

# The Swing from Recycling to Waste Prevention

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**ABSTRACT:** *The new European waste strategy is not solely targeted at handling waste sources, but instead puts the entire supply chain of a commodity at the center of concern. Waste prevention and re-use have the highest priority and take place before a product or a material's end-of-life stage is reached. Recycling can help decrease primary resource use, but it does not resolve the causes, only the symptoms. Recycling processes, in general, require energy and will create side streams (i.e. waste). In addition, there are insurmountable challenges and the activity is far from 100% recycling. Since they really discuss the causes, the theory of waste reduction and re-use is entirely different. It is self-evident that a decrease in waste would also decrease the use of waste production services, energy and money. However, even though European legislation is proceeding in the right direction, there has not been a clear decrease in the production of waste so far. Unfortunately, the production of waste is a positive factor in economic development. Waste generation is basically a big business and many stakeholders are not involved in eliminating waste. To decouple economic growth from waste generation, more sophisticated incentives are needed.*

**KEYWORDS:** *Grass Roots Recycling Network (GRRN), Total Quality Management (TQM), Zero Waste, Zero Waste Systems Inc. (ZWS).*

## INTRODUCTION

Waste management was a sanitary practice over the years and it was enough that waste was transported out of the towns and discarded elsewhere. However, the amount of waste created increased tremendously due to the significant economic growth after World War II and environmental and health problems such as air, soil and groundwater contamination emerged. In developed countries, such as the USA and European countries, the 1960s marked the beginning of modern environmental policy making, including waste treatment. Directive 75/442/EEC was adopted in Europe in 1975. It was the first waste legislation that brought environmental and human health safety to the fore. In 1991, 1996 and 2006, the Directive 75/442/EEC was amended [1]. Today, the revised Waste System Directive, which replaced all previous waste directives, regulates waste management. The Waste System Directive incorporates the so-called waste hierarchy, among other concepts. This stipulates a priority order for policy and practice on waste reduction and management legislation. In December 2010, it was due to come into effect in all EU Member States at the latest. Waste avoidance is given the highest priority in compliance with Directive 2008/98/EC and is ranked above all other policies. The avoidance of waste is based on a basic principle. You use fewer resources if you generate less waste and you will have to expend less time (e.g. money, energy) to recycle or dispose of your waste [2]. Ultimately, complete waste prevention to zero would result in a waste-free environment and waste management will also be redundant. Our economies are far from a waste-free status in reality and it is also clear that, in principle, it is difficult to fully eliminate waste.

The second position goes to 'preparing for re-use' in the waste hierarchy. As a reduced number of new goods have to be produced, re-use demonstrates certain distinct benefits. As a result, less resources and raw materials are used and the cost of disposal is lower. It must, however, be considered that both energy and resources would also be consumed by transport and cleaning, etc. New products can be more energy-efficient (e.g. less washing machine power consumption), have less environmental effects (e.g. engine that emits less harmful exhaust fumes) or have higher safety standards (e.g. vehicles with better crash performance) [3][4].

### ➤ *Recycling*

In the area of oil-refining and related industries, the first recorded use of the word 'recycling' took place in 1924. It is an artificial word and unifies the syllable and 'cycle' again standing for return to the original position. However, the underlying concepts of recycling are much older, even though the word recycling is very recent. In the nineteenth century, London's 'dust-yard' waste management scheme had major parallels with the recycling schemes of the informal sector operating in many developing countries today. It was not until the 1970s that the term was used in a wider context. Although the term displayed a positive picture and was/was commonly used for 'green-washing' goods and services, there was no specific meaning of recycling. There was a huge increase in its usage in the early 1990s, as a matter of fact [5].

Since 2008, recycling has been specified more or less clearly by EU Directive 98/2008/EC. It describes recycling as: 'any recovery activity by which waste materials, whether for original or other purposes, are reprocessed into goods, materials or substances. This involves the reprocessing of organic material, but does not include the recovery of energy and the reprocessing into products to be used as fuels or for operations of backfilling.' Recycling requires a set of processes that can be further categorized according to various aspects. The level of processing that takes place, on the one hand, leads to the following categories:

- I. *Recycling of products*: any form in which the chemical and physical structure of a product is retained but the product is not used for the original purpose (e.g. using tyres or glass bottles as building material).
- II. *Material recycling*: any phase in which the physical constitution is destroyed, but not the chemical constitution (e.g. melting and reprocessing of metals, or recycling of fertilizers from food waste to the farming land by digestion or composting).
- III. *Recycling of feedstock (also raw material recycling or chemical recycling)*: Any method through which a material's physical as well as chemical composition is reprocessed into its original components (e.g. de-polymerization).

On the other hand, the recycling allocation process differentiates between the following two cases:

1. For closed-loop commodity systems, a closed-loop allocation process applies. It also refers to open-loop product systems where there are no modifications in the recycled material's intrinsic properties. In such situations, when the use of secondary materials replaces the use of virgin (primary) materials, the need for allocation is avoided [6].
2. For open-loop product systems where the material is recycled into other product systems and the material undergoes a transition to its intrinsic properties, an open-loop allocation process occurs.

### ➤ *Metal recycling*:

Metals are often believed to be renewable goods because they consist of indestructible atoms that can be easily and infinitely recycled. In practice, however, losses and pollution are unavoidable and thus such recycling restrictions are evident. A certain fraction of material is already lost by dissipation during its use stage (e.g. corrosion). Secondly, all the material put on the market is, of course, difficult to obtain, and the quantity of obtained material will still be smaller than the material put on the market [7].

➤ *Plastics recycling:*

For plastics, the situation is even worse. They consist of macromolecular molecules (i.e. polymers) that are very susceptible to mechanical treatments and elevated temperatures. In practice, each stage of recycling implies an intrinsic loss of properties (e.g. reduction of molecular mass) and thus restricted recycling [8].

***Is 'zero waste' the objective of recycling?***

'Zero waste' is a concept that in waste management today is exaggerated and exploited almost constantly. A quick search of scientific and technical databases showed that an unprecedented rise in zero waste entries has occurred over the last 20 years. It is clear, however, that no unambiguous meaning of the word exists. There is no specific proof of the roots of the word zero waste, but it is known that in 1973, in Oakland, California, Paul Palmer founded Zero Waste Systems Inc. (ZWS). The first ZWS attempt was to use surplus chemicals instead of disposing of them from the emerging electronics industry. The Zero Waste Institute was later founded by Palmer, which expanded its activities to a wider scale. Palmer describes zero waste as 'a realistic philosophy about how to use resources to minimize maximum efficiency.' An extension of the Japanese-based Total Quality Management (TQM) ideas into the environmental sector, according to Robin Murray, is zero waste. In order to improve economic performance, the original goal was to reduce failures and reject rates in the automotive industry to zero. As a consequence, this technique also seeks to eliminate all unwanted by-products, thereby achieving 'zero waste.' The word zero waste is, sadly, perceived more or less literally. Zero waste does not mean, according to Palmer, that waste is only diverted from landfills. It reflects the third stage of growth in the manufacture and use of products. By using intelligent design and re-use, incineration and recycling certainly need to be avoided. The word zero waste is often understood less specifically. Zero waste is a concept and a design standard for the 21st century, according to GRRN (the grass roots recycling network). Recycling is included, but it goes beyond recycling. However, no binding figures exist. The Zero Waste International Alliance reports that 'over 90 percent of waste disposal from landfills and incinerators is deemed good or darn close to achieving zero waste.' Several regions or cities have initiated zero waste campaigns that display entirely different goals. Robert Krausz's comprehensive analysis provides a closer look at different zero waste programmes. It is possible to identify four groups according to the degree of apparent ambition, according to Krausz [9][10].

- a. Zero waste as an aspiring goal
- b. Zero waste with comparatively modest goals
- c. Zero waste with reasonably ambitious goals
- d. Zero waste to the target of landfill

## CONCLUSION

Waste is governed by various legislation and rules. The revised Waste System Directive plays an important role in Europe and defines the hierarchy of waste. Waste prevention is on top of the ladder and preferable over all other alternatives. Several other directives put into practice particular forms of waste in the EU (e.g. WEEE, packaging). The new law has, however, implemented quotas for recycling and recovery, but hardly for the prevention of waste. In recent years, the recycling rate has increased tremendously in many countries. It is, however, clear that there are such recycling restrictions. Recycling is often a matter of money. The 'goods' are now recycled, but the recycling of other waste sources is not competitive with recovery, disposal or export, in particular. Thermodynamics can also be used to illustrate the limits of recycling. Even if recycling displays ecological benefits often, it uses energy and resources and does not itself solve waste generation.

Waste reduction and re-use are certainly very beneficial policies to minimize resource consumption and the effects on the environment, as the amount of waste is reduced. Unfortunately, so far, more waste will be created by economic development. Basically, it is hard to quantify waste reduction and counteract the economic interests of different stakeholders. Producers and dealers, which are also generators of waste generation, are involved in growing sales and turnarounds. Also in the waste management field, if less waste is generated, collectors, landfill operators, incinerators and recyclers would have less revenue. In order to match interests, new and more sophisticated drivers are necessary. Waste smuggling is a big issue that causes significant environmental and health issues. Wastes from developed countries are exported to third-world countries, on the one hand. In the other hand, the transfer of production and related waste generation ('indirect' trafficking) is transmitted to third-world countries. There are distinct environmental and social drawbacks to all types of waste export.

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