From waste management to resource recovery: the waste management sector in the circular economy

Nikolaos Voulvoulis

Centre for Environmental Policy, Imperial College, London SW7 2AZ, UK

Current global development is characterised by increasing resource use and growing inequalities between the developed and developing parts of the world. Billions of people, mostly in developing countries, legitimately demand further economic growth and therefore increased resource consumption. Emerging scenarios and calculations demonstrate that benefits delivered from resource efficiency alone will not address the demands of this ever-growing demand for raw materials and energy.

Meeting the development needs of the world population and sustaining economic growth with a finite resource base on a planet that is already under stress, comes down to the economy's ability to grow while resource use is declining (Figure 1). The circular economy is a generic term for an industrial economy that, by design or intention, is restorative and eliminates losses. To move towards a circular economy means moving away from our current linear economy (make-use-dispose) towards one where our products, and the materials they contain, are valued differently; creating a more robust economy in the process.

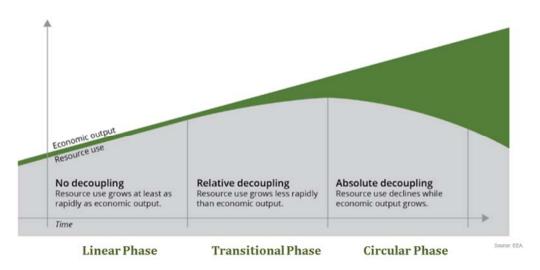


Figure 1: Circular economy and its ability for growth while resource use is declining

The circular economy goes beyond resource and energy efficiency, it closes the loop between resource extraction, production, and disposal, with wastes cycled back into the economy as inputs for production of new products to keep the economy growing while resource use is declining. Circular economy approaches 'design out' waste and typically involves innovation throughout the value chain, rather than relying solely on solutions at the end of life of a product (Figure 2).

Reducing the quantity of resources required both to deliver a particular product or service (lightweighting); and during their use phase (efficiency);

Lengthening products' useful life (durability);

Designing products that are easier to maintain, repair, upgrade, remanufacture or recycle (ecodesign);

Developing the necessary services for consumers in this regard (maintenance /repair services, etc.); Reducing the use of materials that are hazardous or difficult to recycle in products and production processes (substitution);

Creating markets for secondary raw materials (recyclates) based on standards, public procurement, etc.;

Incentivising and supporting waste reduction and high-quality separation by consumers; and incentivising separation, collection systems that minimise the costs of recycling, and reuse;

Facilitating the clustering of activities to prevent by-products from becoming wastes (industrial symbiosis);

Encouraging wider and better consumer choice through renting, lending or sharing services as an alternative to owning products.

Figure 2: Circular economy characteristics

With the linear economy reaching the limits of the planet's finite resources, circular economy thinking offers promising new perspectives for a renewed social and economic dynamic, where economic growth is balanced with environmental protection and preservation. This paper covers three manifestations of circularity (Figure 3) and looks at the evolving role of the waste management sector in this transition to a circular economy. With challenges in environmental policy increasing in the future, the sector has an important role to play. The paper makes the case for it taking the lead in the management of natural resources cycles.

Turning waste into a resource of value

•The circular economy requires a shift from 'waste' to 'resource'. Both energy and materials need to flow in the economy, and what is normally perceived as waste is raw materials of value and market demand. To start, key raw materials can be recovered from the waste stream including: biomass, plastic, wood, paper, metal, glass and also energy can be extracted. These materials all have a value to sectors in the economy, and can therefore be sold back into the production cycle as secondary raw materials, which help to generate GDP.

Trade Shift & Symbiotic Relationships

•A symbiotic approach – using, recovering and redirecting resources for reuse – aims to keep them in productive use in the economy for longer. This in turn creates business opportunities, and reduces demands on resources. It offers opportunities for cooperation and synergy, resource efficiency, in production and optimization of services and products. In symbiotic conditions, consumption and production ecosystems become closed loops, eliminating the waste of outputs throughout the product lifecycle.

Products to services

• A shift from users to consumers. Service provision is often an economic activity where the buyer does not generally, except by exclusive contract, obtain exclusive ownership of the item purchased. Such a shift would not only allow companies to retain product ownership for easier repair, reuse and remanufacture, but might result in producer responsibility obligations being extended to users as part of the purchase agreement. Service/leasing business models offer additional opportunities for economic growth.

Figure 3. Manifestations of circularity – the way to the circular economy.