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New business models for a radical change in resource efficiency

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ABSTRACT

Beginning with an analysis of the business constraints imposed by increasingly scarce resources, in this paper I make the case for a 'circular economy'. The principles of this approach are outlined, as is the need for new business models. I also discuss incentives to stimulate enterprises to enter the circular economy.

1. Introduction

The vast majority of industrial processes and their supply chains are understood (and operated) as a linear sequence, such as the following: Extraction → Transport for several more conversion/assembly steps → Consumption → Waste → disposal (by incineration or landfill). This view is reflected in the definition by La Londe and Masters (1994): 'A supply chain is a set of firms that pass materials forward.' Multiple suppliers will be involved in manufacturing a product and bringing it to market, including farmers, miners, refiners, component producers, product assemblers (perhaps a hierarchy of them), wholesalers, retail merchants and transportation companies, which together form the supply chain. Linear supply chains are geared to improve the efficiency of each step along the chain, thus ensuring maximum output at minimal cost. In a linear system, returning or repairing products for reuse creates additional costs and forms a disturbance to the optimized flow.

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The broader use of life cycle analyses and carbon foot-printing, among other environmental assessment methodologies, have revealed how wasteful and inefficient the current complex material networks are (Steinbach and Wellner, 2010). Yet two centuries ago, when the exploitation of natural resources first started to drive long-term rising prosperity in parts of the Western world, to the contemporary observer those resources appeared to be an inexhaustible source of wealth for the estimated 1 billion human beings then on earth (Demeny, 1990). Since then the world's population has multiplied seven fold, with a concomitant rise in per capita consumption of resources. It is envisaged that by 2030 another 3 billion people will enter the global middle class, increasing the strain on resources through their patterns of consumption (e.g., Landsberg et al., 1962; Meadows et al., 1972, 1992; McKinsey & Company, 2011).

I posit that by replacing linear supply chains with a circular model that maximizes the effective use of resources a new business model emerges that will ensure prosperity in spite of population growth and the demands it makes on finite resources.

2. The circular economy

We can and should learn from nature, where progress is achieved by ever-more-efficient resource cycles, boosting both resilience and adaptability to discontinuity in the external environment. The concept of waste in nature does not exist; everything is an input to another process in the life cycle. It is on this model that the circular economy is built: a product is designed to create minimal waste by allowing it to be easily repaired, or the materials to be upgraded or reused. In the circular economy, value creation is built on longevity and new forms of consumption, e.g. pay-per-use instead of ownership.

Conversely, the overwhelming majority of conventional production supply chains rapidly convert all material inputs into non-usable waste. Growth-oriented business models know only one way forward: once market saturation is reached, frequency of product replacement must be increased. Mass production, through constant improvements in labor efficiency, reduces the costs of production while boosting demand. But it largely ignores questions of resource efficiency since the producer does not bear the total cost of the resources consumed, which should encompass the cost of waste disposal, pollution-related health care, the provision of energy infrastructure, transportation infrastructure and water supply. If these costs were allocated to the consumers of resources, many existing businesses would be non-viable.

As early as 1998, Robert Ayres conceived a concise vision of how to restructure economic systems in a sustainable way instead of depending on business models built on the depletion of natural resources (Ayres and Weaver, 1998). The circular economy cuts through the existing concept of growth based on increasing resource-intensive activity. One can distinguish three categories of material resource consumption:

1. Energy (actually 'useful energy' or exergy), whether from the sun, from sub-terrestrial heat, wind, tides, nuclear fission, or fuel combustion.
2. Biological materials such as food and wood products that can be safely returned to the biosphere, where they act as nutrients.
3. Excavated materials like metals and hydrocarbon derivatives (e.g. plastics), which are not biodegradable and are based on finite resources.

Instead of the depletion of resources, in a circular economy waste is 'designed out' and consumed materials are seen as nutrients in interlinked usage cycles. Increasingly, resource shortages (actual and anticipated) are triggering innovation and the creation of new business models. The Ellen MacArthur Foundation has recently published the first studies highlighting the economic rationale for a transition to a circular economy (Ellen Macarthur Foundation, 2012, 2013). The following sections outline how the new business models that are consistent with a circular economy work to the benefit of both the economy and the environment.