



Waste not, want not – Pathways towards a circular economy in South Africa

Waste is the end-product of any material transformation process, biogenic or anthropogenic, and refers to material flows that are of no further use to the process that generates them. Most waste in the biosphere is assimilated by entering other transformation processes that can utilise them as feed material. Thus, the material flow becomes circular.

Human activity started to break this circularity. As soon as we introduced tools that were not exclusively derived from the biosphere, the discarded materials at the end of their useful life left a lasting impact. Neolithic arrowheads that give us valuable clues about our origins are an early form of anthropogenic waste that has persisted for thousands of years. The archaeological and anthropological study of material culture through waste defines human legacy.

This legacy is in and of itself not problematic. Strictly speaking, all materials are subject to geological circularity which eventually turns over all materials on earth's surface, albeit over a period of millions of years. The problem with waste arises when its persistence interferes with the functioning of the biosphere or disrupts the circularity of other processes.

Historically, poor waste management was felt at a local level. Nuisances and health concerns such as the breeding of vermin and spreading of disease were the main concerns. However, as humans moved into a technological age, more and more non-biogenic waste was created. The exponential rise of non-biogenic waste presents new impacts to interfere with the biosphere or the environment at an increasingly global scale. Toxic chemicals released from certain industrial waste and acid run-off from many mining waste deposits enter ground and surface waters, damaging life-sustaining systems. Dispersion of lightweight plastics, especially as litter, causes increasing pollution of land and the oceans. Gaseous emissions of CO₂ and other greenhouse gases through anthropogenic activities is increasingly affecting global climate, thus affecting all processes in the biosphere.

The existential threat of climate change has inspired considerable mitigation and adaption measures focused on reducing, and eventually eliminating, all anthropogenic greenhouse gas emissions. When it comes to solid waste management, however, the focus often remains limited to pollution control. Nonetheless, the global debate is beginning to re-discover circularity and applying it to non-biogenic wastes such as municipal solid waste, light industrial waste, construction and demolition waste, waste electrical and electronic equipment (e-waste) and mining wastes. Returning these fractions to some form of use – or converting that which cannot be returned in this fashion into some form of societally acceptable end-form – recognises that waste is an integral part of economic activity within the societal context. Waste management needs to move from being some form of last rite consigning waste to its final resting place towards being a regular economic activity within a given broader local, national, and eventually global, socio-economic framework.

South Africa combines many characteristics of the economies of a developed and developing nation. This dual nature is reflected in the waste management interventions where well-managed landfill sites co-exist with waste pickers reclaiming materials that can be gainfully recycled. A reasonable legislative waste management framework is in place, which recognises the need and opportunity for circularity, yet the existing systems make economic activity in this space cumbersome, forcing activities to the legal and economic margins.

The Community of Practice (CoP) 'Waste to Value: Transitioning South Africa towards a Waste-to-Resource Circular Economy' has brought together an interdisciplinary collective of experts to explore the nexus between existing waste management practice, legislation, and the socio-economic realities in South Africa. A key realisation of the CoP is that addressing the status quo will require local solutions to the global

problem, recognising that turning waste materials back into economic commodities needs to fit within the local socio-economic context, and there is no global one-size-fits-all solution.

Circularity in context

This Special Issue of the *South African Journal of Science*, entitled 'Waste as a resource: South African perspectives on circularity', presents 12 articles that reflect on perceptions of waste, investigate municipal solid waste management practice, explore the socio-economic realities of waste pickers, and study the legal framework that governs our relationship with an increasingly complex material legacy in South Africa. Transition to a sustainable circular economy will need to focus on establishing a material transformation process more akin to biogenic circular flows. Reduction strategies, re-design, and a focus on end-of-life management in the South African socio-economic context is at the heart of the CoP. The thinking that guides the formulation of potential pathways towards this transition is reflected in the articles.

In this spirit, the articles begin with classic studies of qualifying and quantifying waste streams including household solid waste, construction and demolition waste and plastic waste. Further articles explore the perception of littering and illegal dumping within low-income communities as well as the ownership of waste and concepts of positive and negative value that are critical when exploring circular activities compared to conventional disposal. The informal sector is a critical consideration when creating circular economic activity and is investigated considering the sustainable livelihood potential for waste pickers. A further article recognises that waste pickers in the context of e-waste are at the bottom end of a complex value chain that ultimately sees the economic value of their activity being realised outside the country due to a lack of the relevant processing capacity locally. Other articles explore technology for the valorisation of waste streams to produce energy and value chemicals. Lastly, two articles survey the transition towards a circular economy in South African and southern African contexts. It is particularly striking that the concept, despite its widespread use, is ill-defined and in practice often excludes the South African socio-economic context.

The integrated approach aims at a socially just transition to a waste economy that facilitates the re-entry of materials into the economic cycles within the local context as far as is possible and with an as broad as possible economic incentive for its participants. In going forward, the CoP intends to formulate a meaningful strategy by which material flows in the South African economy thus far considered as waste are evaluated for their potential to be returned into the local economic cycle in the most sustainable fashion. To achieve this, a continued multidisciplinary approach is needed that draws on the expertise of sociologists, economists, legal experts and – perhaps critically – technologists, jointly cognisant of the local and national socio-economic realities and aspirations.

Acknowledgement

The publication of this Special Issue was made possible through the generous support of the National Research Foundation (NRF) of South Africa for the Community of Practice: Waste to Value under grant no. UID 128149. The NRF cannot be held liable for any of the authors' stated opinions, findings and conclusions.

Jochen Petersen

Principal Investigator, Community of Practice: Waste to Value, Department of Chemical Engineering, University of Cape Town, Cape Town, South Africa

Aysha Lötter

Project Manager, Community of Practice: Waste to Value, Department of Chemical Engineering, University of Cape Town, Cape Town, South Africa

HOW TO CITE:

Petersen J, Lötter A. Waste not, want not – Pathways towards a circular economy in South Africa. *S Afr J Sci.* 2022;118(Special issue: Waste as a Resource), Art. #14566. <https://doi.org/10.17159/sajs.2022/14566>