



Circular Economy – Reducing Symptoms or Radical Change?

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Abstract

In this article, we address why our management of the economy, community and business has led to global warming and we discuss the importance of worldviews, ontology, epistemology and axiology in the search for alternative paths of development. We do this by focusing on the concept of Circular Economy. Circular Economy is often presented as a solution to the problems of a globalized economy in the form of over-exploitation of resources, climate change and pollution of the environment. Within the mainstream economics paradigm, the aim is how to increase the effectiveness of resource extraction and utilization in order to maintain growth. We contrast this with the paradigm of Ecological Economics where the goal of the economy is to achieve and secure a higher quality of life. Circular Economy often side steps the deep ontological and epistemological questions we need to answer if we are to address the complex and interrelated environmental, economic and social problems we face today. This can be a limiting factor in the search for creative and long-term solutions. However, within the Circular Economy discourse, we find strands that critically engage with the foundations of mainstream Economics and so, innovative solutions for the society of the future are a possibility. We argue that to bring about a lasting solution to the interconnected social, economic and environmental problems, Circular Economy must engage with the ontological, epistemological and axiological foundations of mainstream economics. To further this argument, we apply Imre Lakatos' 'research program' model to philosophy of science as our framework of analysis and draw lessons for business and communities.

Keywords Circular economy · Ecological economics · Quality of life · Lakatos

Introduction

We are confronted by an increasing number of alarming warnings about environmental breakdown. The Intergovernmental Panel on Climate Change (IPCC) recently published a

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report that outlines the significant changes the global economy has to make if we want to limit global warming to 1.5 degrees Celsius. This level of warming is associated with risks for ‘health, livelihoods, food security, water supply, human security, and economic growth’ (IPCC 2018, p.12). A significant increase beyond 1.5 degrees C can be catastrophic to our civilization.

Our time has also seen a financial crisis that came close to causing a systemic collapse at a global scale (OECD 2009). At the same time, our generation is seeing a level of inequality unprecedented since the Second World War (Roberts 2012; Piketty 2014) and research has shown that such an extreme level of inequality hurts individual and societal wellbeing (Wilkinson and Pickett 2010).

These environmental and economic problems are intimately connected with the ever expanding size of the global economy in the past century. In the period 1900–2010, the global material stocks increased 23-fold and will increase several folds from this level if we continue ‘business as usual’ (Krausmann et al. 2017). Research shows that human economic activity has endangered planetary systems in the areas of genetic diversity, mineral use, land systems change and climate change (Rockström et al. 2009; Steffen et al. 2015). These interrelated problems on the social, economic and environmental fronts have been described as *persistent* (Rotmans and Loorbach 2009) and *wicked problems* (Rittel and Webber 1973), indicating that these problems are complex, emergent, uncertain and related to systemic failures. They, thus, require a close examination of our worldviews, values, norms and practices that form the basis of our economic system (Schlaile et al. 2017). Although scientists warn that the environmental crises are driven by the economic growth model,¹ there are few signs indicating that the model will be replaced in the near future. According to Latour the opposite is more likely: “Nowadays it seems easier to imagine the end of the world than to imagine the end of capitalism” (Latour 2014, p.1).

Instead of examining the problems to understand their complexities, many economists and politicians have responded to these challenges by launching the idea of green growth (the ambition of maintaining growth while lowering environmental impact). However, there is so far no evidence that document that it is possible to decouple negative environmental consequences from economic growth (Simonis 2013; Cullen 2017; Schröder and Storm 2018).

Circular Economy is central to any endeavor to transform the economy and forms part of the strategy of global institutions such as the EU and UN (European Commission 2015; UNEP 2006). The EU defines a circular economy as an economy ‘where the value of products, materials and resources is maintained in the economy for as long as possible, and the generation of waste minimized’ (European Commission 2015). However, it is unclear how fundamental this shift to a circular economy is and whether it is the answer to the interconnected environmental, economic and social problems the world is facing today. In this paper, we discuss the extent to which the concept of Circular Economy represents a deeper change towards an economy in harmony with nature by examining foundational issues related to worldviews/paradigms, ontology, epistemology and axiology (what is considered good and of value). Does Circular Economy present a real and fundamental change from the current economic system that has landed us in this problem? To answer this question our analysis applies the model of Lakatos’ ‘research program’.

¹ See a recent letter written by 238 scholars to the European Union calling for a reorientation of the economy towards stability and wellbeing and away from a focus on economic growth (The Guardian 2018).

In the following section, we present our frame of analysis: Lakatos' model of 'research program' to philosophy of science. In the third section, we discuss the central characteristics that define Circular Economy. Then in the fourth and fifth sections, we present mainstream/neoclassical economics² and ecological economics as opposing 'research programs' with different hard core assumptions. Then we present how Circular Economy can play the roles of a protective belt or a challenge to the hard core of mainstream economics. We will then draw lessons for businesses and communities before we conclude the article.

Frame of Analysis – Lakatos' Model of 'Research Program'

There are various propositions/theories on how a body of knowledge progresses. Falsificationism is one strand originally put forward by Karl Popper. Imre Lakatos (1970) built on Popper's work and introduced his 'research program' model by differentiating between naïve and sophisticated falsificationism. Naïve falsificationism accepts that empirical refutation of a theory is enough to reject it. However, it is possible to link a series of theories together by adding auxiliary clauses to explain new anomalies that may challenge the original theory without rejecting it. Lakatos called this sophisticated falsificationism. His position is that a community of scientists organize themselves around a 'research programme' with a series of theories to explain new facts. If newer theories add to new knowledge and new explanation of facts, then the research program is experiencing a 'progressive problemshift'. 'Sophisticated falsificationism thus shifts the problem of how to appraise *theories* to the problem of how to appraise *series of theories*' (Lakatos 1970, p.118–119, emphasis in original).

All scientific research programs may be characterized by their '*hard core*'. In a research program, there are methodological rules that guide how knowledge progresses and ensures '*continuity*' in the research program. The methodological rules '... tell us what paths of research to avoid (negative heuristic), and others what paths to pursue (positive heuristic)'. Researchers/scientists shall not tamper with the hard core of a research. 'Instead, we must use our ingenuity to articulate or even invent "auxiliary hypotheses". ... It is this protective belt of auxiliary hypotheses which has to bear the brunt of tests and get adjusted and re-adjusted, or even completely replaced, to defend the thus-hardened core. A research programme is successful if all this leads to a progressive problemshift; unsuccessful if it leads to a degenerating problemshift' (Lakatos 1970, p.113, emphasis in original).

Imre Lakatos explains scientific development by referring to change on two levels. Evolutionary development is based on changes in the protective belt of a research program while revolutionary shifts bring about changes in the hard core of a research program (Lakatos 1970). The interconnected environmental, economic and social problems laid out in the introduction present a challenge that mainstream economics as a scientific research program has to deal with through its 'methodological toolbox'. This article explores the role Circular Economy plays in this process: either the role of a protective belt or challenging the hard core of mainstream economics (and therefore, a fundamental change to the current economic system).

² We use mainstream economics and neoclassical economics interchangeably in this article as the two are closely related in economic policy development and implementation.

What Is Circular Economy?

The idea behind a circular loop of resource use in a production process has been around for a long time. Murray et al. (2017) discuss how the concept of a ‘cyclical closed-loop system’ has been around since the 1800s, for example, in the production processes of chemical factories. The idea that our modern day production processes should be oriented towards a circular process and that we should reduce the amount of waste we produce came into mainstream discourse in the 1960s with the publication of Kenneth Boulding’s book ‘The economics of the coming spaceship earth’ (Greyson (2007) in Murray et al. 2017). Georgescu-Roegen and his work on thermodynamics in economic systems is another important contributor to the field (Korhonen et al. 2018b).

However, the terminology ‘circular economy’ was first used in Western literature in the 1980s ‘to describe a closed system of economy-environment interactions’ (Murray et al. 2017, p.372). In more recent years, the concept has gained traction in the UN. Although the term ‘circular economy’ (CE) does not appear among the 17 sustainable development goals (SDGs), we find concepts prominent in the CE discourse such as efficient use of resources, reducing waste generation and material footprint as indicators under Goal 12 on sustainable production and consumption. China is the first country to adopt CE into law and has formulated its 10-years plans around it (Korhonen et al. 2018b; Murray et al. 2017). CE has also taken root in the EU and European countries such as France and Netherlands (Murray et al. 2017; UNEP 2006). Private foundations have also taken important roles in promoting the idea of a circular economy. In the UK, Ellen MacArthur Foundation is prominent in raising awareness about CE (Kirchherr et al. 2017; Korhonen et al. 2018b). The diversity of resources dedicated to spreading awareness about CE on the Ellen MacArthur Foundation website testifies to this fact.³

There is an abundance of definitions of Circular Economy in the literature. Kirchherr et al. (2017) found 114 definitions in their literature review. Practitioners, business leaders, researchers and private foundations operate their own definitions of CE. The United Nations Environment Program (UNEP) defines a circular economy as ‘an economy which balances economic development with environmental and resources protection. It puts emphasis on the most efficient use of and recycling of its resources and environmental protection. A circular economy features low consumption of energy, low emission of pollutants and high efficiency. It involves applying [c]leaner [p]roduction in companies, eco-industrial park development and in integrated resource based planning for development in industry, agriculture and urban areas’ (UNEP 2006, p.1).

After reviewing 114 definitions, Kirchherr et al. (2017, p.224) adopted the following umbrella definition: ‘A circular economy describes an economic system that is based on business models which replace the ‘end-of-life’ concept with reducing, alternatively reusing, recycling and recovering materials in production/distribution and consumption processes, thus operating at the micro level (products, companies, consumers), meso level (eco-industrial parks) and macro level (city, region, nation and beyond), with the aim to accomplish sustainable development, which implies creating environmental quality, economic prosperity and social equity, to the benefit of current and future generations’. They adopted this definition to represent what they see as different aspects of CE and as an ambition to guide future research and practice towards coherence and consistency.

³ See for example, <https://www.ellenmacarthurfoundation.org/publications>

The Ellen MacArthur foundation defines Circular Economy as ‘an industrial system that is restorative or regenerative by intention and design. It replaces the ‘end-of-life’ concept with restoration, shifts towards the use of renewable energy, eliminates the use of toxic chemicals, which impair reuse, and aims for the elimination of waste through the superior design of materials, products, systems, and, within this, business models’ (Ellen MacArthur Foundation 2012, p.7).

Ken Webster (2015, p.16) describes the main defining characteristics and strengths of a circular economy as follows:

1. ‘The circular economy is a global economic model that decouples economic growth and development from the consumption of finite resources;
2. It distinguishes between and separates technical and biological materials, keeping them at their highest value at all times;
3. It focuses on effective design and use of materials to optimize their flow and maintain or increase technical and natural resource stocks;
4. It provides new opportunities for innovation across fields such as product design, service and business models, food, farming, biological feedstocks and products;
5. And it establishes a framework and building blocks for a resilient system able to work in the longer term’.

The definitions we have reviewed display a consensus in the need to move away from a linear throughput of resources and improving the utilization of resources in production and consumption systems (Korhonen et al. 2018b; Kirchherr et al. 2017; Korhonen et al. 2018a; Webster 2015; Ellen MacArthur Foundation 2012). Rising resource scarcity, the increasing cost of resource extraction and rising resource prices are strong indicators that we need to rethink our production processes.

However, there are a number of challenges to implementing a successful CE. Cullen (2017, p.483) states that an entirely circular economy where ‘waste no longer exists, ... where material loops are closed, and where products are recycled indefinitely’ is practically impossible. He notes that discussions of CE often downplay material losses and overlook the energy demands of recycling processes. The renewable energy sector is not yet well-developed to make the latter concern dispensable (Schröder and Storm 2018). Similarly, Price and Joseph (2000) lament the fact that waste management policies overemphasize the role of recycling and do not pay enough attention to lifestyle changes that can reduce waste generation. Korhonen et al. (2018a) list challenges to CE such as thermodynamic limits (to an efficient recycling of materials), rebound effects (where by consumption increases as a result of improved production efficiency and resulting lower prices), path-dependencies and lock-ins (whereby the old way of consumption and production persists in spite of better CE innovations and practices) and spatial and temporal governance difficulties of CE practices (networks of organizations are expected to work across spatial and temporal boundaries). These critical perspectives on CE assert that any discussion of overhauling our production and consumption systems needs to be accompanied by the examination of the fundamental worldviews and paradigms that guide the economy, our lifestyles and our culture.

However, Circular Economy is mainly a practice-oriented field and the approach is driven by practitioners such as business development agencies, policy-makers, business consultants, business associations or foundations (Korhonen et al. 2018b). One does not find an academic community, a faculty or a journal specifically dedicated to the topic (Murray et al. 2017). As a

result, it is not easy to find the worldview, ontology and epistemology that guides its development (Korhonen et al. 2018b; Kirchherr et al. 2017). Scrutinizing the diverse literature dedicated to the topic (websites, book chapters and academic literature) one finds contradictions. On the one hand, Circular Economy is presented as a novel way to boost economic growth with lower environmental impacts (Kirchherr et al. 2017; Korhonen et al. 2018b; Webster 2015). On the other hand, we find criticisms of the status quo asserting that there are other ways of measuring progress than economic growth (or growth in the Gross Domestic Product (GDP)) (Webster 2015).

In the next two sections, we present Neoclassical Economics as a research program and Ecological Economics as a field challenging the hard core of Neoclassical Economics before examining the role Circular Economy would play in light of these two discussions.

Neoclassical Economics as a ‘Research Program’

Researchers have used Lakatos’ methodology of scientific research programs to analyze Neoclassical Economics and its theories. One of the earliest debates using this methodology was between Spiro J. Latsis and Milton Friedman in the early 1970s when they looked at the neoclassical theory of the firm as a research methodology. Latsis laid out four assumptions as the ‘hard core’ of this theory: profit maximization, perfect knowledge, independence of decisions and perfect market (Latsis 1972). He argued that theories of monopolistic competition and perfect competition are part of a degenerating research program (of the neoclassical theory of the firm) and therefore must be abandoned. He highlighted behavioral theories (that highlight inner workings) as more progressive than those that are situational deterministic (the situation determines the outcome. For example, perfect vs. monopolistic competition) (Brahmachari 2016, p.9).

In Microeconomics, the assumptions of rational preferences, utility/profit maximization, independent actors, and full information can be seen as its hard core theoretical assumptions (Weintraub 1993). Individuals are assumed to maximize their utility (or wellbeing) through their choices in perfect markets. They have full information and act independently of each other with consistent preferences. Consumers and producers use market prices as signals to help them determine how much they consume and produce.

Neoclassical Economics’ origins lie in utilitarianism and its atomistic view that society’s wellbeing is the sum of the utilities of individuals (Pratten 2015). Societal wellbeing is maximized by achieving ‘the greatest happiness for the greatest number of people’ (Stanton 2007). The perspective that we can maximize societal wellbeing by maximizing individual utility gave birth to the earliest formulations of utility theory.

The Marginalist welfare school of economic thought (of the 1870s) formalized this notion by using two assumptions: 1) individuals act to maximize their utility and 2) utility is ‘diminishing on the margin’ (Stanton 2007, p.5). Utility maximization subject to budgetary constraints and the assumption of fixed resources were central to their mathematical models. ‘From the standpoint of history of ideas, they brought Newton’s mathematics and Bentham’s utilitarianism into intimate association with economic theory’ (Cooter and Rappoport 1984, p.511). Utility became associated with the ‘material necessities of life, using money as a “measuring stick”’ (Stanton 2007, p.6). Utility or ‘well-feeling’ was not directly observable but could be represented by preferences (Gasper 2007, p.25). These preferences are ‘revealed’ when people make choices about which goods and services to consume. The implicit

connection here is that utility is expressed through choices in the market and this consumption, along with the income that enables it, becomes directly linked to wellbeing.

The focus on material necessities to life in combination with diminishing marginal utility of income had the implication that the value of an additional unit of income is more valuable to the poor man than the rich. This again led to the argument that societal welfare will increase with income redistribution (Cooter and Rappoport 1984). The Ordinalist school (of the 1930s) attacked this reasoning by arguing that it is not possible to compare utilities of people. Therefore, the claim that the poor have a higher marginal utility of an additional unit of income than the rich was attacked as flawed (Robbins (1932) in Stanton 2007). The utilitarian definition of social welfare was replaced with Pareto optimality (a situation whereby no one can be made better off without someone else being worse off).

At the individual level, utility remained associated with pleasure or ‘well-feeling’ (Gasper 2007, p.25) and its link with material consumption in the market was maintained. Therefore, increasing income became synonymous with increasing utility or wellbeing in Neoclassical Economics. At the societal level, this translates into increasing national income (GDP) per capita; the argument for unlimited economic growth (Phillips 2006).

In our analysis, we place the imperative of economic growth within neoclassical economics’ ‘hard core’ because of the undisputed central position it occupies in neoclassical economic theory and practice. Few mainstream economists and politicians would challenge economic growth and would rather expend much effort in protecting it by adjusting auxiliary hypotheses.

Foundations of Neoclassical Economics

In this section, we examine the foundations of Neoclassical Economics (its worldview/paradigm, ontology, epistemology and axiology). We follow Schlaile et al. (2017, p.4) in defining worldview or paradigm as ‘a set of basic beliefs or metaphysics. ... [I]t can be defined as a complex set of assumptions, concepts, values, and practices that constitute a worldview for the community that shares them’.

Neoclassical Economics (NE) is still firmly rooted in the eighteenth century’s mechanical worldview. The influence of Newtonian mechanics is pervasive in the Neoclassical paradigm (Schlaile et al. 2018). For example, William Stanley Jevons, one of the central theorists of neoclassical economics defined utility as ‘force of attraction’ between a consumer and a desired object, in the same spirit as the gravitational force of mechanical physics (Schlaile et al. 2018, p.11). Individuals are envisaged as isolated atoms. NE ‘assume[s] that society is simply the sum of its individuals, the social good is the sum of individual wants, and markets automatically guide individual behavior to the common good’ (Costanza et al. 2014, p.30). Economic agents are perfectly rational (rationality here is defined as maintaining stable and consistent preferences), and with full information and no transaction costs they make choices that maximize their individual utility. The NE worldview ‘gives no regard to the experience of human beings in their other economic roles as producers, regulators, merchandisers, etc. (let alone other roles, such as citizens, parents, and so on)’ (Goodwin 1991, p.2). This ontological view of individuals as isolated and ‘passive agents in a static closed system ... justifies... [the] formulation of social reality as typified by regularities ... allowing the methodology of deductive reasoning and mathematical formalism’ (Spash 2012, p.44).

The epistemology of neoclassical economics is characterized by the dominance of logical positivism. The association of utility with revealed preferences is a logical positivist view that people’s actions in the market represent their motivations. It seems to say ‘all we can

scientifically know about people is their actions' (Goodwin 1991, p.2). Others criticize its ontological and methodological individualism (that is, the implication that the social good can only be explained by looking at the individual and that social phenomenon is not more than the sum of its parts (Lukes 1968; Robeyns 2005). Neoclassical Economics limits itself to studying the economic sphere with little interaction with other disciplines such as ecology, sociology or anthropology. This indicates that it operates in a multidisciplinary epistemological space where different disciplines operate in parallel and do not interact with each other (Max-Neef 2005).

When examining the foundations of NE, it is important to examine the values embedded in the paradigm (i.e., axiology). It is difficult to find a good account of the NE value-system because the field considers itself to be value-free. In standard undergraduate textbooks of economics, positive (value free) economics is differentiated from the normative and regarded as more 'scientific' (Spash 2012, p.37). However, this claim of achieving separability of facts from value is highly criticized (Putnam 2004). We can discern the values in NE by looking at the focus it has on individuals as utility maximizing consumers and on organizations as profit maximizing firms. No other roles are assigned to individuals or organizations. This limited framework legitimizes 'specific values, thinking patterns and behavior of various actors in society, be they business leaders, politicians or ordinary citizens' (Söderbaum 1999, p.163). The rhetoric of self-interested competition as the dominant form of individual action, material growth as a social good and free-markets as the preferred institution of economic interaction can justify the actions of 'corporations and governments extracting resources, dislocating indigenous populations and creating environmental destruction' (Spash 2012, p.44). These morally questionable practices are often justified as 'being good for the economy, for creating jobs, and boosting profit to businesses'. This is value monism whereby monetary value is the deciding factor between different courses of action.

In the mechanical worldview of NE, nature is depicted merely as an input into the production process. NE emphasizes the instrumental value of nature. Environmental problems that may be caused by the economic system are portrayed as externalities and are exogenous to the economic models themselves. Attempts to address these externalities have to be justified by cost-benefit analyses where the impacts are converted to monetary value and are evaluated by their consequences for the economy (Spash 2009). Natural resources are subordinate to the economy and are depicted as 'essentially limitless due to technical progress and infinite substitutability' (Costanza et al. 2014, p.58) (see Fig. 1).

Ecological Economics – Challenging the Hard Core

Ecological Economics (EE) is a young field that came into being in the late 1980s as a result of the discontent with mainstream economics and its handling of environmental issues. The presence of 'a strong natural science element' makes EE unique (Spash and Ryan 2012, p.1093). In their historical overview of the development of Ecological Economics, Spash and Ryan (2012) present three camps of actors in the field. The first camp contains natural scientists (particularly ecologists) that became active in Ecological Economics as a way to communicate their research findings to politicians through collaborations with social scientists. They were not particularly interested in the fundamental questions that differentiated mainstream/orthodox economics from heterodox economics. This camp of a mix of natural scientists, social scientists and activists adopted a pragmatic approach and used a mix of methodological approaches they felt

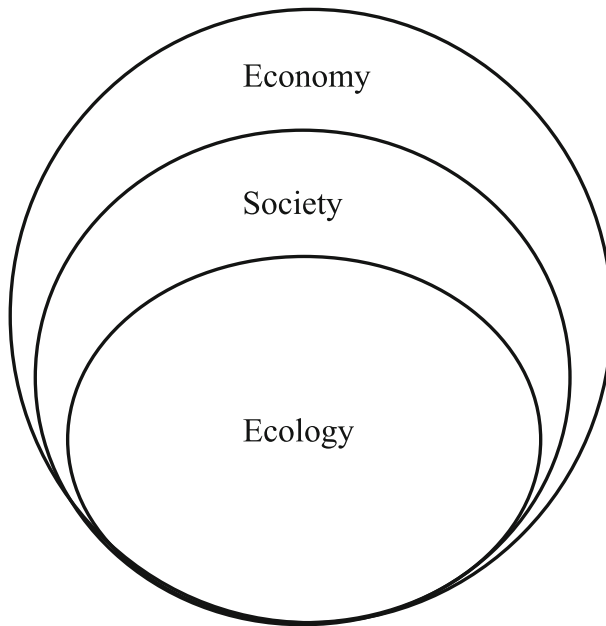


Fig. 1 The worldview of neoclassical economics

was effective in getting their message across. The second camp includes a mix of agricultural, environmental and resource economists trained in the neoclassical tradition that chose to be active in ecological economics. They maintained their neoclassical worldview and pursued mainstream approaches of mathematical formalism, optimization and modelling. Their main goal was to infuse their work with discussions of sustainability without critically engaging with the foundations of neoclassical economics. The third camp involves socially oriented ecological economists that reject neoclassical theory and its preoccupation with unlimited growth and consumption. ‘This group aims to revolutionize economics in order to both correct the way in which the environment is addressed and also address a range of other associated societal problems (e.g. poverty, inequity, discrimination, sexism, myopia, hedonism, materialism)’ (Spash and Ryan 2012, p.1100). They represent a critical voice against the mechanistic and reductionist worldview and policies of neoclassical economics. This strand of ecological economics follows the Georgescu-Roegen tradition and the heterodox Daly/Costanza school of thought. They also share common grounds with other heterodox schools such as evolutionary and complexity economics (see Schlaile et al. (2018) in this journal for a discussion comparing NE with evolutionary economics).

The discussion of Ecological Economics in this and following sections focuses on the work of the third camp of ecological economists. Costanza et al. (2014, p.87) describes EE as ‘not a static set of answers but a dynamic, constantly changing set of questions’. There are three interdependent goals at the heart of this strand of EE: sustainable scale, fair distribution and efficient allocation (Costanza et al. 2014). The first goal is where EE is in strong opposition to NE. Unlike NE (which advocates unlimited economic growth), EE aims to limit the economy to a sustainable scale. EE argues that the goal of the economy should be quality of life instead of quantitative growth. NE’s solution to ensure a fair distribution in society is by increasing

economic growth (the oft-repeated ‘a rising tide lifts all boats’ quote). Any other redistribution effort has to satisfy the principle of Pareto optimality, severely limiting the possibilities to correct the widening global inequality. This has led to the criticism of NE as an economic system that protects the status quo (Max-Neef and Smith Philip 2011). Of the three goals, efficient allocation is where EE disagrees the least with much of neoclassical theory (granted the first two goals are met).

There are five points that have received consensus among socially oriented ecological economists (quoted from Costanza et al. 2014, p.89):

1. The vision of the Earth as a thermodynamically closed and non-materially growing system, with the human economy as a subsystem of the global ecosystem. This implies that there are limits to biophysical throughput of resources from the ecosystem, through the economic subsystem, and back to the ecosystem as wastes.
2. The future vision of a sustainable planet with a high quality of life for all its citizens (humans and other species) within the material constraints imposed by 1.
3. The recognition that in the analysis of complex systems such as the Earth at all space and time scales, fundamental uncertainty is large and irreducible and certain processes are irreversible, requiring a fundamentally precautionary stance.
4. That institutions and management should be proactive rather than reactive and should result in simple, adaptive, and implementable policies based on a sophisticated understanding of the underlying systems that fully acknowledge the underlying uncertainties. This forms the basis for policy implementation, which is itself sustainable.
5. The last point is conceptually pluralistic. This means that even while people writing in ecological economics were trained in a particular discipline (and may prefer that mode of thinking over others), they are open to an appreciation of other modes of thinking and actively seek a constructive dialogue between disciplines (Norgaard 1989). There is not one right approach or model because, like the blind men and the elephant, the subject is just too big and complex to touch all of it with one limited set of perceptual or computational tools.

Georgescu-Roegen (1971) argues that the true economic output is ‘enjoyment of life’, not growth in Gross National Product. An increase in the enjoyment of life must be combined with a reduction in the consumption of natural resources. This makes it relevant to question two long-lived principles in economics; firstly, to be healthy, the economy must constantly increase the amounts of energy and raw materials that flow through it in order to generate ever-greater wealth. Secondly, in order to be happy, people must have more and more of this wealth to have access to consumer goods.

Research in quality of life/wellbeing has identified a negative relationship between material consumption and human wellbeing in many Western societies (Easterlin 2004; Easterlin et al. 2010; Pena-López et al. 2017). In Western societies that have achieved a high material living standard, a reduction in consumption can lead to an increase in wellbeing, a so-called ‘wellbeing dividend’ (Guillen-Royo 2010, p.384). Theoretical discussions on quality of life identify paths where this is possible. Examples are by expanding the capabilities and intrinsic empowerment of individuals (Schäpke and Rauschmayer 2014), reducing social pressures to conform to a materialistic lifestyle (Guillen-Royo 2010), enhancing the quality of social relations (Bruni and Stanca 2008) and satisfying fundamental human needs (Ryan and Deci 2000) among others.

Foundations of Ecological Economics

Ecological Economics adopts an organic worldview where ecosystems and social systems are comprised of closely interacting and interdependent subsystems. The earth itself and all its living and non-living components are interrelated and the human being is a member of this integral community. Every system is connected to and depends on all the others in continuous evolving processes. Deep ecology, an influential thought on a holistic worldview, emphasizes the intrinsic value of nature and rejects isolating constitutive parts of nature. Everything is interconnected and, at the same time, continuously changing. Deep ecology replaces the objective of material growth with sustainable qualitative development; it is critical of the prevailing economic system and locates the fundamental causes of ecological problems in social structures and cultures (Næss et al. 1989).

Capra and Jakobsen (2017) take the systems view of life approach to ecological economics and highlight four guiding principles for the field. The first envisions the economy as a nested system within other living systems (ecology, society, culture) (see Fig. 2 above). They assert ‘every economic activity should be a servant of life’ (Capra and Jakobsen 2017, p.836). The second principle emphasizes the importance of networks and relationships in the economy. It derives this principle by looking at (and learning from) how life in the ecosystem is a set of interrelated networks and relationships. The third principle deals specifically with material flows. Here, too, the source of inspiration is the ecosystem. ‘All living systems need to be open to continual flows of energy and matter, and all living systems produce wastes. In nature, however, organisms form communities, ecosystems, in which the waste of one species is food for the next so that matter cycles continually through the ecosystem, while energy is dissipated at each stage. ... Circular value chains make it possible to reduce both the consumption of virgin natural resources and the amount of waste that goes back to nature’ (Capra and Jakobsen 2017, p.840). Circular flows are also characteristics of the flow of knowledge in the economy. Knowledge informs economic activities (for example, finding better ways of producing goods

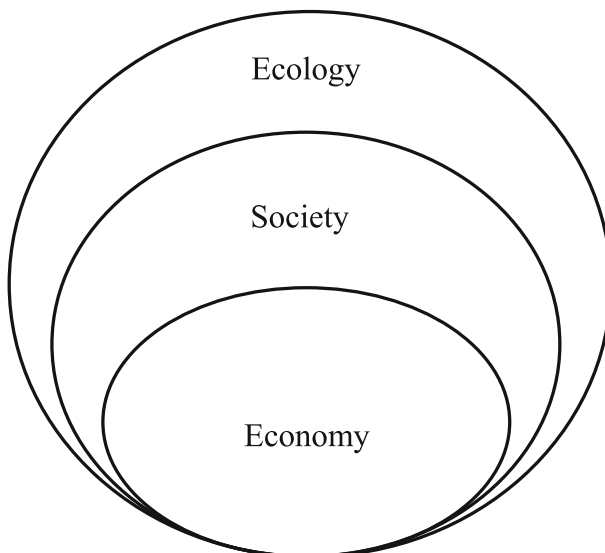


Fig. 2 The worldview of ecological economics

and services) and the experience gained in these activities improves our knowledge (Ingebrigtsen and Jakobsen 2007). The last (and fourth) principle highlights the role of ethics in the economy. ‘It is ... most urgent to reintroduce an ethical framework within the context of communicative cooperation between co-responsible economic actors on all levels. ... [E]thics always has to do with community; it is behavior for the common good’ (Capra and Jakobsen 2017, p.842). The absence of an ethical framework guiding the global economic and financial systems has resulted in a glaring inequality and social injustice and therefore, introducing an ethical framework is an important part of transforming the economy.

Ecological Economics adopts an ontological collectivism where ‘community relations define who people are, affect what they want, facilitate collective action, and have a historical continuity of their own’ (Costanza et al. 2014, p.30). This contrasts sharply with the atomistic view of individuals in NE.

A call for an organic worldview engenders a shift from a multi-disciplinary focus to inter- and transdisciplinarity. A worldview that recognizes complexity in social and natural systems calls for a new way of understanding reality. In transdisciplinary research a disciplinary cross-fertilization makes the borders between the different sciences more transparent. Unlike specialized knowledge, a transdisciplinary and holistic approach can help prevent a domination of reductionism, and thus, to a certain extent, reduce the risk of falling into the trap of abstraction. Such an approach also loosens up the theoretical and methodological restrictions imposed by traditional disciplinary boundaries and opens up a range of methodological perspectives.

Contrasting the axiologies of NE and EE, we find that EE makes explicit value judgements while NE claims it is a value-free, positive science. We will select a few ideological beliefs (which represent strong value judgments) presented by Spash (2012) as foundations for Ecological Economics and compare that with NE’s (often implicit) value standpoints. Spash (2012) defends both human and non-human inhabitants of Earth as morally considerable. This indicates assigning intrinsic value to our non-human cohabitants of Earth. In NE, non-human beings are considered either as consumption goods or as inputs to the production process. They have only an instrumental value to the economy and the consumer. He also assigns a more meaningful aspiration to human existence than hedonism. This is an explicit position that moves away from equating wellbeing with consumption and gives a node to eudemonia or the good life where the focus is the flourishing of human culture and community within environmental limits. In EE, inequality across genders, social groups, generations and geographical positions is morally indefensible and should be addressed through policy measures as opposed to NE’s requirement of pareto optimality to any redistributive changes.

Circular Economy – Challenging the Hard Core or Forming a Protective Belt?

Comparing the two fields of Neoclassical (NE) and Ecological Economics (EE), we find that they take radically opposing views. Most notably, NE emphasizes economic growth while EE focuses on research that decouples human wellbeing from economic growth. NE emphasizes competition as the primary form of interaction between economic agents while EE emphasizes the important role of co-operation in social interactions that has ensured evolutionary survival of our specie. NE emphasizes self-interested, atomistic actors while EE emphasizes relational actors embedded in social and environmental contexts. In light of this comparison, we will

examine if Circular Economy plays the role of a protective belt or a challenge to the hard core of NE (Table 1).

Circular Economy problematizes the linear, extract-produce-use-throw model of our economic system where products are designed for short lifespans. Circular Economy proposes to extend the use value of products through reuse, repair, refurbishment and remanufacturing. This reduces the demand for virgin raw materials to produce consumption goods. When the use-value of products are exhausted, then the products can be recycled for raw materials. Once the economic value of the products are thoroughly utilized and only then should the products be combusted for energy (alternatively termed ‘recovery for energy’). These are the 4R framework components (reduce, reuse, recycle and recover) of CE and a definition promoted by practitioners (Kirchherr et al. 2017).

Researchers studying the role of CE for sustainable development explore its implications for the three pillars of sustainable development: environmental, economic and social sustainability (Korhonen et al. 2018a; Korhonen et al. 2018b). On environmental sustainability, the main emphasis is on reducing the extraction of virgin raw materials that go into the production process and reducing the burden on the environment from excessive production of waste and pollutants. There is an aspiration of creating a symbiosis between the economic and eco-system where the byproducts of the economy are taken up by natural processes and assimilated into the biosphere (Korhonen et al. 2018a). On economic sustainability, one goal is to reduce production-costs. For example, costs associated with extracting and processing raw materials, waste management costs and emissions control costs. Another aim is to maintain the value in products for as long as possible by extending their use. Branding results in economic gain when goods are marketed to consumers as environmentally friendly, and businesses can brand themselves as responsible businesses and attract investment. CE’s contribution to social sustainability is an area where there is limited research. Korhonen et al. (2018a, p.40) list three potential social advantages of CE: ‘1) new employment opportunities through new uses of the value embedded in resources, 2) increased sense of community, cooperation and participation through the sharing economy and 3) use groups share the function and service of a physical product instead of individuals owning and consuming the physical product’.

CE is a young field (Murray et al. 2017) where practitioners (policy-makers, business consultants, business associations, business foundations etc.) play a leading role in its development and implementation (Korhonen et al. 2018a). The concept’s orientation towards practitioners mean that there is limited reflection on the worldview, values and societal structure that drive its development (Korhonen et al. 2018b). National governments, the European Commission and business foundations promote CE by claiming that it will lead to billions of Euros in annual economic gains (Korhonen et al. 2018a) and that it will boost economic growth. The focus on economic growth influences which aspects of Circular

Table 1 Summary of hard core difference between NE and EE

Neoclassical Economics (NE)	Ecological Economics (EE)
Growth	Well being
Atomistic	Relational
Competition	Cooperation
Instrumental values	Inherent values
Mechanistic worldview	Organic worldview

Economy make it into policy and public awareness. Practitioner definitions of CE ‘overall are found to feature reuse and recycle... An explanation is that practitioners have little interest in promoting reduction since this may imply curbing consumption and economic growth’ (Kirchherr et al. 2017, p.226).

CE, seen from this perspective, does not critically engage with worldviews and values. Engagement with worldviews may even at times be dismissed as a distraction from the real issue of reaping economic profits. For example, Webster (2015, p.12) states ‘[s]ome people really don’t like stories or narratives about the economy, or pretend that they simply don’t need one: all they want to do is find the business opportunity therein, see which way the wind is blowing and take advantage. One of the advantages of a circular economy is that it is perfectly possible to work this way, starting from today... The point is one does not need a change of values to get involved’. He continues to argue that a circular economy has three objectives: ‘more growth and more jobs in combination with substantially reduced resource consumption’ (Webster 2015, p.100). Such a position places Circular Economy in the protective belt of mainstream economics. Its role is to protect the hardcore imperative of maintaining economic growth in the face of environmental and social challenges. It ignores the concern raised by industrial ecologists and environmentalists that a selective focus on recycling will not be enough to solve the problems associated with production and consumption systems. CE must be accompanied by a reconsideration of the foundations of the economic system.

Sustainability oriented researchers of CE see it as a possibility for the business sector to contribute to sustainable development. There is a recognition that for CE to make a significant contribution, there has to be a paradigmatic change (in culture and values) (Korhonen et al. 2018a). Otherwise, CE will be relegated to a watered-down, ‘feel-good concept’ avoiding the heavy task of rethinking the entire production and consumption process (Kirchherr et al. 2017, p.227).

We find approaches that call attention to the complex processes in nature and society and incorporates them in a circular economy. Korhonen et al. (2018a) advocates for a definition of CE where the throughput flow of resources and energy does not exceed planetary boundaries. Others allude to the complexity of natural and economic systems. For example, ‘the vast majority of real-life natural, social and economic phenomena belong to the realm of complexity. Indeed, natural systems, whether physical, social or economic only rarely exhibit simple causality or weakly connected causality’ (Sally Goerner quoted in Webster 2015, p.47). This calls for a new way of conceptualizing business and community informed by systems thinking.

This strand of argument also advocates the re-invigoration of local economies by slowing the speed with which materials flow through the production process. Changing the production process of goods gives the advantage of improving material utilization and generating local employment. By reducing the scale of production and using local resources for local use, local employment is created. Adjusting taxation away from labor and renewables and towards pollutants and financial markets helps to invigorate the labor market. Social innovations such as community currencies, rooftop agricultures and sharing initiatives, are presented as ‘circular economy in practice’ and as examples of how local communities are generating their economies with local resources (Webster 2015).

The sharing economy represents a new culture where communities/user groups share the function or value of a product as opposed to individuals owning and consuming products. The

sharing economy is expected to ‘increase sense of community, cooperation and participation’ (Korhonen et al. 2018a, p.40).⁴

The latter considerations show distinct characteristics that depart from the neoclassical worldview. There is a consideration for the physical limits imposed by the ecosystem in production and consumption systems. There is a recognition of the complexity of social and natural systems and a call for systems thinking. And in advocating for the sharing economy, there are value systems that advocate building local communities (as opposed to maximizing individual utility), that emphasize cooperation and participation than competition. These are manifestations of values that challenge the hardcore of neoclassical economics and align more with the principles of Ecological Economics.

In the following two sections, we elaborate on the implications of the conceptual discussions we have conducted so far in the paper for business and communities.

Implications for Management of Businesses and Communities

Implications for Business

Practitioners from the business world are important contributors to the development of Circular Economy. In earlier sections, we have discussed the ambitions, visions and enthusiasm around CE. We have also expounded reservations from industrial ecologists and CE researchers regarding the limitations of CE. It is particularly important to be observant to the tendency to use CE as a ‘feel-good’ remedy to the consumerist culture that has brought havoc to the environment. These experts state that a genuine desire to bring about a fundamental change to the production and consumption system must engage with the wider issues of the worldviews and values that underly the economic system (Cullen 2017; Price and Joseph 2000; Korhonen et al. 2018a).

Businesses as engines of the economic system play an important role in the development of CE. Firms can take an active role in raising awareness about the potentials and short comings of CE both internally and in the wider community. They can take heed of the caution sounded by researchers that CE is still a young field and much can be achieved by reducing the firm’s production of waste and extending the value of products. Environmental management systems such as EMAS (Eco-Management and Audit Scheme) and ISO 14001 (the International Organization for Standardization) are anchored in neoclassical economics and do not ask critical questions of the hard core of the research program. There is a limited focus on the value of reducing the scale of the economy but rather a focus on selective practices such as recycling. There is limited awareness about where the recycled goods come from and what happens to them after recycling. There is even less focus on how recycling itself can demand energy intensive processes and may even require virgin raw materials to enter the production process (Price and Joseph 2000). Firms can adopt a holistic view of the economy, ecosystem and social systems, examine the role they play in the system and work towards a better world by networking with other socially and environmentally engaged firms.

Networking with other firms will also contribute towards alleviating one of the challenges identified by Korhonen et al. (2018a) regarding the difficulty of overcoming spatial and

⁴ However, there is limited research on CE’s social impact. As a result this aspiration for social impact of CE is currently not backed by empirical evidence (Korhonen et al. 2018a).

temporal boundaries in the implementation of CE. One of the practical solutions he proposes is adopting an ‘inter-organizational sustainability management’ (Korhonen et al. 2018a, p.44). This will be possible only when firms build cooperative networks where they can address such cross-cutting issues.

Establishing mutually binding co-operative relations is also an important first step to bring about a change to the neoclassical worldview where competition rather than cooperation is given a central role. Firms can both compete and cooperate with each other. However, a firm’s social and environmental responsibility will be better served through cooperative networks.

Reflections on foundational issues (worldviews, ontology and axiology) will also have an impact on the organizational culture and the wellbeing of employees. A shift from value monism to value pluralism will help firms live up to their social responsibility. Arjoon (2010, p.62), in this journal, envisages businesses as ‘society of persons’ instead of a ‘society of capital goods’. He asserts the moral justification for businesses is their contribution to human flourishing and advocates for valuing intrinsic rewards such as (learning new skills, personal development, and the application of virtues) in addition to extrinsic rewards (for e.g., monetary compensation). Based on empirical evidence, George and Sice (2014) show how organizations can contribute to the wellbeing of employees and the wider community by adopting a holistic perspective of wellbeing. Active reflection on worldviews and values can encourage firms to adopt a wider focus than just on economic gains and orient themselves towards a more collective focus on serving the development of the good society.

Implications for Communities

In our discussion of Circular Economy, we have shown that the concept incorporates different interpretations and practice. We showed that a circular economy’s activities play either the role of the protective belt or the role of challenging the hard core of neoclassical economics. Community initiatives such as the sharing economy and local currencies are initiatives that play the latter role (of challenging the hard core) and aim to bring fundamental changes to the way the economy is currently organized. Longhurst et al. (2016) argue that these initiatives are ‘counter-narratives’ engaging in ‘transformative social innovation’ (p.2). They define transformative social innovation as ‘changes in social relations, involving new ways of doing, organizing, knowing and framing’ (Longhurst et al. 2016, p.2). Initiatives such as transition towns, ecovillages, sharing cities and solidarity economy are all seen as transformative social innovations. Many of these initiatives congregate around the degrowth movement where the central unifying aim is to question the whole notion of unlimited growth. ‘Proponents of degrowth ... argue that exponential economic growth cannot continue indefinitely in a world of finite resources ..., calling for a reorientation of economic activity away from continuous expansion and toward lower material production and consumption’ (Longhurst et al. 2016, p.2). Other researchers of sustainability transitions highlight how these initiatives encourage innovations by providing a protective space where these ideas can take root and grow outside of the rules of the competitive market (Seyfang and Haxeltine 2012). These community initiatives align themselves with the principles of ecological economics such as value pluralism (as opposed to value monism), favoring co-operation over competition, a holistic view of co-existence within a community (as opposed to atomism) and their focus on a circular instead of linear material flow.

There are thousands of such initiatives around the world today (Longhurst et al. 2016). However, establishing such alternatives is not easy. Around 90% of aspiring community-level

initiatives fail for lack of a unifying community vision (Christian (2003) in Guillen-Royo 2010). The implication of our paper for managers of such processes is to highlight the importance of closely examining the ontological basis of values and norms that define their communities. An atomistic worldview (of autonomous independence) and a holistic view (of interdependence and reciprocity) may lead two community members into a conflict if not clearly understood beforehand. An aim of perpetual growth/expansion and profitability may lead to a different community than a vision of simplicity that focuses on non-monetary sources of wellbeing. Citizens that aspire to establish community level initiatives or those that are at the initial stages of community formation are best served if they find ways to explore and understand the foundations of their values before initiating the hard work of starting up an initiative together. Dialogues and workshops are well-tested ways of shedding light on these issues that lay deep in our consciousness but are rarely critically examined.

Conclusion

Our civilization faces an unprecedented combination of social, economic and environmental challenges that require fundamental changes to the global economy. These problems are often interdependent, complex and plagued by uncertainty. Therefore, they require a close examination of the foundations of our economic system. Circular Economy (CE) has gained prominence as part of the solution to these challenges. In this article, we argue that to explore whether CE is a solution to these challenges, we need to examine the foundations of its development (its worldview, ontology, epistemology and axiology).

Circular Economy that fails to critically examine and challenge the foundational basis of unlimited economic growth operates within the same mechanistic worldview as mainstream economics. Economics based on the mechanical perspective is characterized by the idea that individuals are isolated actors and society represents no real unity in itself. Unlimited economic growth is a societal good and the ultimate goal of economic policies. Nature has no intrinsic value and is seen as an instrument towards this goal. In this worldview, CE will operate as a protective belt to the hard core of mainstream economics. Circular Economy that operates within an organic worldview recognizes and values networks and relationships in nature and society. It accepts that the economy should serve society and nature. It aims to build communities and reduce social injustice. In this worldview, CE can contribute to finding creative solutions that will not be restricted by the demand of maintaining unlimited growth. It will also be easier to accept (as industrial ecologists recommend) that any discussion of moving towards a circular economy needs to be accompanied by the conviction to reduce our consumption of natural resources (even at the expense of an ever expanding economy).

To solve the complex challenges connected to environment, society and economy, implementing a circular economy could, in both contexts, be an important part of the answer, within the existing mechanical system by reducing symptoms (reactive), in an alternative organic system by increasing the life forces (proactive) in economy, society and nature.

Compliance with Ethical Standards

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