting more and better from less 2005) includes the following measure: "The competitiveness of services in comparison to the acquisition of new goods should be improved, for example by expanding tax deductions related to domestic service, and through measures that promote rental and repair services". From the beginning of year 2006 the maximum amount of the domestic help credit was raised (Huvila 2007). From the view point of environmental benefits the domestic help credit is quite a limited instrument so far, because it concerns only repair work made at home. To make it more effective domestic appliance producers must pay attention to the appliance being repairable at home and to new services for households. (Mela & Kautto 2007.)

Value Added Tax (VAT)

Many products are made in countries where labour costs are low but they would have to be repaired in a country where labour costs are relatively high. Because retailers and repair shops are usually different companies, there is a lack of real incentive for encouraging repair instead of replacement. This problem is called "repair cost scissor". Changing the Value Added Tax (VAT) regime may be one solution to this problem. In addition to encouraging repair work it may also be an instrument to enhance demand for sustainable products. (Waste reduction 2008, 58-59, 83.)

The majority of the interviewees felt that differentiated Value Added Tax could be a good instrument for waste prevention. They saw a chance

that differentiated VAT could change producer and consumer behaviour. However, the interviewees couldn't say exactly how this tax should be set. The interviewed experts proposed for example reduced VAT for material efficient services (mending, fixing, leasing, renting). No concrete examples of which services would get the reduction emerged, and it is a troublesome question. Some of the interviewees mentioned the possibility to lower VAT for products with environmental labels. A need for an extra tax on meat production was also mentioned. According to some of the interviewees reduced VAT faces opposition from taxation ministries or from governments and is therefore politically hard to introduce.

Taxes on natural resources

Since 1990 a tax levied on the extraction of raw materials has been in place in Denmark. In Sweden the tax on natural gravels was introduced in 1996 with the intention of closing the price gap between natural gravel and crushed rock, which was seen as its closest substitute. The idea of minerals taxation is to reduce the consumption of non-renewable natural resources and to improve material efficiency and the recycling of materials. In an EEA (2008) study it was found that the aggregate tax needs to be used as part of a package of policy interventions based on a systemic analysis of the factors which influence the impacts from the extraction of sand, gravel and rock resources. Earmarking the revenue raised from the tax for example to develop quality standards for recycled aggregates could strengthen the impact of the tax and enhance the demand for recycled aggregates. International competitiveness is not a major concern of the aggregates industry because it is in any case uneconomical to transport aggregates over long distances. Studies made on taxes on natural resources found that there is potential to expand the use of these taxes and that they can help to promote innovation and support research and development. (Nordic Council 2002, Söderholm 2004, Parikka 2006, EEA 2008.)

A majority of the interviewees seemed to consider a tax on natural resources an effective instrument because it affects already the use of raw materials. If the prices for raw materials get higher, it will motivate to increase material efficiency. Some of the experts said that also taxes on other raw materials than gravel and sand, e.g. metals, should be introduced. One of the interviewees expressed that taxes on energy would be better than taxes on natural resources. High energy costs for extracting virgin materials would increase the value of all materials.

The Waste Tax and Municipal Waste Charges

The interviewees seemed to consider waste tax a weak instrument. It has almost no influence on waste prevention and the tax should be very high to be efficient in the matter of waste prevention. Some of the interviewees reminded that waste tax had been efficient at the time it was introduced and that it has had an effect on recycling. One idea to revise the tax is to

earmark the tax revenue to waste prevention initiatives. Some of the interviewees commented that as the environmental burden associated with waste is not by weight it means that there is a problem with the waste tax set per ton of waste.

According to the interviewees waste fees for households are so small that they don't have an effect on waste prevention. Also for companies the waste fees are quite small compared with their other expenses. One way to develop waste fees are the pay by weight schemes. The interviewees pointed out that there are ambiguous research results on the subject. When it comes to comparing household waste amounts in municipalities there are some results which show that municipalities with the pay by weight scheme have less household waste per person.

Green Public Procurement

Integration of environmental considerations into the purchasing policies of states and municipalities has been very much in the focus in different countries. In the EU Green Public Procurement has been defined as follows: "Green Public Procurement is the approach by which Public Authorities integrate environmental criteria into all stages of their procurement process, thus encouraging the spread of environmental technologies and the development of environmentally sound products, by seeking and choosing outcomes and solutions that have the least possible impact on the environment throughout their whole life-cycle". (Bouwer et al. 2006, 5.)

A key finding of the expert interviews was the variability of views regarding the possibility of public sector to be a front runner in environmental matters. On one hand the interviewees think public procurement has a potential for waste prevention due to big volume of purchases. On the other hand they consider public sector a slow actor. The experts pointed out that it is important to integrate environmental considerations into whole purchase functions not just individual purchases. This includes procuring pre-commercial services. It was mentioned that getting the industry to participate is essential.

One important question is the criterion for green public procurement and which role waste prevention or material efficiency has there. Some of the interviewees emphasized other environmental matters than material efficiency or waste prevention being more important in green public procurement criterion. However, the majority expressed that waste issues and material efficiency should be stronger included in the criteria for green public procurement.

2.1.3 Government-Industry Dialogues

Between mandatory and voluntary policy instruments there are initiatives, such as government-industry dialogues. The basic idea is that govern-

ment agrees to refrain from enforcing legislation on condition that the private actors achieve a certain goal. (Tojo 2008.)

Negotiated agreements

One example of a dialogue process between the government and industry is the sector-specific negotiated agreement for promoting material efficiency in industry. The interviewees seemed to consider negotiated agreements between the state and industry for material efficiency weak instruments, which are not enough as such, but nevertheless important to be in place. Dialogue between the state and industry is needed anyway and the state cannot decide for example on economic instruments without a dialogue. The interviewees think that it is important to include sanctions in the agreements and to control that the targets which are set are achieved. They also felt that setting material efficiency targets at an ambitious level is essential. A question of who should be responsible for negotiated agreements was raised in the interviews. A lot depends on the competence of the authority drafting the agreement. Some of the interviewees saw as a benefit of negotiated agreements that they create a win-win situation for both parties. According to the interviewees a negotiated agreement works best for a sector with limited amount of actors. The interviewees also commented that financial incentive for industry to make an agreement is needed.

Lilja (2008) has listed flexibility on the company level, strengthening the partnership between industry and the authorities and know-how accumulation in the administration as the main strengths of negotiated agreements.

Product panels

An other example of government-industry dialogues are the product panels. Product panels consist of representatives of manufacturers, retail, environmental and consumer administration, research, recycling and various other stakeholders. They all work together to draft plans of action aiming at environmental improvements of products and services, and promotion for environmentally sound products and services in the markets. Probably the most famous and productive of existing product panels is the Danish textile panel. (Nissinen&Parikka 2005.)

The interviewees commented on product panels quite the same way as on the negotiated agreements. Product panels were considered weak instruments for material efficiency but positive instruments for enhancing dialogue between administration and industry. Some of the interviewees doubted competition problems might occur in product panels.

2.1.4 Voluntary Instruments

Although governments often support the adoption of voluntary instruments, they are usually initiated and promoted by industry. Some of the voluntary actions taken may solely be based on voluntariness and there is no participation from government. Therefore they are not always considered to be public policy instruments. (Kautto&Melanen 2000, 10; Dalhammar 2007.)

Environmental management systems

The European Community Eco-management and Audit Scheme (EMAS) is a voluntary environmental management system (EMS) for organisations. ISO 14001 is an other environmental management system which is very much used.

According to the interviews environmental management systems should be developed with respect to enhancing material efficiency. As a benefit of these the interviewees saw that the awareness of environmental issues in the company increases. The interviewees proposed to develop EMS's with a bonus system to personnel for good management of environmental issues and to connect management systems with specific material efficiency surveys.

Business Concepts

The interviewees said that promoting waste prevention or material efficiency pilot projects in industry is important and pilot projects should lead to continuous improvements. Co-financing and state subsidies for pilot projects are needed. Even in the beginning of a project the focus should be on establishing the work. The interviewees emphasized the importance in environmental matters to speak the language business understands. Some examples of successful projects were mentioned in the interviews.

MAMBO is a tool for Flemish small and medium sized enterprises to calculate their total waste costs. It is developed by OVAM, which is a public Flemish Institution responsible for waste management and waste prevention in Flanders. The name MAMBO comes from "less waste means more profit for the company". Implementation of the MAMBO-methodology shows that the true waste costs are up to 10 times higher than the visible disposal costs. Mean value of total waste costs amounts up to 5 % of production costs. The total waste cost consists of three different parts: the loss of raw and auxiliary materials, the added value that is wasted, and finally, the cost of collection and treatment of the waste. The MAMBO tool allows to correctly calculate the waste costs for the entire production floor as well as for bottlenecks in the production process. Even to enterprises which already have gained detailed insight in their waste costs, MAMBO offers a surplus value through the validated

method and questioning. (De Schoenmakere 2008, OVAM 2008, Success Stories on Waste Prevention 2008, Waste reduction 2008,119.)

Another project mentioned in the interviews is the Finnish MASCO – Material Efficiency Services -project which focuses on business models of so-called material flow management, where the customer company out-sources management of selected material group to service providers. MASCO-model follows the ESCO concept (energy service company) as applied in the energy field. From an economic perspective this type of business-to-business services are a profitable service category. The aim is to free the resources of the customer company for its own core business but also to strive for greater material efficiency in processes. Environmental benefits come from the reduced amounts of used materials and waste. Chemicals are the main target material group in MASCO. In addition to reduced environmental burden and cost savings there is an other kind of benefit that material efficiency services provide; new business for environmental service companies. (Halme et al. 2006, Anttonen et al. 2008.)

2.1.5 Informative Instruments

Informative instruments are based on an assumption that people behave differently when they have better information and understanding. In the interviews the informative instruments were mainly considered supplementary to other instruments.

Consumer information and education

The majority of the interviewees considered consumer guidance an essential instrument for waste prevention, however not very efficient. Some of the interviewees seemed to consider campaigns for schools important and that waste prevention information should happen in every level. According to the interviews organization of material efficiency information at national level is important. Finland has set up a material efficiency centre which provides services for businesses and advice for consumers and public sector organisations on various ways to improve material efficiency. The centre is connected to Motiva Oy, a company run as an agency of the Ministry of Employment and the Economy, which already provides many expert services promoting energy-efficiency and the use of renewable energy. There has been discussion in Norway of a national waste prevention center (Avfallsforebygging 2002, 143). In Denmark the Danish Society for Nature Conservation has proposed to set up a national centre for waste prevention (Ren Viden 4/2008).

Eco-labels

There are several eco-labels in use in the Nordic countries. The interviews revealed that stricter criteria for eco-labels with focus on products' environmental burden is needed. Some of the interviewees highlighted

the developing of material labels. According to the interviews eco-labels can be connected to several other material efficiency policy instruments, for example public procurement criteria and environmental management systems for organisations.

Material Accounting (also green accounting, waste accounting)

Some of the interviewees proposed material or waste accounting as a tool for enhancing material efficiency in companies. Denmark has had legislation about green accounts since 1995. The green accounts have two objectives, firstly to enhance the public's access to information about the environmental performance of companies and secondly to motivate reporting companies to improve their resource efficiency and to work more systematically with environmental issues. The Danish Green Accounting system does not require the companies to improve their activities. It is mainly meant to give information to the public about the companies use of energy, water and raw materials. However the supervisory authority makes a statement to the green account report. The statement must reflect whether the environmental data agrees with the information the authority has about the company. All the Danish Green Account documents are available at the Central Business Register (CVR) web pages. CVR covers both public and private businesses. Since the 2003 about 1000 Danish enterprises report green accounts and about 15 per cent of them freely, whereas the rest have an obligation. EMAS (Eco-Management and Audit Scheme) registered companies can choose to produce only a public environmental statement within the EMAS system instead of the green account. Danish experience shows that both economic and environmental benefits can be achieved through green accounts. (the Central Business Register 2008, Miljøstyrelsen 2008, Kjaergaard & Hall 2007.)

The interviewees had very diverse opinions about green accounting. Some thought it would be a good idea to combine green accounts with environmental permit procedure, whereas some thought it would bring them to something totally different than they were meant for. One of the interviewees pointed out the Danish green accounts being a good source of information for researchers, while another one claimed them to be a flop for users because the green account documents are quite technical. It was mentioned in the interviews that green accounting represents one way of turning from command and control to self-regulating and having a positive dialogue.

An other example of accounting systems mentioned by the interviewees is the Petra Waste Benchmarking of Helsinki Metropolitan Area Council. The Petra Waste Benchmarking compares the amounts of waste generated by an individual company with the average of the companies in the same business sector or with similar types of property. Aim is to help a company to develop its own waste management system and to reduce the amount of waste. The follow up of both the recovery rate and the total

amount of waste is made easy by set barometers. The benchmarking to other companies helps to recognise, if one's own operations are generating unnecessarily high amounts of waste. The best ones are awarded with the Saver of Natural Resources prize. The Petra service is meant for all companies and organisations operating in the Helsinki Metropolitan Area and is free of charge. (YTV 2008.) According to the Finnish interviewees the Petra Waste Benchmarking should be expanded nationwide.

2.2 Other Issues regarding Material Efficiency

This chapter introduces other issues regarding material efficiency and waste prevention than policy instruments that were discussed in the interviews.

2.2.1 Material Efficiency and Consumption

The majority of the interviewees expressed great concern about growing consumption. The interviewees referred to the rebound effect which means that ever growing consumption tends to offset the environmental benefits of new technology and policy measures taken. Some of the interviewees stressed that goals for waste prevention in consumption and stronger policy instruments are needed. However, it is a delicate question for policy-makers to interfere in private consumption.

Households need tools that help them to recognize the environmental impact of their consumption. However some of the interviewees emphasized that there is not much that consumers can do to material efficiency and that the solutions are decided already in the production phase. The interviewees also pointed out that a lot of products used in Europe are actually produced elsewhere, why it is quite complicated to have any influence on the production phase.

Some of the interviewees mentioned MIPS (material input per service unit) and life-cycle assessments (LCA) as important tools to recognize the impacts of consumption. Finnish Eco-Benchmark-project was mentioned as an example of popularising LCA studies of consumer products. Normally the LCA studies tend to be pretty technical and not much attention is paid to how the results are presented to consumers. The Eco-Benchmark can be used to determine the scale of the environmental impacts of different products and services: for example, which is the relative importance of doing the laundry compared to overall consumption. (Eco-Benchmark-project 2008.)

2.2.2 Material Efficiency in Construction and Building

An other sector mentioned relatively often in the interviews is the construction and building sector. Waste amounts from this sector are quite big. The interviewees felt that material efficiency targets for construction, and norms in the building codes are needed. For example the lifetime of buildings should be longer.

The British WRAP- programme (Waste & Resources Action Programme) has published a technical guidance of effective waste minimisation in construction. According to the guidance report there are several opportunities to waste minimisation throughout the different areas of construction project life-cycle; communication, design, procurement and logistics. (Delivering effective Waste Minimisation 2008.)

2.2.3 Barriers against Waste Prevention and Material Efficiency

Many of the interviewees expressed concern towards the barriers opposing waste prevention and material efficiency. The barriers against waste prevention can be divided into socio-economic, economic, market, legal and technical barriers. One example of a socio-economic barrier is the lack of standards for reusable products. An example of an economic barrier is the lack of incentive for waste prevention due to low waste disposal cost. (Eionet 2007.) Many of the interviewees mentioned "buy more, pay less" -commercials as an opposite power for waste prevention. In fact, one Danish chain of stores, REMA 1000, has decided not to offer quantity discounts for buying more, because people tend to buy more than they can consume and so the discounts enhance waste amounts (RenViden 4/2008).

One drag on enhancing material efficiency is the lack of EU level targets. In the interviews the experts saw a need for similar quantitative targets in material efficiency, as the EU has in energy efficiency. Opinions on the level and nature of the targets needed, varied though. One of the interviewees proposed setting targets at different levels, as well in the international and national level as in the industry level. It is important to define the targets in a dialogue with all stakeholders. Without targets it is hard to get started with waste prevention. As the interviewees pointed out we need to know where should we get, how to measure material efficiency achievements and who is responsible for actions.

According to the interviews a more holistic perspective on material flows and how to prevent materials becoming waste is needed. As some of the interviewees stated, we need a life-cycle approach when designing policy instruments. To reduce the environmental impact of production and consumption this approach generates an added value to government policy making. For example, the life-cycle approach makes it possible to identify measures which affect several parts of the life-cycle and highlights environmental impacts which arise as a result of domestic and for-

eign production and consumption. However, the environmental problem and the product chain in question must be well defined. (Styrmedelsanalys med livscykel- och innovationssystemperspektiv 2006.)

Policy agencies on the national level should improve collaboration, and existing policy instruments need to be strengthened. Waste management policies and regulations can actually create barriers against waste prevention for example if re-use of particular waste streams is made very complicated (Waste Reduction 2008, 36-50). Using a combination of different policy instruments should not create barriers against waste prevention or material efficiency and it should lead to reduced environmental effects. Dalhammar (2007, 133-144) has presented some guidelines of a positive interaction of different policy instruments. Firstly, instruments can complement each other. For example different instruments can address different actors or as in the case of products, different instruments may also address different parts of the product life cycle. Secondly, instruments can work in synergy. For instance, informative instruments are often used in combination with other instruments. Thirdly, instruments can be coordinated to avoid duplicating effort. For example, in order to this in industry, some European countries allow EMAS-registered enterprises to use the environmental statement required by EMAS in their mandatory environmental reports. Finally, one instrument can provide an alternative to another instrument. As an example, agreements between governments and industries can be seen as an alternative to binding regulations.

If the barriers against reducing waste amounts and enhancing material efficiency are not tackled, the effects of the policy instruments introduced in this report may remain insignificant.

3 Conclusions

According to the interviews waste prevention has not been in focus in the past years, but it is expected to change due to climate change debate and also due to the new EU waste framework directive. Some of the interviewees pointed out material efficiency being economically reasonable for companies, why there is a growing interest on the matter.

The overall finding of the interviews is that the environmental burden related to material and waste flows is considered more important than the actual waste amounts. As stated in a Swedish report, reducing the amount of waste from products reduces the environmental impact of the production phase. The environmental benefit of waste prevention depends for example on the environmental impacts of producing the product or material in question. (Goldstein 2006.)

According to the interviews the experts gave strongest support for economic instruments as they felt that these are more encouraging than other types of tools. However, many of the interviewees mentioned also administrative instruments such as bans and environmental permit system. Government-industry dialogues were seen important but not very effective instruments. The interviewees were also positive to voluntary and informative instruments, although they were mainly considered supplementary to other instruments.

The policy instruments discussed in the interviews are presented in the table.

Administrative Instruments

Bans

- Ban on taking recyclable wastes to landfills
- Ban on trade of products hard to repair
- Ban on disposable packages

Requirements in Environmental Permits

- Information on possibilities to improve material efficiency
- Demanding Waste minimization or material efficiency programs
- Waste limits to environmental permits for industry

Product Policy Instruments

- Eco-design of Energy-using Products
- Top runner

Producer Responsibility

Restrictions on the Use of Natural Resources

Restrictions on the Production of Waste

Economic Instruments

Expanding the Applicability of Domestic Help Credit

Reduced Value Added Tax

- for fixing and mending services
- for products with ecolabel

Taxes on Natural Resources

Waste Tax

Municipal Waste Charges

- Pay by weight schemes

Green Public Procurement Policies

- Material efficiency as a criterion

Government-Industry Dialogues

Negotiated Agreements

Product Panels

Voluntary Instruments

Environmental Management Systems
Business Concepts

Informative Instruments

Consumer Advice and Education
Eco-labels
Material Accounting

Following policy instruments were considered most potential:

- Setting requirements for material efficiency in environmental permits
- Product policy instruments
- Reduced value added tax
- Taxes on natural resources

From the viewpoint of industry and enterprises also the policy instruments not emphasized in this project may have great potential. For example the government-industry dialogues and promoting new business concepts should be further examined.

It was stated many times in the interviews that we need a combination of different instruments, as well economic, informative as administrative instruments, for enhancing material efficiency. At the same time one may ask that if we are conscious of environmental effects of a certain material flow, for example the use of natural sand and gravel, isn't it more effective to design and implement one policy instrument to solve the problem than to combine several? To use a combination of different policy instruments should not be an end in itself.

To enhance material efficiency there is a need to discuss the matter on a product or material level. As some of the interviewees stated, we need a life-cycle approach when designing policy instruments. In addition to introducing effective combination of policy instruments for waste prevention and material efficiency, the barriers against waste prevention should be analyzed and tackled.

4 Interviews

- Eva Ahlner, Principal Technical Officer, Swedish Environmental Protection Agency
- Mattias Bisailon, Researcher, Profu, Sweden (independent research and consultant company in the areas of energy, environment and waste management)
- Göran Finnveden, Professor, School of Architecture and the Built Environment, KTH (Royal Institute of Technology) Stockholm
- Riitta-Liisa Hahtala, Head of the Consultation and Communications Unit, Helsinki Metropolitan Area Council (YTV)
- Erja Heino, Researcher, The Finnish Association for Nature Conservation
- Taina Nikula, Senior Adviser, Finnish Ministry of the Environment
- John Parm Ulhøi, Centre Director, Aarhus School of Business, University of Aarhus
- Mikael Skou Andersen, Professor, National Environmental Research Institute, University of Aarhus
- John Thøgersen, Professor, Aarhus School of Business, University of Aarhus

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