

Sometimes Pigs *Can* Fly



Ian Williams, professor of applied environmental science at the Centre for Environmental Science at the University of Southampton, ISWA National Committee member and Chartered Waste Manager, gives an update on ZeroWIN and a personal view on the circular economy, surmising that the unexpected can happen...

Interest in the circular economy (CE) has grown since the Swiss architect Walter Stahel introduced his ideas for service-life extension of goods in the 1970s. The CE refers to a closed economic model that aims to conserve scarce resources whilst simultaneously preventing further environmental deterioration. The CE model takes inspiration from the living world, moving away from the highly wasteful traditional linear economic model of “take, make, use, dispose”, towards the restorative and efficient approach of closed-loop material flows (see Figure 1). Consideration of systems is fundamental to the model, as the flow of products and materials are organised into cycles preventing the disposal of resources. Products are designed with future reuse in mind, and then through recycling

and remanufacturing are used within the system for as long as possible, maximising their value and minimising environmental damage.

The CE model is associated with several concepts. Direct links have been made with zero waste systems, product stewardship, supply chain management, regenerative design (eco-design) and industrial symbiosis, as well as with reverse logistics, cradle-to-cradle systems, eco-efficiency, cleaner production, pollution prevention, the polluter pays and proximity principles, biomimicry, industrial networks and industrial ecology.

Key factors driving support for the CE model include landfill taxes, high market prices for recyclable materials and the increasing costs of resource extraction linked to growing demand for materials. Population growth combined with rapid urbanisation and growth in the middle



classes, particularly in Asia, has driven greater demand for technology-based products and services, leading to concerns about resource insecurity. Countries such as China, Japan and Germany have reacted quickly to embrace the CE model, although there isn't an internationally homogenous approach. The Chinese interpretation is more generic, encompassing all reuse and recycling activity, and in practice it appears to cause significant environmental degradation. It is possible that countries slow from the starting blocks risk being left behind, with subsequent economic consequences.

The ZeroWIN Project

IN AUGUST 2010, I introduced *CIWM Journal* readers to the ZeroWIN project – Towards Zero Waste in Industrial Networks. This was an ambitious EU-funded project researching – and trialling by means of case studies with industrial partners – methods and strategies to eliminate the wasteful consumption of resources in key industrial sectors in Europe, primarily via the formation of industrial networks. The project ran from 2009-2014 and involved 30 academic, research and industrial partners across Europe, and one partner in Taiwan. Now that the project is finished, its results and conclusions can be reported.

The ZeroWIN project aimed to demonstrate how existing approaches and tools can be improved and combined to best effect in an industrial network and how innovative technologies and design innovations can contribute to achieving a CE. It focused on two key waste types in four resource-intensive sectors: high-tech waste from the electrical and electronic equipment, automotive and photovoltaic sectors; and construction and demolition waste. The project's plan was to show that the approach could be commercially viable whilst meeting at least two of the following stringent targets:

- 30 percent reduction of greenhouse gas emissions
- 70 percent overall re-use and recycling of waste
- 75 percent reduction of fresh water use.

A key part of the project was to create a common vision as a foundation for the demonstration activities in each industry sector. The key concepts, guiding principles, technologies,

ZeroWIN's 10 Case Studies

- The Design for Reuse (D4R) laptop
- The D4R photovoltaic (PV) System
- A Re-Use Network and the Resource Exchange Platform
- Resource Efficiency Construction Networks (UK)
- Resource Efficiency Construction Networks (Portugal)
- Refurbishment and new construction projects (Germany)
- Demolition of end of life buildings (UK)
- Demolition of end of life buildings (Portugal)
- Automotive part recycling
- Business to Business EEE Industrial Networks

Note: D4R = Design for Re-use, Recycling, Refurbishment, Repair.

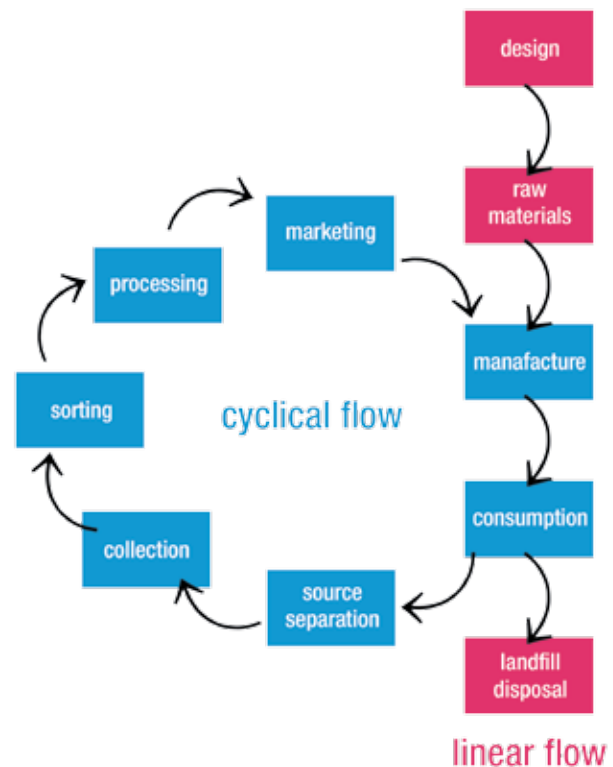


Figure 1: linear and cyclical resource flows

methods and tools were distilled into the key strategies that underpin the ZeroWIN approach. They are: designing waste out of the system; industrial symbiosis and closed-loop supply chain management; use of effective waste prevention methods and new technologies; applying Individual Producer Responsibility (IPR); and accurate monitoring and assessment of results. These key concepts formed the foundation for 10 demonstration case studies (see Box 1), which were completed in 2013/14.

The crucial ZeroWIN concept is an “Industrial Network” – a framework for cooperation between network members aimed at zero waste and resource conservation. The ZeroWIN networks evolved as a targeted process and required extensive data collection and analysis, facilitation of contacts between various non-related industries and determination to overcome barriers, including entrenched cultural practices in some sectors.

The development and delivery of the case studies was jointly managed by the University of Southampton and Wroclaw University of Technology (Poland), and quantitatively evaluated by the University of Natural Resources and Life Sciences (Austria). Project outputs are available from its website (www.zerowin.eu). The key results from the project are a quantitative assessment of the performance of the ZeroWIN approach by 10 case studies applying the production model. Other outputs have included recommendations to policy-making; the creation of a Resource Exchange Platform; the delivery of education, training and support services; and a guide to industry and business on how to save resources.

I was unforgettably told by sceptics of the CE model that “pigs would fly” before the ZeroWIN project’s

targets could be demonstrated. Yet all 10 case studies were successfully delivered – on time and under budget – although many obstacles had to be overcome. Table 1 summarises the achievements of selected case studies against the agreed targets. In fact, against the odds, the ZeroWIN project met its overall environmental targets.

These outputs provide insights into the challenges and barriers existing in the studied industry sectors. They should be seen as good lessons learned from the merger of academic theory and vision with industrial practice, and should provide both objective evidence and inspiration for the future development of a resource efficient Europe based upon a CE model.

The Evidence Base Is Building

AROUND THE world, researchers and businesses are testing the CE model and highlighting its potential. The Ellen MacArthur Foundation was set up in September 2010 to inspire countries, economies and industries to see the CE framework as a genuine economic paradigm shift. The Foundation has rapidly established global credibility and formed partnerships with serious players in national and international economies.

The Institute of Environmental Management &

Target	Decrease of 30% GHG emissions	Reduction of 75% of fresh water utilisation	70% of overall reuse and recycling of waste
D4R Laptop	66%	65%	87%
PV – Stand Alone	45%	41%	91%
PV – Smart Grid	>100%	>100%	91%
Reuse Network – Desktop Computer	66%	64%	100%
New Building Construction – UK	58%	43%	93%
Refurbishment of Building – Germany 1	19%	14%	78%
Refurbishment of Building – Germany 2	38%	>100%	85%
Demolition of Pre 1950s Building – UK	>100%	>100%	99%
Demolition of 1950-1980 Buildings – UK	>100%	37%	99%
Demolition of Buildings – Portugal	>100%	>100%	99%

Table 1: Quantification of environmental improvements achieved by the ZeroWIN project, by selected case study (Data from the Institute of Waste Management, University of Natural Resources and Life Sciences, Vienna, Austria)

Assessment estimates that sustainable resource management can save organisations between £5 000 and £200 000 per year, depending on the size of the company, generating potential savings of a trillion US dollars annually worldwide and £55-56bn in the UK.

This produces opportunities for growth and offers a competitive advantage as organisations obtain greater value from resources. Implementation can protect corporate reputation through reducing supply-chain risks and material price volatility. Entry level and semi-skilled job creation in remanufacturing and recycling has significant potential, with current estimates of jobs exceeding one million in Europe alone. Reducing pressure on resource extraction will in turn reduce the impact of issues such as land degradation, as well as lessen greenhouse gas emissions.

This emerging evidence base – partly funded by the EU’s research programmes – was the foundation upon which the Barroso Commission’s Circular Economy Package was built. It is to be hoped that the Juncker Commission really does deliver on its promise to present a more ambitious proposal to promote the CE, rather than kicking the can down the road. My message to our UK-based politicians as they develop and hone their policies and election promises would be to base them on evidence; to respectfully misquote Bill Clinton: “It’s the circular economy, stupid.”

An International Challenge

SOME SCEPTICS claim that the basis of the CE is based upon a naïve and circular argument: sustainable business practices deliver a sustainable environment because a sustainable environment delivers sustainable business practices. They say that the CE is unproven and risky. It is widely acknowledged that achieving the direct exchange of by-products between industries is a significant challenge for achieving a global closed-loop economy. Our businesses are rightly fearful of aimlessly “...going round and round and round...” like the joggers memorably described by Phil Daniels in *Blur*’s “Parklife.” But given that there will be 8bn people on the planet by 2025, and they will all desire a decent quality of life, surely we should be embracing the challenge?

Let’s go back to the evidence. The activities undertaken by the ZeroWIN project had never been undertaken previously by such a large group of international experts and industrial organisations with such a range of different viewpoints and perspectives. The consortium successfully developed a vision that others can follow, delivered its demonstration case studies and met its ambitious environmental targets whilst retaining commercial credibility. The ZeroWIN case studies provide both objective evidence and inspiration for the future development of a resource efficient Europe. ZeroWIN was an ambitious project set with difficult goals, but its outputs have shown that these challenges can be met and that society can move towards a circular resource economy if our politicians are willing to change our prevailing business practices and culture.

Sometimes pigs can fly. ■

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