



NOTE

On ecocycles and circular economy

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Abstract - This Note briefly discusses the importance of natural and technological zero-waste processes and the links connecting ecocycles and the new concept of circular economy.

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Pollution is nothing but the resources we are not harvesting. We allow them to be dispersed because we've been ignorant of their value.

R. Buckminster Fuller in (Farrell, 1971)

If the present growth trends in world population, industrialization, pollution, food production, and resource depletion continue unchanged, the limits to growth on this planet will be reached sometime within the next one hundred years. The most probable result will be a rather sudden and uncontrollable decline in both population and industrial capacity.

Conclusion No. 1 on page 23 of the book "Limits to Growth" (Meadows et al., 1972)

Using ground-breaking modelling of scenarios based on data on population, environmental pollution, and resource use the book "Limits to Growth", published 44 years ago (Meadows et al., 1972), projected the collapse of our civilization at about the middle of the 21st century. Although the book divided economic thinkers of the day (and has been heavily criticized by some), its conclusions turned out to be surprisingly solid (Turner, 2014). Indeed, the well-being of society has been long tied to the availability of inexpensive resources – water, carbon, nitrogen, and many other elements – that are essential to sustain life. Concentrations of these elements in the ground, water, air, and in living organisms are determined by various self-regulating processes called ecological cycles.

Today's "Eco Cycle" strategy is centered on these processes and its goals are 1) to make these cycles free from toxic materials and 2) to create a resource-efficient society by reducing the ecological footprint in an economically sustainable way. Long-term health and productivity of the ecosystem can be assured by science-based management decisions based on the understanding how local cycles fit into global ones. Ecological cycles provide viable models for our modern society in many ways. The European Ecocycles Society has been founded by scientist investigating these cycles and its journal ECOCYCLES has been created to publish their findings (Komives and Nemethy, 2015).

Although during the last decades scientists and thinkers developed strategies similar to "Eco Cycle", such as "sustainability", "zero waste", "regenerative design", "cradle to cradle", etc. (Lacy and Rutqvist, 2015) (Sauve et al., 2016), and the policy of "extended producer liability" (Lifset et al., 2013), in this Note paper we would like to discuss the most recent one with the broadest scope: "circular economy" (CE) (Stahel, 2016).

Our capitalistic, so-called linear ("take-make-dispose") economy largely overlooks the environmental impacts that originate from consumption of resources and waste production, resulting in the extraction of too much of the virgin resources, which, in turn, leads to pollution and waste. In contrast, the most important goal of CE is to eliminate the concept of waste, thereby drastically improving resource efficiency. In CE, two kinds of

resources 1) biomass and nutrients and 2) abiotic materials are moving in two closely linked compartments: the biocycle and the technocycle, respectively.

Obviously, recycling remains a very important component of the CE. *Nota bene*, CE does not equal to “recycling on steroids”, since returning a product to the material level is far from optimum. It has to be kept in mind that one of the most effective ways to achieve the goals of recycling is through source reduction (demand-side waste management), i.e., precycling, which means that we reduce the quantity we make in the first place. Precycling can be viewed as an important part of the consumer’s decision-making process regarding a product’s waste implications (is the product durable, reusable, or repairable and whether it is made from renewable materials) (Liptak, 1991).

Despite all the benefits of CE, the transition from the current linear economy to a circular one will not be simple at all: more than two hundred years of routine has to be changed, and the way of thinking of decision makers, entrepreneurs, and consumers has to be shifted, as well. New designs, technologies, and production models are needed to reduce reliance on virgin raw materials, and even the logistics of cycling materials of all types continuously through supply chains has to be developed (van Buren et al., 2016). Problems may also arise, when there is no demand for a certain reused material because of quality (purity) or price considerations. To achieve the shift from linear to CE, an integrated, holistic approach taking a number of issues into consideration is necessary. Thus, as the very first step, goods have to be designed to be reusable, easily upgradable or recyclable. Since stocks are needed as a source and destinations of materials, their maintenance and management is also very important. CE depends heavily on feedback: not only as regards to materials but also in energy and information. In transport, forward and reverse logistic networks with overlapping bulk product delivery and recycling pickup points have to be designed. Understandably, local products that need very little storage and transportation are preferred. Finally, materials containing components posing environmental or health hazards (*e.g.*, infectious agents, greenhouse gases, and toxic chemicals, such as persistent organic pollutants) need to be eliminated from circulation. Therefore, tailored systems of thorough Life Cycle Assessment (Finnveden et al., 2009) should be established both in the selection process of raw materials and the production, keeping in mind the ecological consequences of disposal and the economic advantages of re-use and waste to energy programs.

The implementation of CE requires sustainable and fully compatible ecological and socio-economical systems on a micro-regional scale both in rural areas and urban settlements, preferably through linking these very different structures (Peura et al., 2014) (Nemethy

and Walas, 2015). The scale of development is important, since a system of self-sustaining micro regions is far less vulnerable both ecologically and economically than the too centralized mammoth-economies. The sustainable landscape management concept might be a useful base for implementing sustainable regional development strategies, because it includes all aspects of development and conservation: natural resources management and biodiversity, environmental protection, socio-economic sustainability and the whole range of cultural heritage issues, as well as the responsible use of ecosystem services. Although the concept that social-ecological systems act as strongly coupled, complex and evolving integrated systems (Folke et al., 2002) has been widely accepted by the scientific community, there are still a number of barriers to implementation of sustainable development strategies, mainly due to ignorance and/or short sighted economic policies and legislation lagging behind with regard to the real developmental needs of a region.

In conclusion, although a lot of theoretical and practical developmental work is necessary for the successful introduction of CE, the greatest task ahead is to change the attitude of the consumers towards the goods they buy: they have to learn to put very strong emphasis on the environmental effects of the products they select. However, the change of paradigm requires advanced stakeholder management, a deep knowledge of social and economic conditions and the power structures (the “Stakeholder Power/Interest Matrix”) (Bryson et al., 2011) of the target regions. As a result, the ultimate success of CE will be determined by the consumers: whether they will be willing or able to use reused, recycled or upgraded goods. Society can organize such a shift by three ways: a) commanding, b) guiding by tax and subsidy, and c) leaving it to the individual and the “market” (Simon, 1998). An obvious prerequisite for successful CE is the good public service network supporting the energy-product-zero waste concept. We strongly hope this Note paper will also promote the informed decision-making of our readers.

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