

What do landfills have to do with the circular economy?

by Federico Poli

Europe's approach to waste management is based on the concept of the circular economy. The circular economy is a new production and consumption model for the distribution, sale, repair and recycling of materials and products in order to extend their life cycle for as long as possible.

In practice, the model minimises waste production. When a product reaches the end of its life cycle, its constituent materials remain within the economic cycle to be recycled and used any number of times for production purposes, thus generating additional value.

In the interests of political correctness, today we talk about the circular economy and conceal or disapprove of the disposal of waste in landfills. This is confusing, because without regulated residual recourse to landfilling, the circular economy simply cannot work and develop. It would be much more interesting to ask the following questions:

- What is the role of the landfill in the circular economy?
- Can sending waste to landfills be sustainable?

These questions can be answered by taking an open-minded, systematic approach to waste management. Let's start with the basics. The circular economy needs landfills to close the materials management cycle: whether we like it or not, not everything can be recycled and recovered. At the same time, however, it is through the circular economy that waste disposal in landfills can be made completely sustainable. This is the real challenge for future landfills (and to make sure the circular economy really works!) Let's see how.



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The role of landfills in the circular economy

In the hierarchy of waste management operations established by Europe, disposal in landfills is the final option after reduction at source, re-use, recycling and recovery for other purposes (including energy production).

Clearly, then, landfills cannot disappear, but should become part of a modern and integrated sustainable waste management system

Waste cannot be endlessly re-used, recycled or recovered. Recycling and recovery themselves produce various types of residual waste which, for technical or environmental reasons, cannot be further recycled or recovered. The most appropriate solution for this waste is to send it to a landfill.



With the continuous updating of European legislation on landfills, the disposal of residual waste in landfills is safer than ever. The law establishes stringent operating requirements for the entire landfill lifecycle, covering both waste and the actual sites, to prevent pollution of groundwater and aquifers, the soil and the air and, at global level, to prevent the effect of climate-altering gas emissions and all other effects on people's health.

That is not all. The law also sets significant specific technical requirements, compliance with which ensures that the IPPC regulations on integrated pollution prevention and control are met in full. In addition, it defines new criteria for the qualification of waste sent to landfills. Only residual, treated, non-biodegradable waste, that is preferably stable and non-reactive, may be disposed of in landfills.

Application of the principles of the European waste management hierarchy means that only residual waste will be produced, which by its nature will be suitable for disposal in landfills, as it will meet the new criteria.



It is clear then that an integrated waste management system needs access to landfills intended for residual waste; at the same time, the circular economy will produce only specific residual waste, whose disposal in landfills will be completely safe and sustainable.

The objectives of the modern integrated waste management system

To support the transition to the circular economy, with the Landfill Directive the European Union has introduced new provisions under which, as from 2030, it will not be possible to landfill waste that can be recycled or recovered as material or a source of energy, and, as from 2035, only 10% of solid municipal waste will be allowed to be sent to landfills.

European legislation on waste requires that appropriate measures be adopted to gradually increase the re-use and recycling of municipal waste, which, based on the volumes produced, must rise from a minimum of 55%, to 60% and 65% by 2025, 2030 and 2035 respectively.

This means that as from 2035 about 25% of municipal waste must be managed in energy recovery systems.

Climate-altering emissions from landfills

The climate-altering emission from landfills is methane, which constitutes around 50% of the landfill gas produced as organic waste decomposes biologically in the anaerobic conditions inside the landfill.

The other main component of landfill gas (50%) is carbon dioxide, which is also produced by the biological activity in the landfill, but, unlike the emissions generated by fossil fuels, it is neutral in terms of effects on the climate, since it is biogenic, part of the natural carbon cycle.

The specific production of methane from waste sent to landfill (cubic metres of methane per metric ton of waste) is changing as a result of application of the treatments envisaged by the waste management hierarchy. While specific methane production from traditional municipal waste has always been considered to be 100–150 m³ per metric ton, for selected and treated waste it does not exceed 10 m³ per metric ton.

Emissions from traditional landfills are approximately 30% of the methane produced (given that around 70% can be captured and used for energy purposes), so that in this case the emission of climate-altering gases is approximately 800 kg of CO₂eq per metric ton of waste. Emissions from modern landfills are approximately 20% of the methane produced (given that around 80% can be captured and used for energy purposes or oxidised through heat or biological processes), and in this case the emission of climate-altering gases is around 40 kg of CO₂eq per metric ton of waste.

Consequently, if the objectives of the European directive on waste are achieved, the climate-altering emissions (methane) from waste management will be significantly reduced (more than 700 kg of CO₂eq per metric ton). Furthermore landfilling becomes totally sustainable because it is sure to achieve, in a generation time (30 years), the emission quality level for which an active control is no longer required.

Conclusions

In the circular economy, the landfill concept is totally different to the concept with which people and some 'supposed experts' are familiar.

Landfilling will continue to be an essential element of a modern integrated waste management system. Correct application of the European laws on the circular economy makes it possible for landfilling to be a wholly sustainable option, since the landfill will become a necessary and virtuous final container to close the materials management cycle in an environmentally friendly and safe manner.

The only point that has not yet been brought up to date in this virtuous conversion process is the term 'landfill', which, in light of the above considerations, is associated with a world that (fortunately) no longer exists.