CIRCULAR ECONOMY

A new world model for resource management

DR STUART MCLANAGHAN puts forward the case for replacing the European waste hierarchy model with one for a resource hierarchy, and developing a systemic approach to sustainable resource management

The Stern Review concluded that climate change represents "the greatest market failure the world has ever seen"; waste represents the second. The recent growth of interest in the circular economy to manage this problem implies the need to restructure our economy to deliver more sustainable patterns of resource use. The development of a whole-life framework for the sustainable management of resources could help to manage this shift.

Market failure

Since the industrial revolution, most economic activity has followed linear patterns of production and consumption, traditionally supported by cheap and plentiful virgin resources, such as coal and minerals.

Since its early 1970s origins, European environmental legislation has centred on waste controls to protect human health and avoid environmental pollution. The EU waste hierarchy ranks waste management options according to environmental preference. But while subsequent EU environmental action programmes have brought more policy prominence to sustainable production and consumption, much of the underlying emphasis is still on strengthening waste legislation as the main way to achieve greater progress towards sustainable resource management.

But it is increasingly being questioned whether adequate transitional progress on resource circularity can be delivered through the current waste hierarchy, where policy interventions focus rather dogmatically on ever-higher end-of-life recycling targets but where these exert little influence on the upstream supply chain.

Additionally, systemic change within the productive economy cannot be left solely to prevailing market forces. For example, consider recent claims that users of recycled plastic are switching back to virgin polymers as the former's value falls due to low oil prices.

As an alternative, the idea for a European resource hierarchy has been proposed to the European Commission's Directorate-General for the Environment, based on a whole-life framework for the stewardship of national natural capital use throughout the productive economy (*see diagram right*). This could form the basis of a fundamental policy shift, to embed resource circularity within the productive economy. It is envisaged that through transitional arrangements, this could supersede the EU waste hierarchy.

Implications for data and reporting

Major economies are complex. Assessing progress towards sustainable resource use will necessitate wider data needs than presently available. Robust data and information, underpinned by sound science and accounting methods, are central to evidence-based policy-making, smarter regulation and wider market-based interventions.

Natural capital underpins the productive economy, where demand is in part influenced by imports and exports. A whole-life approach to resource stewardship would require the development of a range of supporting metrics including natural capital extraction rates from 'proven reserves' as a metric to indicate the (un)sustainability of key resource use.

The Natural Capital Committee (NCC) has been asked to advise on 'when, where and how natural assets are being used unsustainably'. It is currently working to develop a system of measurement for natural capital, and to identify which assets are at risk, as well as contributing to the development of an accounting system, working with the Office for National Statistics (ONS) and Defra.

One particularly challenging aspect is how to reconcile the loss in one area of natural capital (such as species and sub-soil assets) by extracting another (for example, minerals.) Better data on exports/imports would also enable 'net resource migration' to be quantified and resource security identified. Greater resource circularity during production and consumption reduces pressure on natural capital reserves, such as hydrocarbons.

The picture is completed with existing national release inventories which report on regulated industry releases by type into the biosphere, where given environmental limits are becoming better understood.

By 2017, amended EU regulation 691/2011 will require the ONS to report on progress towards a greener economy. It might now be timely to bring together the NCC, Environment Agency, Defra and ONS to scope out the necessary metrics for determining the (un)sustainability of resource use within a 'whole-life' resource framework. The Liberal Democrats have pledged to task the NCC to produce a 'Stern report' on resource use, and Labour has also committed to undertake a review of resource security.
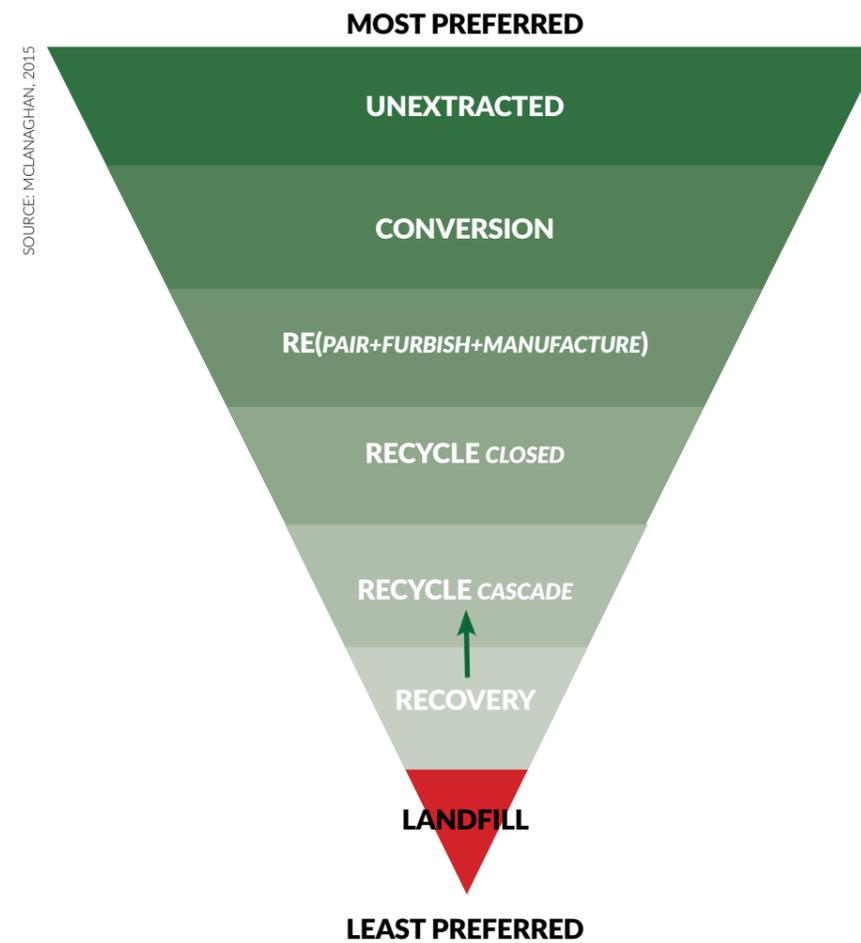
Implications for business and policy

Recent news illustrates the unprecedented challenges faced by the recyclate industry in the face of volatile market conditions. As well as underpinning delivery of both rising Landfill Directive diversion and recycling targets, many in the environmental services industry see exports as essential to ensuring all material that is collected re-enters the productive economy.

On the flipside, while contributing to the UK trade balance, exports reflect a combination of earlier de-industrialisation via outsourcing to countries with lower cost centres; insufficient domestic reprocessing infrastructure; underdeveloped domestic recyclates markets; and the loss of valuable secondary resources over lengthened supply chains.

Objectives need to look beyond building reprocessing capacity only then to export higher-grade recyclate materials. It is only

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THE RESOURCE HIERARCHY

SOURCE: MCLANAGHAN, 2015

MOST PREFERRED

UNEXTRACTED

CONVERSION

RE(*PAIR+FURBISH+MANUFACTURE*)

RECYCLE *CLOSED*

RECYCLE *CASCADE*

RECOVERY

LANDFILL

LEAST PREFERRED

Key:
UNEXTRACTED
Virgin resources in the biosphere; unextracted natural capital reserves (eg minerals and ores) whether proven, or otherwise.
CONVERSION
Conversion of extracted resources into products and services (eg via manufacture).
RE(*PAIR+FURBISH+MANUFACTURE*)
Products that undergo repair, refurbishment or remanufacture, resulting in their retained use within the productive economy.
RECYCLE *CLOSED*
Closed-loop recycling within the original manufacturing facility or sector, for the same or similar purpose.
RECYCLE *CASCADE*
'Cascade recycling' or 'downcycling': resources recycled after product 'end-of-life' in different value streams. As resources descend the cascade their value declines (entropy increases.)
RECOVERY
Nutrient leakage into the biosphere is minimised by restricting energy recovery to resources from which all further cascade recycling has been exhausted. The arrow to cascade recycling from recovery represents any subsequent resource use in manufacture (for example, inert ash used for secondary aggregates).
LANDFILL
In the circular economy waste does not exist. Resources would not be landfilled, other than for subsequent mining. Transitionally, some landfill will be required, but only when all cascade recycling opportunities have been exhausted.

through greater coupling of domestic reprocessing and manufacturing needs that the value of secondary resources can be realised in our national productive economies.

Manufacturing countries outside Europe are beginning to strengthen their environmental policies and experience upward pressures on labour costs. North American analysis has concluded that, for some products, manufacture in the US is becoming just as economical as manufacture in China.

If this trend becomes more widespread, when taken with initiatives to drive greater resource circularity, the UK could potentially see re-industrialisation as costs and environmental regulation equalise. This might provide a catalyst to unlock exciting opportunities, for example using the local enterprise partnerships model to stimulate inward investment opportunities for regeneration projects based on co-located resource reprocessing and manufacturing infrastructure.
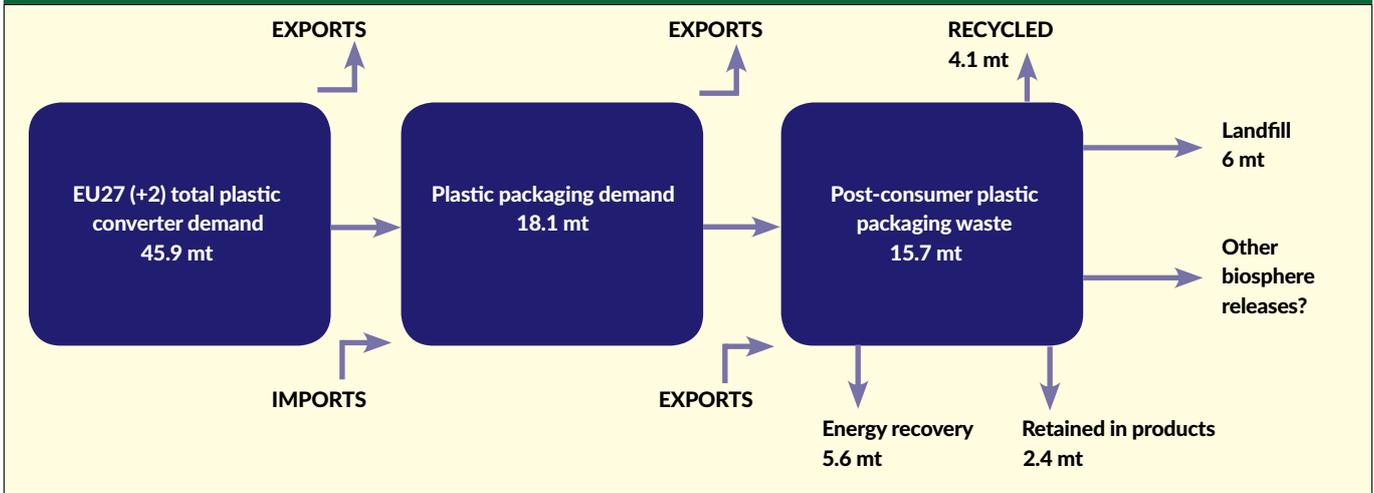
The reprocessing sector can also draw on good practice in national facilities management, together with logistics (including back-hauling) and distribution networks, developed by household name retail outlets. The focus would be on more regional reprocessing infrastructure, possibly utilising merchant capacity, accepting similar inputs from a wide range of secondary material arisings (for example, domestic, commercial and industrial), This would bring operational scale and quality, wherever possible making use of standardised collection infrastructure and integrated transport hubs.

The scale of secondary material arisings will determine whether infrastructure is best developed at a regional level, such as individual plastic polymer reprocessing, or national level, such as rare earth metal refining.

A range of potential delivery mechanisms could be evaluated to accelerate construction of reprocessing infrastructure, including a dedicated national resource infrastructure development plan, an extended role for Defra's existing Waste Infrastructure Development Programme or a wider resource remit ››

EU27 PLASTIC PACKAGING FLOWS (MILLIONS OF TONNES)

EXPORTS

EXPORTS

RECYCLED
4.1 mt

EU27 (+2) total plastic converter demand
45.9 mt

Plastic packaging demand
18.1 mt

Post-consumer plastic packaging waste
15.7 mt

Landfill
6 mt

Other biosphere releases?

IMPORTS

EXPORTS

EXPORTS

Energy recovery
5.6 mt

Retained in products
2.4 mt

ADAPTED FROM PLASTICS EUROPE DATA

under the National Infrastructure Plan.

Sector and geographical roadmaps

Greater understanding of the circularity of resource flows and the extent of national resource security is becoming central to business decision-making. This can be informed by auditing resource flows and/or assessment against a range of 'circularity indicators'.

Engaging key decision-makers across respective supply chains via industry roadmaps, such as the Dairy Roadmap and Bio-economy Roadmap, could be used to inform what economic activity might look like under different scenarios for resource circularity – for example 'linear-business as usual', 'medium transitional' and 'fully circular' – and the corresponding types of structural change necessary.

By identifying the main supply chain blockages to resource circularity, legislative, regulatory, fiscal and voluntary interventions can be better structured to maximise leverage and mitigate unintended consequences, such as land taken out of food production to grow biofuel crops.

For example, a 2012 snapshot indicates that almost two-thirds of plastic packaging polymers were lost from the economy to a combination of landfill and energy recovery. This figure does not take into account the leakage of post-consumer plastics into the biosphere associated with litter. The despoiling of our oceans and beaches with plastic debris represents one of the most visible examples of our current 'take-make-consume-dispose' society (*see diagram above*).

In the medium-term, a fully circular roadmap for the plastic packaging sector might see the use of petroleum-based polymers restricted to longer-life and more durable product appli-

cations. Instead, the use of fit-for-purpose biodegradable alternatives (such as PAS100 and PAS110-compliant corn and potato starch-based films) for fast-moving consumer goods applications, means that low bulk density, food contaminated film materials could be readily recycled alongside kitchen waste via composting and anaerobic digestion facilities.

Current work on standards and guidelines need to reflect the dynamic nature of the circular economy, providing guidance rather than a prescriptive set of requirements. Business often aspires to do what is right but small- and medium-sized enterprises in particular often lack the know-how and resources to do so.

Standards and guidelines should be at the leading edge of good practice, centred less on academic positioning and terminology and more on business needs. They must be understood by non-technical audiences.

Individual business sectors should then be encouraged and supported to build on framework standards by tailoring them to sector-specific guidelines. Standardisation work in this area is being currently championed by a recently formed British Standards Institution Committee (SDS/1/10: Sustainable Resource Management).

Delivering greater resource sustainability

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needs to be led by business and will require vision, innovation and investment. A number of industry figures across disciplines have been vocal in calling for the creation of an Office for Resource Management in the next Parliament. This would certainly help to elevate sustainable resource management and the circular economy up the political agenda.

But careful positioning will be required, particularly in the event of a second Conservative Party-led coalition, due to concerns throughout the last Government of George Osborne's seemingly ideological opposition to market intervention and by extension green growth. Labour has stated it would not reverse the 2015/16 spending review cuts. This will likely dampen appetite in Defra and other departments for major new initiatives. Councils also have little appetite for risk during austerity.

Instead, and rather more reactively, the Government remains set to look to Brussels to develop the circular economy package. As a result, the All-Party Parliamentary Groups and national trade bodies will be increasingly important to build political consensus.

While the potential business and environmental opportunities are enormous, we must guard against evangelism and engage creatively with business but avoid the easy language and poor understanding around what is possible.

It will also be important to understand the wider implications of substantial structural change to existing major economic systems, in particular those associated with traditional patterns of production and consumption, along with addressing inequalities between richer and poorer nations. ○

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