



Review

Measuring waste prevention

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ABSTRACT

The Waste Framework Directive (WFD-2008/98/EC) has set clear waste prevention procedures, including reporting, reviewing, monitoring and evaluating. Based on the WFD, the European Commission will offer support to Member States on how to develop waste prevention programmes through guidelines and information sharing on best practices. Monitoring and evaluating waste prevention activities are critical, as they constitute the main tools to enable policy makers, at the national and local level, to build their strategic plans and ensure that waste prevention initiatives are effective and deliver behaviour change. However, how one can measure something that is not there, remains an important and unresolved research question. The paper reviews and attempts to evaluate the methods that are being used for measuring waste prevention and the impact of relevant implemented activities at the household level, as the available data is still limited.

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1. Introduction

In 2008, according to the latest official Eurostat statistics, the total waste generation in the EU-27 was 2.62 billion t with an increasing trend. Of this quantity, 98 million t or 3.7% were classified as hazardous waste. This means that in 2008 each EU citizen produced on average about 5.2 t of waste, of which 196 kg were hazardous (Eurostat, 2011). Waste prevention means eliminating or reducing the amount and/or the toxicity of waste, including recyclables. For businesses, government agencies and other organisations, it includes processes that: conserve supplies and inventory; eliminate, reduce and reuse products and packaging; deploy waste-reducing technology and equipment; use more durable, reusable, repairable and less toxic products and packaging; leave grass clippings on the lawn to naturally decompose; and reduce food and yard waste, including through on-site composting. For the citizens, waste prevention also includes: buying products with the least amount of packaging; buying only the amount of a product that is needed; buying less harmful products; and reusing, donating or repairing items that might otherwise be discarded or recycled (NYCDoS, 2000; Sharp et al., 2010a,b).

Measuring waste prevention is a complex and difficult undertaking. It is not really clear what can be measured if it is not there. Unlike recycling, where the amount of material transferred from the “garbage can” to a “recycling bin” can be quantified, waste pre-

vention often results to the elimination of the material. In this case there is nothing to weigh or evaluate. According to WR1204 (2009a), the aim of monitoring and evaluating household waste prevention is to assist policy makers, local authorities and experts to: ensure that robust decisions are made about where to prioritise resource allocation; collect reliable, high quality data; and certify that waste prevention programmes are being effective and providing the required behaviour change.

In the UK, the Government has funded a large research programme on waste prevention, which has consolidated much of the scattered knowledge in the issue, enhanced understanding of waste prevention and triggered relevant research and practice. The programme included a review of evidence analysing the behavioural opportunities and barriers in household waste prevention, associated with the effectiveness of various policy measures (Cox et al., 2010), assessing the impact of waste prevention campaigns (Sharp et al., 2010a) and developing methods to monitor and evaluate waste prevention through mass reduction and behavioural studies (Sharp et al., 2010b). Today, waste prevention is becoming a priority in many national policies, worldwide. In the EU especially, the Waste Framework Directive (WFD-2008/98/EC) has set clear waste prevention procedures, including reporting, reviewing, monitoring and evaluating. It also requires Member States (MSs) to establish national waste prevention plans by the end of 2013 and actively develop waste prevention programmes. Moreover, the WFD places a legal obligation for MS to follow the waste hierarchy, where prevention is the top priority of any waste management plan.

As waste prevention is becoming increasingly important for waste and resources management, both at the level of planning and implementation, it is crucial to develop reliable methods to

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monitor, measure and evaluate waste prevention and its benefits, as well as to assess the effectiveness of actions aiming to promote relevant awareness and behavioural changes. The aim of this paper is to review the methods that are being used for measuring, monitoring and evaluating waste prevention activities and the relevant implementation programmes in the framework of household/consumer prevention.

2. Waste prevention in the Waste Framework Directive

According to the WFD (2008/98/EC) waste prevention is defined as “the measures taken before a substance, material or product has become waste, that reduce the quantity of waste, the adverse impacts of the generated waste on environmental and human health or the content of harmful substances”. Preventing waste means reducing the amount of waste generated, reducing the hazardous content of that waste and reducing its impact on the environment. Waste prevention includes strict avoidance of waste generation, qualitative and quantitative reduction at source and reuse of products. It does not include recycling of materials and separate waste collection (Pre-waste, 2012). In the last decade several efforts were taken, both at national and international level, to define waste minimisation and waste prevention, along with setting legal targets and guidelines to reach an effective waste prevention (Salhofer et al., 2008).

The WFD establishes the legal framework for the management of waste within the European Union. It aims at protecting the environment and human health through the prevention of the harmful effects of waste generation and management. Member States should take measures for the treatment of their waste in line with the following hierarchy, which is listed in order of priority: prevention, preparing for reuse, recycling, other recovery, notably energy recovery, disposal.

At a national level, the principle of waste prevention was embodied in German (AbfG, 1986; KrW-/AbfG, 1994) and Austrian waste management law (Salhofer et al., 2008) as the ultimate goal. In Cyprus the WFD got into a force at the end of 2011, while Greece transposed it at the beginning of 2012, through the Law 4042/2012. Some nations have specified specific targets for waste prevention. Scotland, for example, in its national waste plan for Scotland in 2003, stated its aim to stabilise waste generation by 2010 and to continue progress afterwards with an actual reduction in waste generation (Hughes, 2005). Also, the Municipality of Paralimni, which is in the Eastern region of Cyprus Republic, established through a Life+ project (WASP-Tool), clear targets for waste minimisation (Zorpas et al., 2012) especially focusing on food waste, paper, PMD, green waste, furniture and construction & demolition waste, in order to increase preparedness, as by the end of 2013 the Cyprus Government must have in place a national Waste Prevention Strategic Plan. The City of Vienna in Austria defined a set of measures for the Vienna Waste Management Plan, as a result of a strategic environmental assessment (SEA) undertaken in 2001 (Lechner, 2005). The main final result of the SEA was to stimulate qualitative and quantitative waste prevention and to allocate to this goal a budget of 5 million €/yr (Büchl-Krammerstätter, 2005). To these outcomes a strategic group was established for waste prevention, consisting of representatives of the municipal government. Among other activities, this committee arranged a competition in 2003 and 2004, as a result of which 42 projects (17 basic studies, 13 awareness raising projects and 12 implementation projects) were funded. It was calculated that these projects prevented a total of 2190 t of non-hazardous waste (1.3 kg/cap/yr) and 4.5 t (0.03 kg/cap/yr) of hazardous waste (MA 48, 1999).

Some countries, such as Taiwan (Young et al., 2010), Australia (Zero Waste South Australia, 2007) and New Zealand (Ministry

for the Environment, 2007) have adopted the target of zero waste as a form of strategic waste prevention. Regrettably, zero waste is usually interpreted as zero waste to uncontrolled disposal or landfill, mostly including recycling and, generally, it excludes environmental assessment (Gentil et al., 2011).

3. Household waste prevention definition

Focus groups consider waste reduction to include recycling activities (RECAP, 2008). This view, however, may lead to residents' belief that they are already “doing their best” for waste prevention and limit further interest or action. However, waste prevention, which is the highest priority of the waste hierarchy, is defined as the prevention of waste at source through avoidance, reduction and reuse, but excluding off site recycling. Along this line, the WFD, especially in Article 3, clause 12–13, states that prevention means taking measures before a substance, material or product has become waste, which reduce: (a) the quantity of waste, including through the re-use of products or the extension of the life span of products; (b) the adverse impacts of the generated waste on the environment and human health; or (c) the content of harmful substances in materials and products. In this respect, re-use is defined as any operation by which products or components that are not waste are used again for the same purpose for which they were conceived. Fig. 1 (EEA, 2002; Wilson, 2004) provides a graphic representation of the clear differences between waste prevention and recycling. Home composting, according to Wilson (2004) will, however, be included to waste prevention, as it prevents waste entering the residual waste stream. According to the EEA (2002) the term “waste minimisation” is commonly used, but a strict definition does not exist and in particular the distinction between prevention and minimisation can be difficult. The definition of waste minimisation was agreed at the Berlin meeting in 1996 (OECD, 1996). As it appears from this definition waste minimisation is a broader term than prevention. Waste prevention covers “prevention”, “reduction at source” and “re-use of products”. Waste minimisation, however, also involves the waste management measures “quality improvements” (such as reducing the hazard) and “recycling” (EEA, 2002).

4. Methods used to measure waste prevention

Several methods have been used to measure waste prevention, which can be summarised as following: (a) Direct quantification of source reduction, referred on reported measurements of changes in waste stream quantities, either by volume or weight. This method includes direct monitoring programs through case studies, audits and/or waste sorting studies. (b) Source reduction cost analysis, which generally incorporates two financial factors: the cost of undertaking the source reduction effort and the savings in purchasing and disposal costs, combined to calculate the realised total costs of the effort. The basic steps include the identification of the source reduction and the direct cost of implementing the source reduction as well as the costs to be measured (such as purchasing, disposal, labour and other relevant factors) before and after implementation of the source reduction. (c) Another measurement technique is the use of indicators (determined on either an economic, resource, or waste basis) to establish both the baseline potential for waste prevention programs and to measure the effectiveness of the program after implementation. Such indicators could include per capita waste generation, per employee waste generation, or tons of waste per wage dollars. (d) Resource productivity ratios are simple measurements of a product or service divided by the resources required to produce the product or service. Each ratio is a measure of the efficiency with which resources are used. For

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