

**Thoughts about RRR-Communication – How well meant intentions in “Reduce – Reuse – Recycle” are an inadequate basis for a successful development of international waste management.**

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**Abstract**

The paper’s purpose is to enhance the public awareness as well as the awareness of the international scientific community regarding the climate change mitigation potential of the waste management sector. Additionally, the recommendations and case studies in the WtERT Network’s Decision Support System are being shown as a means of communication in the international waste management sector.

By regarding data about mitigation effects found by the Life Cycle Assessment method (LCA) and changing the focus from “Recycling” to “Closing Landfills”, waste management measures can be reevaluated.

As a result, once the closing of landfills has been agreed upon, immediate reduction of the waste volume becomes a necessity and – in addition to recycling – waste-incineration must be taken into consideration as soon as possible.

The paper concludes in showing how the new knowledge infrastructure by the WtERT network could be helpful in international waste management communication regarding all aspects of recycling, incineration and dumpsites.

**Keywords**

Circular Economy, Climate Change, Landfill, Waste to Energy, Recycling, Incineration

**1 About Priorities**

**1.1 Perception**

Frequently we ask our international contacts what their top motivation is in optimizing waste management in their respective country.

They often respond that they want to keep the cities clean or would like to create a modern recycling system. When landfills need to be closed, this mainly relates to old dumping grounds and is never a matter of negotiating land-filling and the associated contribution to climate protection.

Of course, stakeholders in the EU try to do what they are told.

**1.2 Public Concern**

In the press release IP/05/1673 “Recycling: Europe’s New Waste Strategy” dated December 21st, 2005 the European Commission reports on its new strategy: Europe is to transform into a recycling society “which tries to prevent waste and utilizes waste as a resource” [1]

Years later, on June 14th, 2018 the new EU guidelines regarding the “Circular Economy Package” were published in the Official Journal of the European Union (L150) stating clear goals with respect to waste prevention and recycling. In addition to the distinct plastic strategy, the new recycling quotas of 65% for household waste and 75% for packaging waste (each by 2035) [2] have, in particular, become the center of attention of the public.

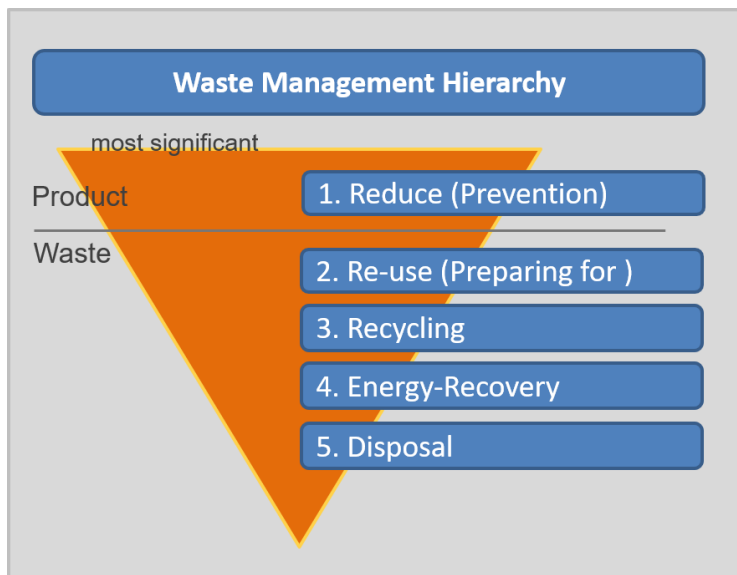


Diagram 1 European Waste Management Hierarchy

The fact that the EU has limited (or is it more a permission?) the depositing of household waste on landfills to a maximum of 10% by 2035 [3] without having binding intermediate goals and, in addition, has incorporated exception clauses in the law of up to 5 years, should convey even to the last attentive observer that the closing of landfills, when compared to the significance of recycling, is a rather subordinate goal.

### 1.3 Different Perspective

This is so distant from the state of knowledge in terms of the real and possible contributions of waste management to climate protection as can be abstracted from the German Federal Ministry of Environment, Nature Conservation and Nuclear Safety's status report from August 2005 regarding the "contribution of waste management to climate protection and possible potentialities". [4]

In the report's summary there are three remarkable sentences which, in my opinion, are distinct enough to reevaluate the significance of recycling from a global viewpoint.

- 1) "In total, the disposal procedures of the waste incineration plants and the co-incineration contain the highest potential for reducing greenhouse gases..." [4]
- 2) "All energetic procedures, considering the general conditions, have a 90% share of the achievable reduction potential." [4]
- 3) "Instead of producing a carbon dioxide equivalent of presently (2005) 87 m with waste management, a credit of 47 m carbon dioxide equivalent could be depicted in the future. As a result, a reduction potential of 134 m t carbon dioxide equivalent could be achieved from 2000 to 2020 for the municipal waste management of EU-15. The major portion stems from the almost 100 m t of carbon dioxide equivalents from the prevented methane emissions as a result of the role of landfilling." [4] <sup>1)</sup>

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1) Calculated over a twenty years' period, methane is a 72 to 86 times more potent greenhouse gas than CO<sub>2</sub>. [5]

In a more recent study from the German Federal Environment Agency “The Climate Change Mitigation Potential of the Waste Sector” (56/2015) the Life Cycle Assessment (LCA) method according to ISO 14040/14044 for waste management is applied. The LCA method takes into account both the direct emissions (debits) from waste treatment and the avoided emissions (benefits, credits) resulting from secondary products or energy generation. This method differs from the one used formerly, the National Inventory Reports, in which savings from incineration were given credit to the energy sector (power plants) or industry sector (cement kilns). [6]

In addition to the statistical data from Eurostat and the OECD (2008 – 2010), plausible assumptions had to be made. Therefore, the given data does not show exact figures but depicts the mitigation potentials.<sup>2)</sup> If calculated credits are higher than the debits, the net results are negative values which give the mitigation potential. [6]

For the ideal scenario from the status quo (2008-2010) to 2030 complete diversion from direct landfilling is assumed. The no longer landfilled waste is partly treated by material recycling. 80% of the remaining residual waste is treated in municipal solid waste incinerators with energy recovery and 20% in anaerobic mechanical-biological treatment plants (MBT). Treatment via MBT results in a refuse-derived fuel (RDF) fraction, 50% of which is incinerated in RDF plants and 50% in coal power plants or cement kilns. [6]

In the OECD region, calculations of the status quo in 2008-2010 show a net Global Warming Potential (GWP) of 66,358,000 t CO<sub>2</sub>-eq (debit). The ideal scenario as described above gives a credit of -286,906,000 t CO<sub>2</sub>-eq. That gives an overall mitigation potential of 353,264,000 t CO<sub>2</sub>-eq. [6]

And now back to the question referred to at the beginning:

Of course, it is excellent that countries are giving thought to secondary raw materials and are encouraging recycling. The fact that the anti-litter-strategies are seriously being discussed is an achievement of the European Commission.

Imagine how much faster the worldwide carbon footprint could be improved if the European Commission, in addition to the well-known waste hierarchy, would clearly identify the goal of “overcoming the landfills” and would evaluate all of the existing “tools” such as incineration (with energy recovery), recycling, and prevention based on their impact on a climate-relevant volume reduction. In this chronological order – incineration, recycling and prevention – waste management has developed in Germany.

But it seems that it has still not found its way into the minds of the law-making body that the idea of “incineration” is transforming into a concept of “powerplants” driven with waste to produce valuable steam energy and other sorts of energy recovery.

Step by step incineration plants in West Europe are being renamed into waste fired power-plants, which focus more and more on energy recovery.

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2) As the percentage of treated waste in the OECD region is quite high it has been assumed that the whole amount of waste generated in the region is treated. Information about the waste composition and recycling rates were taken from national data or assumed, where data have not been available. [6]

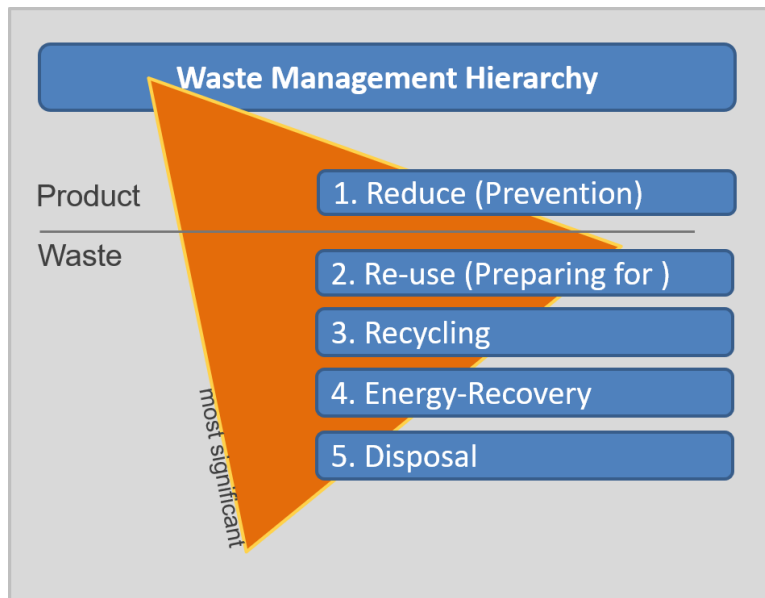


Diagram 2 European Waste Management Hierarchy from a Different Angle

Due to the prevailing landfill crisis incineration plants had to be built. The associated rise in costs of waste management enabled recycling to establish itself much faster.

## 2 Awareness

Often recycling is scaled down to material recycling when perceived in an abridged form.

### 2.1 Climate Change

In an integrated waste management, energy recovery must receive a higher evaluation when viewing the time factor related to closing landfills as rapidly as possible.

When considering the ever so important reduction of climate gases, the aim should lie on reducing landfilling and reassessing any tools available to achieve this goal.



Diagram 3 European Waste Management Hierarchy for Action

In addition to the waste management objective of reducing disposal more attention should be given to the structures on waste disposal sites and the technical goal to close landfills. A significant reduction in climate gases can be achieved even in existing waste disposal sites by implementing technical measures.

Here one can differentiate between the closing of landfills resulting in a reduction of gas emissions and the additional benefit of conducting energy recovery by utilizing gas.

It is unlikely that this will occur with the measures of the CDM Joint Implementation Initiatives through the purchase of Certified Emission Reductions (CERs) when viewing the still low prices of CO<sub>2</sub> certificates.

## **2.2 Wording**

Extending the term “Reduce Disposal” to “Close Landfills” is an important new wording, which, in addition to the greater weight on the technical components, can be fixed in the minds of those concerned.

Those who read the following wording in law texts

a. Recycling and Reduce Disposal

or

b. Recycling and Close Landfills

and who want to implement these will set other priorities and act differently.

Using the right words is very important, because it is strongly connected to your inner motivation for doing things.

You can feel the difference by using the two harmless words “Climate Warming” against “Climate Heating”. “Heating” has nothing to do with cozy feelings.

And even more, let us start to avoid the term “landfill”, which sounds as if there is a hole in the earth waiting to be filled.

Some specified wording is anchored to a vague labeling of our childhood. So, it might feel that a term like “Incineration” is deeply connected with the uncertainty of technical discussion longing to the past.

Therefore, to use the Word “Power plant, run by scrap” instead of using “Incineration” makes a great difference.

## **3 Necessity of a New Communication on a Global Scale**

Those who are following the dimension of the climate change with interest, but without apprehension are likely to conclude that all measures taken to counteract this phenomenon must be conducted on a global level.

### **3.1 The 80/20 Principle**

The “80/20 Rule“ (Vilfredo Pareto) says that 80% of the results are achieved with 20% of the total effort. The remaining 20% of the results with 80% total effort require quantitatively the most work.

Taking the time component of climate change into consideration, it is understandable that we must begin where we can achieve the most with the least amount of effort (20%). Here, too, reduction in mass and the closing of landfills have priority.

### 3.2 Dissemination of Knowledge without Preconceptions

If one follows the statements of this speech so far, then it is evident that a global dissemination of knowledge without preconceptions is essential.

The following diagram is intended for public discussion to help develop an unbiased side-by-side of activities in place of the often ideologically struck counterparts of material and thermal recycling – and that apart from EU hierarchy.

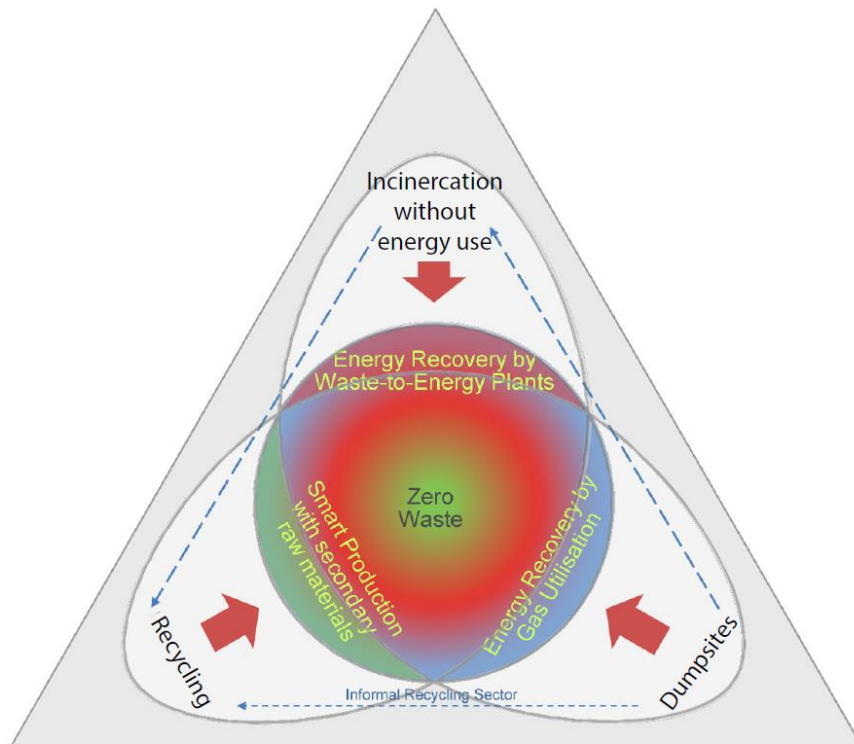


Diagram 4 Recycling, Landfilling and Incineration to Achieve Zero Waste  
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The collection of materials from waste, their energy recovery, and their recycling in smart production are processes that go hand in hand. Especially in modern countries with a high rate of energy recovery, recycling is growing in importance and becoming a significant economic factor.

#### 3.2.1 Integrity of Creation

The waste community must be developed into a sharing community with the aim to find out its part for the integrity of creation.

#### 3.2.2 Free Your Mind

If we free our mind and

- talk about recycling with additionally emphasizing the issue of landfill problems while looking for better solutions for the entire system,

- encourage people to be interested in new ways of solution making and if
- we have an open-minded approach towards a diversity of thinking

then we need a new slogan where we can embrace all the methods and activities in an integral waste management.

Till we find something better – we shall continue to use the slogan *Waste to Energy (WtE)*.

### **3.2.3 Way of Acting**

We pursue our keen interest to identify and provide outstanding practical examples of the Waste to Energy concept and to consolidate practical and expert knowledge and experience. We do this on a very broad level because we want to demonstrate that the concept of transforming waste to energy offers valuable solutions in all areas of the waste and resource industry. Furthermore, unlike in the hierarchies of other common waste management programs the sectors of landfill, incineration, and recycling are given equal status and presented free of bias.

### **3.2.4 Sharing Community**

In 2002 the Waste-to-Energy Research and Technology Council (WtERT) was founded by the Earth Engineering Center of Columbia University, New York, and the U.S. Energy Recovery Council. The goal was to identify and help develop the most suitable means for managing various solid wastes research, and to disseminate this information by means of publications, the web, and technical meetings. At the end of 2011, the Global WtERT Council (GWC) was created as a U.S. non-profit organization. Today GWC is the umbrella organization for 19 WtERT organizations in 18 countries, which consist of Brazil, Chile, China, Colombia, Cuba, Czech Republic, France, Germany, Greece, India, Italy, Korea, Pakistan, the Philippines, Serbia, Singapore, UK and the USA.

With all the above-mentioned arguments in mind, in January 2017 WtERT Germany was assigned by GWC to collect and showcase knowledge from all WtERT organizations.

Through many discussions on the topic of WtE we developed the vision to succeed in not only compiling the knowledge of our WtERT Partner Organizations, but also in uniting this with the experience of multiple partners in research organizations, industry and municipalities. To reach a high credibility of the whole WtE System, we believe it to be important to show existing solutions (case studies) and share personal recommendations from international WtE experts.

In August 2017 we relaunched [www.wtert.net](http://www.wtert.net) and thereby offer the opportunity to join the WtERT Decision Support System (WtERT-DSS).

The WtERT DSS provides a platform for stakeholders from all over the world to

- get informed and inform about state-of-the-art methods and technologies for sustainable waste management,
- inform about the status of waste management in their country and learn about solutions in neighboring and other countries toward approaching sustainable waste management,
- to provide a database of realized solutions by means of case studies from all over the world,
- to get in contact with scientists, local decision makers, associations and companies who may assist with the implementation of the required technology.

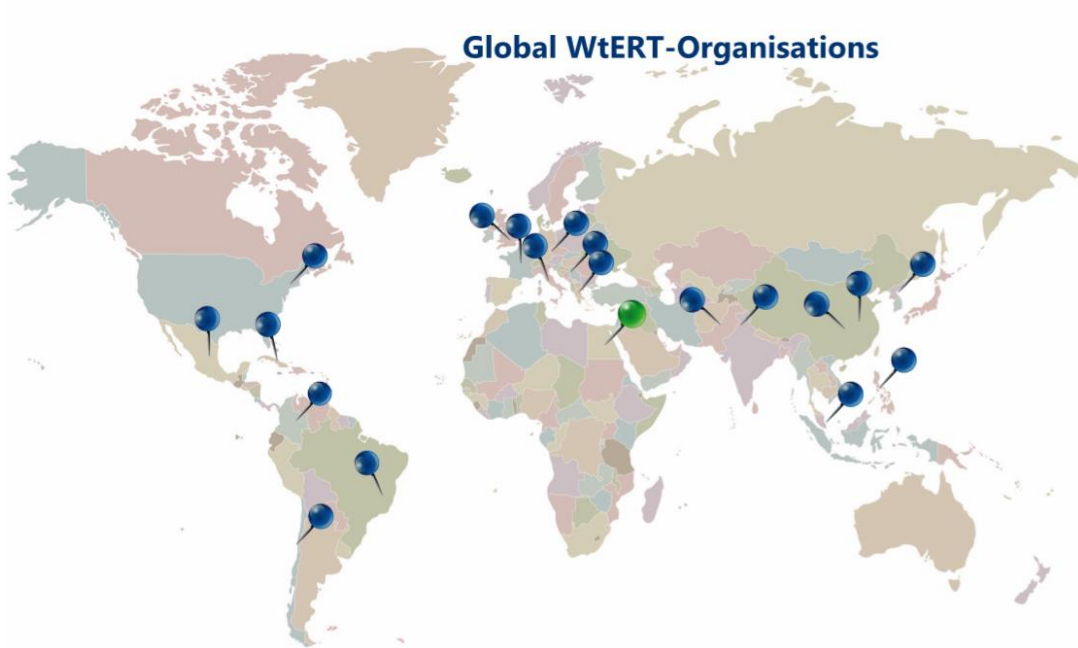


Diagram 5 Locations of Global WtERT Organisations

### 3.3 EU Including Candidate Countries

Looking at the chart below depicting the quotas achieved for the treatment of municipal waste up until 2017, one can identify the vast potential of reducing landfills merely in the European Union including the current candidate countries.

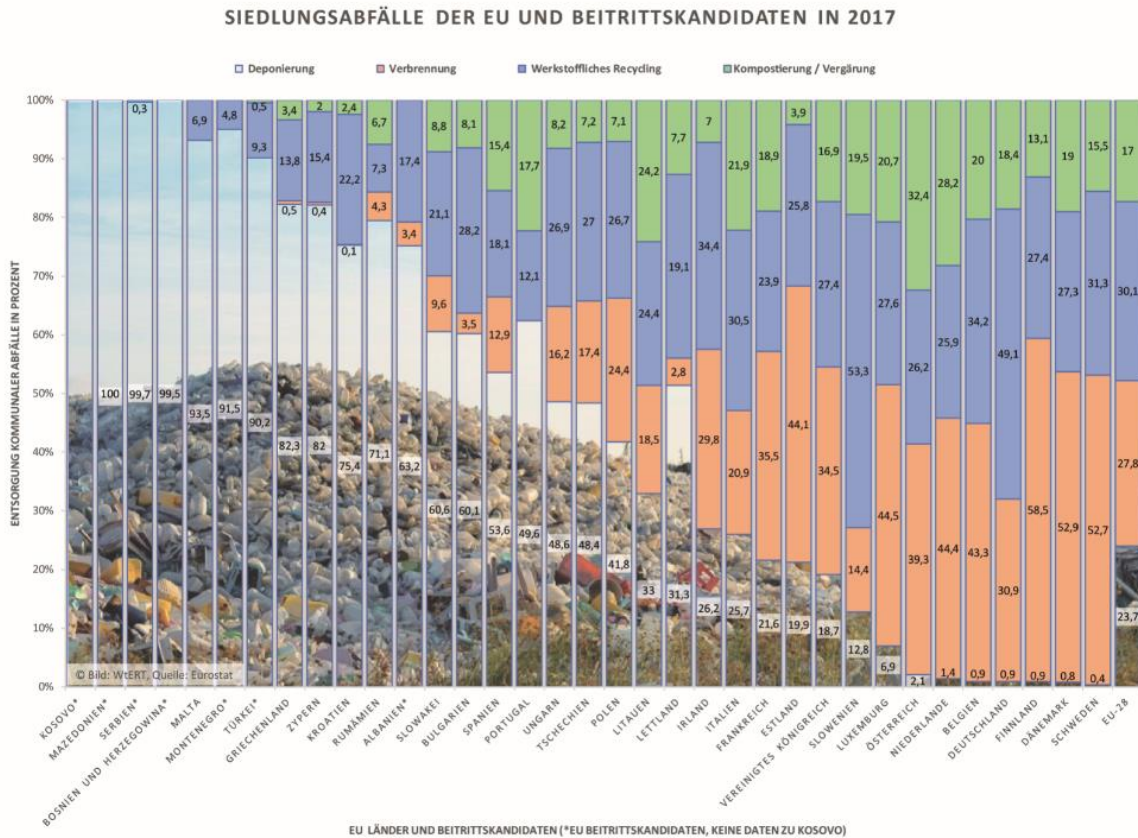


Diagram 6 Current State of Waste Management in the EU



What does it mean – Recycling?

Around half of the amount of old plastic is recycled in Germany as stated by Radio Praha in 2018 [7]. The recycling quota, however, is defined as the amount of old plastic **input** into recycling plants but it neglects the unrecycled leftovers that must be disposed of as residual waste elsewhere [8]. Additionally, the recycling quota also includes exports of old plastic into non-European countries such as China, Malaysia or India. Germany, for example, is a major exporter with 406.000 t of exported old plastic in the first half-year of 2017 [9]. Can we assume that the exported old plastic will be fully recycled in Asia? Like China did before India stopped the import of old plastic as they do not have the capacity to even recycle their own old plastic [10]. Already in 2018 China stopped the import of certain types of old plastic as they realized that unlimited growth with limited resources is not viable and decided to develop their own circular economy [11]. Malaysia as well reduced the amount of import as they have difficulties with illegal recycling plants that do not meet the environmental regulations of Malaysia [12]. Getting a better picture with this information we can expect that the actual recycling quota is below the official stated recycling quota and, hence, likewise the calculated effect on climate protection.

With the *Waste to Energy – Support for Decisions* as an offer for stakeholders, we will continually bundle a wide range of possible waste management solutions and show them with the goal of doing our contribution of reducing CO<sub>2</sub> emissions.

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