Circular economy and the waste management hierarchy: Friends or foes of sustainable economic growth? A critical appraisal illustrated by the case of the Republic of Croatia

Traven, Luka

Editorial

WM&R

Waste Management & Research
2019, Vol. 37(1) 1–2

DOI: 10.1177/0734242X18818985
journals.sagepub.com/home/wmr
SAGE

Circular economy and the waste management hierarchy: Friends or foes of sustainable economic growth? A critical appraisal illustrated by the case of the Republic of Croatia

The waste management hierarchy categorises waste management approaches into more and less desirable ones with waste prevention and material re-use and recycling being favoured over energy recovery and landfilling. Producing as little waste as possible by recycling and reducing waste makes intuitive sense and is an integral part of the paradigm of circular economy (CE), where material open-ends are closed through re-use and recycling.

The CE concept was first introduced in 1966 by the economist Kenneth Boulding in his essay 'The Economics of Coming Spaceship Earth' (Boulding, 1966) and has been further elaborated by the ecological economists Pearce and Turner in their book 'Economics of natural resources and the environment' (Jensen, 1998). According to the European Union (EU), the CE is supposed to 'boost global competitiveness, foster sustainable economic growth and generate new jobs' (European Commission, 2016.).

Despite the fact that the CE paradigm is currently 'in vogue', in this short communication I will put forward an alternative hypothesis and argue that by promoting the CE and waste management hierarchy using a top-down approach, the EU is proverbially 'putting all its eggs into one basket' and making its economy less, rather than more, sustainable and competitive.

While waste management hierarchy makes intuitive sense, it is often applied unconditionally, meaning that waste minimisation and material recycling must always be the preferred options. The interpretation misses a key point: the type of waste management option that should be preferred is not an inherent property of the approach, but rather a function of the circumstances under which it will be implemented.

The European Commission (EC) acknowledges this and allows for departures from the waste management hierarchy if the circumstances are such that applying an approach of a higher order is technically, economically or environmentally less sound than using a lower order approach. For example, for bio-waste the EC explicitly states:

> while the waste management hierarchy also applies to the management of bio-waste, in specific cases it may be justified to depart from it as the environmental balance of the various options available for the management of this waste depends on a number of local factors, inter alia collection systems, waste composition and quality, climatic conditions, the potential of use of various waste-derived products such as electricity, heat, methane-rich gas or compost.

Unfortunately, this crucial fact is largely missed by both practitioners and regulators, which often insist on higher order options despite circumstances not always warranting it. Thus, we are witnessing a conceptual centralisation of waste management approaches around a single top-down idea of CE: Material re-use and recycling as the dominant mode of waste management.

Unfortunately, using a top-down approach to waste management planning makes the system prone to catastrophic failures. We operate in a highly complex and dynamic system, which exhibit emergent behaviour, operates without central control, shows non-linear dynamics and is prone to a sudden change in state (Jensen, 1998).

In the context of waste management for example, recycling markets exhibit high degrees of volatility that cannot be predicted. In the United States (US) in 2015 the falling prices of recycling commodities, along with cuts in government subsidies, have resulted in large numbers of recycling facilities being closed. The company rePlanet, one of California's largest recycling enterprises, has closed 191 centres across California, mainly due a steep decline in prices of aluminium and plastics (PET) on the recycling markets. Thus, every system that aims to be sustainable in the long-run must successfully address the possibility that circumstances will change, and waste management systems are certainly no exception.

One way of dealing with uncertainty in complex systems is to use 'non-predictive decision making'. The idea behind the approach is that although the behaviour of a system cannot be predicted, the vulnerability of the system to volatility can (Taleb, 2012). In general, large top-down systems are fragile and sensitive to fat-tailed events, the so called 'Black Swans' (Taleb, 2010), which can be extremely disruptive. Sustainable systems are generally operating from the bottom up, without a central intervening authority and are in a constant 'dialogue' with the environment. From the above it follows that by putting such a heavy emphasis on a single approach (re-use and recycling of waste), we are reducing our options for managing waste and predisposing the system to failure in case of an unexpected event. To give a practical example on how the above can play out the case of the Republic of Croatia will be briefly introduced.

Croatia is struggling mightily to achieve both national and EU recycling targets and comply with the national legislation and EU directives. According to the current Waste Management Plan of the Republic of Croatia for the period 2017–2022 (Official Gazette 3/17), in 2015 the recycling rate of municipal solid waste (MSW) was 24%, with most of its waste being landfilled. Croatia's current problems are rooted in strategic, top-down, decisions made in 2005, when the Croatian Parliament adopted the Strategy on Waste of the Republic of Croatia (Official Gazette 130/05). The strategy envisioned 13 large-scale waste management centres equipped with mechanical–biological treatment (MBT) technology with the aim of producing high-quality, solid recovered fuel (SRF) to be used in energy-intensive industries (Beckmann et al., 2012).

In 2005, the economic recession was yet to rise its ugly head and the demand for conventional and alternative fuels was in high demand. In addition, not many MBT plants existed in Europe and thus the supply of alternative fuel was low. At the time the decision to focus on the production of high-quality SRF seemed like a sound and reasonable strategy.

However, since 2005 things have changed. The crisis of 2008 stalled economic development, which spilled over to the construction industry. As a result, SRF started to be in low demand. In the meantime, the number of MBT plants in Europe were being drastically increased, with approximately 570 plants built in 2017 with a total treatment capacity of 22 million tonnes per year, and another 120 plants, which are to be commissioned between 2017 and 2025, with an estimated capacity at 10 million tonnes per year (Ecoprog GmbH, 2017).

In addition, the national and EU legislative framework has changed with re-use and recycling of waste being the preferred MSW treatment option and favoured over energy recovery, with extremely ambitious recycling targets of 50% by weight by 2020. The new proposed Waste Management Plan of the Republic of Croatia for 2017–2021 (OG 3/17) goes as far as to suggest a completely different national waste management concept, based on a large number of material recovery facilities and composting plants. Because of these developments, only two MBT plants out of 13 have been built with a total capacity of 190.000 $t\,y^{-1}$ and none are currently operating without problems, mainly related to placement of the produced SRF on the market.

The above example illustrates clearly how utilising a top-down approach, by promoting a single, centralised, waste treatment technology, resulted in an inability of the system to adapt to the changing circumstances. Owing to the inertia of the system, extreme efforts will have to be made to steer the system away from the initial strategy and towards the new waste management paradigm of CE.

What can be learnt regarding planning in general and waste management in particular from the above? First, that we are blind to the future and we must realise that we are operating in an unpredictable world. Second, we should never limit our options, and should instead diversify our waste management portfolio by allowing for different waste treatment technologies to be deployed. Third, we should not build centralised large-scale waste management systems and should instead downscale and decentralise them. Siting a waste management facility is problematic, but this will allow us to minimise the losses in case of a failure and enable for a quick recovery without massive negative effects. Fourth, we should implement strategies that are able to successfully address volatility in the system, such as the implementation of rate stabilisation funds, which makes it possible to fund community recycling programmes in case market prices for recyclables take a dive.

Unfortunately, CE does not take into consideration the fact that we are operating in a system of extremely low predictability and is reducing our options for dealing with unexpected waste management problems. As Croatia's case clearly illustrates, for any waste management system to be sustainable over the long term, a more flexible, decentralised approach to waste management must be considered.

Acknowledgements

The idea for the article stems from the work of Professor Nassim Nicholas Taleb, Distinguished Professor of Risk Engineering at the New York University Tandon School of Engineering and his opus Incerto, which dwells into (among other things) uncertainty, volatility, risk taking and decision-making.

References

Beckmann M, Pohl M, Bernhardt D, et al. (2012) Criteria for solid recovered fuels as a substitute for fossil fuels – a review. *Waste Management & Research* 30: 354–369.

Boulding KE (1966) The economics of the coming spaceship earth. In Jarrett H (ed) *Environmental Quality in a Growing Economy*. Baltimore: Resources for the Future/Johns Hopkins University Press, pp. 3–14.

Ecoprog GmbH (2017) The Market for Mechanical Biological Waste Treatment in Europe (Analyst Version). *Locations, plants, backgrounds and market estimations*.

European Commission. (2018) Circular Economy – Implementation of the Circular Economy Action Plan. Available at: http://ec.europa.eu/environment/circular-economy/index_en.htm (accessed 16 March 2018).

Jensen HJ (1998) *Self-organized Criticality: Emergent Complex Behavior in Physical and Biological Systems*. Cambridge: Cambridge University Press.

Taleb N (2010) *The Black Swan: The Impact of the Highly Improbable*. New York: Random House.

Taleb N (2012) *Antifragile*. New York: Random House.

Luka Traven
Associate professor of Environmental Science and Waste Management,
Department of Environmental Medicine,
University of Rijeka, Rijeka, Croatia
Email: luka.traven@medri.uniri.hr