Waste prevention and education in five European Countries

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ABSTRACT: This research assessed the different goals of the EU Waste Framework Directive (2008) concerning waste prevention in five countries of the EU. The countries under research are the home countries of the EVS group members: Austria, Belgium, Germany, Netherlands and Portugal. The research about the *status quo* of waste prevention revealed that waste prevention has not reached yet. All the countries have high recycling rates and low dumping rate, except Portugal. Although decoupling trends start to appear and the countries are climbing up the waste hierarchy, waste prevention is still a mountain too far. The EVS group also checked if education was included in the waste prevention programmes and education plays a very important role. The group looked for good examples of waste prevention and analyzed them with SWOT. The examples are a success in the home countries and can be implemented in other EU or even worldwide countries.
Keywords: WFD, waste prevention, waste management, education

1.INTRODUCTION

The matter of waste is connected tightly to Sustainable Development. This means a development that meets the needs of the present generation, without compromising the ability of future generations to meet their own needs (Brundtland Report, 1987). Thus, it offers a vision of progress that integrates immediate and longer-term objectives, local and global action, and regards social, economic and environmental issues as inseparable and interdependent components of human progress (European Commission, 2014). Waste is a matter which contains challenges in all mentioned dimensions of Sustainable Development. It evokes various environmental, social and economic challenges, both local and global, which can have immediate as well as long-term consequences. Waste prevention bases on a simple concept: If you create less waste, you consume fewer resources and you will have to spend less effort like money or energy to recycle or dispose the waste. To become truly sustainable, there shouldn't be any waste production. This works either through re-use of materials, as they were designed, or waste prevention (Bartl, 2014).

Waste prevention is difficult to measure and to monitor. How to measure a thing that never existed? Recycling can be measured and quantified, but waste prevention is something that is probably eliminated from the waste stream (Bortoleto, 2014). Statements about the success of a particular waste manage activity therefore always require assumptions about the kind and amount of waste would have been generated without the measure (Dehoust, 2010).

Working in a research group with people from different countries implies the possibility to show variations of the application of the WFD in designated countries. Besides, waste prevention practices vary and there are plenty of different waste prevention programmes on international, national and regional level which are more or less successful. Statistics like the amount of waste per household or the recycling rate vary a lot between the different countries. They may reveal the status quo of waste prevention in the different countries and show in which areas improvements are required.

As the implementation of waste prevention and education varies a lot between the countries, it is important to see, in which way concrete actions take place. Therefore, this study presents interesting examples of waste prevention in the different countries and describes the advantages and disadvantages. This is an approach to show how the matter of waste prevention is realized and to learn from each other. Sharing good ideas is crucial for successful waste prevention.

2. METHODOLOGY

The countries under research are Austria, Belgium, Germany, Netherlands and Portugal. These countries are chosen because they are the home countries of the members of this research

group. This research group worked in an e-learning of the course in Environmental Seminar of Sustainable Development with the support of a tutor and expert to developed this research. The methodology consists of literature research, the definition of indicators and the collection and analyzing of statistics.

To be able to compare the status quo of waste prevention in the different countries, the group defined nine indicators. These indicators are chosen on basis of what statistics are available in each country. The chosen indicators are meant to reveal the status quo of waste prevention in the countries. The group selected a data time frame from 2006 till 2012. The following indicators were selected:

1. Total amount of waste produced by households
2. Amount of waste per capita/year
3. Waste intensity - relation between GDP and total waste generation
4. Household waste destination
5. Number of separated waste streams
6. Measures in which money is an incentive to reduce the amount/production of waste
7. Re-use
8. GDP in relation with national direct material input
9. Environmental awareness

3. RESULTS

Waste prevention should be top priority in every EU country aiming at a sustainable waste management, in the table 1 we present the indicators selected and presented in methodology and for these we make use of the national or regional statistics to determine if the impacts of the waste prevention goals are visible by means of numbers.

3.1 Comparison of nine different indicators related with waste prevention in five different countries (Austria, Belgium; Germany; Netherlands; Portugal)

Although waste prevention is more then only numbers (the definition of waste prevention relates also to the hazardousness of substances), trends can become visible. Eventually, a comparison between the different countries will give insight in the differences between these countries, as can be seen in the table 1.

Table 1. Results from the different country related with waste prevention indicators.

Indicators	Austria	Belgium	Germany	Netherlands	Portugal
1.Total amount of waste produced by households	4020 (10^6)	5035 (10^6)	44.188 (10^6)	8800 (10^6)	4782 (10^6)
2.Amount of waste per capita/year	477kg /2012	459kg /2012	549kg/2012	530kg/2012	454 kg/2012
3.Waste intensity - relation between GDP and total waste generation	Decoupling	Decoupling	dDecoupling	Decoupling	not been reached the goal of a decoupling waste generation of economic growth
4. Household waste destination (2012)	C&D – 33,9% MR – 28,03% TI – 34,66% L – 3,41%	C&D – 20,97% MR – 36,3% TI – 42,08% L –1,16 %	C&D - 97,5% MR – 66% TI – 31,6% L –< 0,5 %	MR – 47% TI – 51,2% L – 0,8%	C&D – 17% MR – 34% TI – 19% L – 55 %
5.Number of separated waste streams	13	6	9	9	5
6.Measures in which money is an incentive to reduce the amount/production of	Waste fee 2012 - 669 mio increasing	Diftar system	Waste fee (garbage)	Diftar system	Waste fee

waste					
7. Re-use	decreasing trend of the re-use of glass visible	recycle center (is rising, but very slowly)	decreasing trend of system of re-turnable bottles	0,5% of households waste was destined for re-use (2010)	
8.GDP in relation with national direct material input	Material intensity decreased by a quarter (1995-2010) and GDP increase 36%	Decoupling (but no systematic improvement of the material productivity of the economy)	long-term absolute decline in use of resources	Decoupling (material intensity, has been reduced by 20%)	No Decoupling
9.Environmental awareness	-	Several surveys in Flanders (survey of eco-friendly consumption)	-	-	-

C&D – Composting and Digesting; MR – Material Recycling; TI – Total Incineration; L – Landfill;

Indicator 2: household waste per capita

Less waste is produced per capita in 2012 than in 2006, but with the exception of Germany. In Germany the number keeps rising until 2011 and in 2012 there is a small decline of the number of waste produced per capita. Some countries (Belgium, Netherlands and Portugal) have a year where there is a maximum of produced waste, but altogether they have less waste produced in 2012 than in 2006.

Indicator 3: Relation between GDP and total waste

There is a general trend when the GDP raises, the waste per household declines. A trend is as if the GDP rises, most of the time the amount of waste declines. As seen in indicator 2, we can see the amount of waste decline over the years. Most of the time the GDP keeps rising after 2009 until the end of the used data, with the exception of Portugal where the GDP keeps declining after 2009 together with the waste produced. So in all countries, except in Portugal, we encounter a decoupling trend of waste production and economic development.

Indicator 4: Household waste destination

While this is the bottom of the waste hierarchy, all the countries have a decreasing trend and therefore they all did a great effort to reduce this number. This is necessary if the countries are paying attention to the long term goals of the WFD.

Portugal is the only one who is above the European Union average, while the rest is beneath it. Austria did well in preventing this deposit of waste. They reduced their number by almost 70% in our data. It seems that Belgium has done a lot of effort, because their number of deposit decreased for almost 90% in the used data. Germany did it good from the start of our data and even decreased their number a little bit. The Netherlands has a decrease of 40% and, while their number was already low at the start of the used data.

Total incineration (including energy recovery): kg/capita

The trend of the European Union is an increase in amount of waste incinerated over the years. There is in also an increase of incineration per capita in every studied country. Some countries have a rising trend over the entire period of time. This rise of incineration is due to more strict rules about the dumping and land filling. This way the countries are going up the waste hierarchy. Other countries, like Germany, Netherlands and Portugal have less waste incinerated in the last year than in previous years. They follow the global trend of the European Union. A reason for this will be the result of an european guideline for going even more up the waste hierarchy.

Material recycling: kg/capita

There is a general positive trend in the European Union when it comes to recycling. More waste gets recycled per capita, while the global trend of waste per capita keeps declining. Not every country has the same definition concerning recycling, this makes the data difficult to compare. The best recycling country is Germany and the least is Portugal. Germany recycles 5 times more per capita than they do in Portugal.

Composting and digestion: kg/capita

Not all compared countries follow the trend of the EU (table 4.27). The countries who have a similar positive trend are Germany and Portugal. The household waste that gets composted or digested in the other four countries decline throughout the years. In the Netherlands this num-

ber stays relative stable. However, countries do not follow the EU trend. They are all above the average, except Portugal. Portugal is doing a good job in increasing the number, but the number of composted and digested household waste stays under the average. Austria is doing the best in this topic, but their number is degrading at a fast rate.

Indicator 5: Number of separated waste streams of household waste

Belgium and Germany have numbers in percentages, so they are easier to compare. Glass is 100% recycled in most countries, so we can conclude that glass is totally recycled in the compared countries which is a good sign. Paper is in most countries a waste that is recycled well. Most of the time the number of recycling is near 90%. Again Germany does better with 99 to 100%. Plastic is more and more recycled in the countries. This is because more methods are found for the recycling of plastics and the efficiency of the methods keep rising. The recycled percentage keeps under 50% in every country because you cannot recycle the same plastic many times. When we recycle plastics, most of the time it is a downcycle, so the same plastic has a less attractive function and can never go to its previous function anymore. There are big differences of the recycling of biodegradable wastes. Germany has a large recycling rate (around 99%) of this kind of waste, while the other countries do not get this number above 50%. The recycling of different metals goes down in every country, except in Belgium, because of the use of more kinds of metals and smaller parts of them in electronical divices. The recycling of metals goes better and there are more efficient ways to recycle different kinds of metal. In Belgium some companies like Umicore earn a lot of money in this business.

Indicator 6: Measures in which money is an incentive to reduce the waste

Most of the countries have one or more incentives to reduce waste. Austria works with household waste fees, Belgium and Netherlands use the diftar system and Germany uses garbage fees. All these incentives are based on the polluter pays principle. Mostly the incentives are not the only measure, but strengthened in a broad range of measures. Portugal seems to have no real incentives yet for households, although is mentioned in the PERSU 2020. Normally more measures lead to a better recycling rates, as can be seen with Austria, Belgium, Netherlands and Germany.

Indicator 7: Re-use of glass

Austria works with fees and it works good. They have data about the re-use of glass, but this number declines from 2008 (from 32,5%) until 2013 (to 29,4%). In Belgium and Germany there is also a very high number of glass re-use. The number of glass recycling is not that high in Belgium because the same company has to refill the bottles to re-use it for the same products. The highest number of re-use of glass is in Germany with around 45% but it is declining.

Indicator 8: GDP in relation with national direct material input

In all countries the material input is declining while there is economic growth. We can talk about a decoupling trend. The more waste does not mean there is more economic growth. The decoupling starts around 2007. Only Portugal does not have this decoupling trend. Their GDP does not rise while the material input is, like in the rest of the countries, declining.

A decrease in total waste generation could indicate that there is a trend of waste prevention. So, the waste quantity reduction does not automatically indicate a lesser impact on the environment, since a lighter material can generate a greater impact during its life-cycle than a denser one (Prewaste, 2010). For example plastic versus glass. The amount of packaging can decline by due to a shift from glass to plastic. But the lifecycle energy used required and the GHG emissions to create the packaging increases. This results in a quantitative, but not a qualitative waste reduction (Bortoleto, 2014).

Waste prevention can be reached through changing the behaviour of people (Bortoleto, 2014). People can be made aware by making them pay for their waste, for example through the diftar system (see indicator 6, in table 1), but also through education and good examples.

The study on managing municipal waste (EEA, 2013) indicates that countries using a broad range of instruments have a higher municipal waste recycling rate than countries using very few or no instruments.

3.2 Examples for waste prevention

One project of each of the countries Austria, Belgium, Germany, Portugal and the Netherlands were analysed. This was conducted with a SWOT analysis, also to see the implementation of

the EU WFD in the projects. These examples should give people all over Europe ideas for finding new ways to prevent waste.

Austria - Award winning project "Iss mich" 2014: Since 2012 the waste-cooking-show wastecooking has been raising awareness for the topic of food waste. Founding the food brand iss mich! is an important move in stepping up against food waste. The slogan is "eat it, don't waste it". That's why iss mich! (eat me!) prepares delicious vegetarian dishes from perfectly healthy veggies that did not meet retail standards - not due to quality but due to aesthetics. The food, filled in glas jars is offered in Vienna and can be orderd for office lunch or home for up to 25 persons and for any events with more than 25 persons. The dishes are organic, healthy, tasty, reducing food waste, served in re-useable jars and delivered by bicycle. Thus, the food is prepared by people, who do hard getting a job. Women, who are living in mother-child houses of the organisation Caritas (Frauenhäuser Caritas) prepare the meals and have a chance to earn some money with it.

Belgium – Robuust: Robuust is a market shop in the city of Antwerp that calls itself 'a zero waste shop'. It is the first packaging free shop in Belgium. It is an idea of prerecycling, where they do not use packaging in all ways. The method for this zero waste shop is that the customers have to bring their own refill box to the shop, define the empty weight and refill it with a product and weight it again. This way, they only pay for the product that is inside the refill box. This is a specialized biological shop where you can buy seasonal vegetables and fruits from local farmers. Besides, you can get a lot of dry foods in bulk; like coffee and tea, dairy products, sweets, nuts, grains, oils and fruit juices. The idea is that you bring your own packaging with you and you can refill it in the shop. The sizes of your buys are not a problem, because you can buy small or big quantities. Another way to narrow their ecological footprint, the company tries to work with local distributors.

Germany – Collaborative consumption: Using instead of owning, borrowing instead of buying – those are the principles of collaborative consumption. The idea is that not everybody needs to own everything but that it is rather useful to share and exchange objects. This concept is not new, though combined with the possibilities of the internet and the current debate on sustainability it brought a renaissance of collaborative consumption in Germany and other countries. The core advantages are the conservation of resources and the money saving for people. A much known form of collaborative consumption is car-sharing or bike-sharing, which meanwhile exists in many German cities. But there is more: for example you can share your parking space (www.unserparkplatz.de), your garden (www.meine-ernte.de) and even your dinner (www.foodsharing.de). There is a platform which concentrates on objects for the daily life (www.frents.com), which will be analyzed in detail. The goal of this platform is to become a social network for people who want to live the idea of collaborative consumption (or shareconomy how it is also called) as often as possible. This is how it works: Frents is the platform for sharing your stuff with your neighbours and friends. It works similar to other community platforms. You can create a profile, have contact with your friends and send them messages. The special feature of Frents is that you can open your collections in all topics you are interested in.

Netherlands – Wecycle: Wecycle is an organisation which promotes the recycling and re-use of electronics and light saving bulbs. It is an organisation that has been with a minimal governmental influence for several years in the Netherlands. Only for separate collection of electronic waste, agreements have to be made local governments. They work for importers and producers. It is financed mostly from the trade in electronic waste and it's parts (Wecycle.nl, 2015). There is a lot of attention for education in Wecycle, from elementary school, secondary school, to companies and households. Especially in electronic devices the re-use is promoted by disassembling electronics after collection and re-using electronic parts, like capacitors. Apart from the goal to recycle and re-use as much as possible, another goal is to reduce electronic waste to 4 kg / person / year, which is now about 8 kg / person / year. This can be achieved by ensuring a longer life-time for electronics (Wecycle.nl, 2015). For now most of the materials are being recycled instead of re-used.

Portugal – Green Cork: Implemented since 2008, Green Cork is a Quercus (National Association for Nature Conservation) project for collecting cork stoppers for recycling. It is developed in partnership with Amorim group, Continente supermarkets, the Dolce Vita Commercial Cen-

ters, schools, scouts, municipalities, waste collection companies, wineries, wine producers and other entities that locally make this project a success. Its main objectives are to collect cork stoppers and finance the planting of indigenous trees through the Joint «Floresta Comum» project. The Green Cork is a project that works in cycle, from the tree comes cork, recycling gives new uses for cork that was previously the stopper, and even allows to plant new trees. Things that came from nature return to nature. Through amounts which Quercus received for delivery to recycling about 235 tonnes of cork stoppers were already planted about 200,000 trees (2014 data).

4. Conclusions

All countries chosen for the research have implemented the long term goals of the EU WFD. The waste prevention programs are well developed in all countries and include targets similar to the EU WFD, per example the recycling quota of 50% by 2015. Some countries like Austria, Belgium and Germany and the Netherlands can be seen as role models for recycling because in those countries the recycling quote is already about 60%.

Looking at the status quo of the countries, one main difference can be seen. The countries Austria, Belgium and the Netherlands do a good job reducing waste. Portugal does a good job as well, but still has a long way to go to reach the environmental level of the other countries. While in all other researched countries a decoupling trend of GDP and waste production can be found, in Portugal the GDP declines with the amount of waste. Furthermore, Portugal is the only country which is above the EU average concerning landfill as a waste destination. Thus, Portugal hasn't reached the EU average in recycling and composting.

There is an increasing trend for incineration in all countries (incineration with energy recuperation is subsidized by the government) and this indicate contradictions which exist between the different levels in the waste hierarchy, and may be a reason why waste prevention is difficult to reach. Very positive is fast declining landfill rate. Austria has a landfill ban since 2009 which led to almost zero landfill. Also in Germany the landfill rate is about zero.

Even though most of the countries researched are role models for waste management there are still things to be improved. Germany, for example, does a good job in treating waste, but it is the only country where the amount of waste increases. Also, all countries could work on reusing of products like glass, since the rate is declining in general.

All countries see education as very important for waste prevention. Therefore, parts of the national waste prevention programs describe the possibilities for education. People need to get aware of waste management issues and sustainable consumption. But there are also already lot of innovative ways for waste prevention. This shows the examples given by each country. Projects like collaborative consumption, using groceries which don't meet the retail standards, zero waste shops, recycling and re-use of electronics and recycling of cork stoppers are great innovative projects which could be developed in all EU countries.

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