

Minor Metals:

Ready for the Circular Economy

The world's population is growing quickly. People are moving to urban centres. Raw material demand is expected to increase 3-fold by 2050.

Government and business need to face these challenges head on to ensure a plentiful supply of resources for all; therefore optimisation is crucial.

Metals will be central to any strategy to make a sustainable future. Minor metals* are used in renewable energy technologies, electric vehicles and other sustainable technologies- please visit www.mmta.co.uk/newsletter/sustainable-minor-metals to learn more.

These metals are often described by governments as 'strategic' or 'critical' because of their exceptional characteristics; minor metals are part of the innovative solutions which will ensure a sustainable future. In addition, steel, nickel, aluminium and other base metals also rely on minor metals as alloying elements to give them their mechanical properties, deformability, corrosion resistance and other essential performance characteristics.

One solution to the world's raw material challenges is to develop a **circular economy**. The circular economy is as a practical method to manage the planet's expanding resource demands.

So what is the Circular Economy?

A circular economy is an alternative to a traditional linear economy ('take-make-dispose') in which we keep resources in use for as long as possible, extract the maximum value from them whilst in use, then recover and regenerate products and materials at the end of each service life. (WRAP UK)

The circular economy aims to eradicate waste—not just from manufacturing processes, as lean management aspires to do, but systematically, throughout the life cycles and uses of products and their components. Indeed, tight component and product cycles of use and reuse, aided by product design, help define the concept of a circular economy and distinguish it from the linear take–make–dispose economy, which wastes large amounts of embedded materials, energy, and labour. (McKinsey & Company)



Exploration and material extraction costs are rising. This, coupled with growing tensions around geopolitics and supply risk, are contributing to volatile commodity prices. A circular economy could help stabilise some of these issues by decoupling economic growth from resource consumption.

Why are we talking about this now?

The European Commission says that the circular economy offers an opportunity to reinvent the economy, making it more sustainable and competitive, bringing benefits for businesses, industries, and citizens alike. This new plan would, they believe, make Europe's economy cleaner and more competitive and the Commission is delivering ambitious measures to cut resource use, reduce waste and boost recycling. The Commission has recently adopted (December 2015) an ambitious Circular Economy Package, which includes revised legislative proposals on waste to stimulate Europe's transition towards this circular economy.

*The term 'minor metals' encompasses a vast array of metals, including tungsten, titanium, cobalt and molybdenum, to name just a few. Traditionally, minor metals were those metals not traded on formal exchanges, although cobalt and molybdenum are now traded on the London Metal Exchange along with base metals. Minor metals have a relatively low annual production volume in comparison to base metals, and very specialist, and often high technology, applications.

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The Circular Economy Package consists of an EU Action Plan for the Circular Economy establishing a concrete and ambitious programme, with measures covering the whole cycle: from production and consumption to waste management and the market for secondary raw materials.

The proposed actions will contribute to 'closing the loop' of product lifecycles through greater recycling and re-use, and bring benefits for both the environment and the economy. Within this there will most definitely be business opportunities for those able to demonstrate that their activities support the overall aims of the circular economy.

The most concrete proposal in the revised legislation is on waste. Clear targets have been set for the reduction of waste and to establish an ambitious and credible long-term path for waste management and recycling. Key elements of the revised waste proposal include:

- A common EU target for recycling 65% of municipal waste by 2030;
- A common EU target for recycling 75% of packaging waste by 2030;
- A binding landfill target to reduce landfill to maximum of 10% of all waste by 2030;
- A ban on landfilling of separately collected waste;
- Promotion of economic instruments to discourage landfilling ;
- Simplified and improved definitions and harmonised calculation methods for recycling rates throughout the EU;
- Concrete measures to promote re-use and stimulate industrial symbiosis - turning one industry's by-product into another industry's raw material;
- Economic incentives for producers to put greener products on the market and support recovery and recycling schemes (e.g. for packaging, batteries, electric and electronic equipment, vehicles).

What about the Circular Economy beyond Europe?

China has set up CACE, a government-backed association to encourage circular growth, and an increasing number of initiatives are being developed in the US, where the clear business case for the circular economy is having an impact.

Civil society has been the real driver for the circular economy until recently. The Ellen MacArthur Foundation, the leading organisation behind the circular economy movement, counts companies such as Philips, Renault and Unilever as their Global Partners, pushing their businesses and supply chains towards the circular economic model. With such downstream companies championing the transition to a circular economic model, those within their supply chains will increasingly need to demonstrate they are complying.

The problem with data...

Minor metals are often used as alloying elements in steel, nickel, aluminium and others and they are often poorly reflected in the recycling rate figures of these metals. It is common for base metal recyclers to not include the percentage of any alloys in the metals they process. This means that reported recycling rates for minor metals can be much lower than what is recycled in reality.

How do minor metals fit in to the Circular Economy?

Minor metals are ideally suited to this shift in economic model:

- Many minor metals have recycling loops of high economic value. Examples where MMTA Members are leaders in their field include:
 - Rhenium and precious metal recovery from spent catalysts
 - Tantalum recovery from used capacitors
 - Indium metal recovery from ITO and sputtering production waste
 - Tungsten recovery from cemented carbide scrap
 - Recovery of molybdenum, tungsten and niobium from used sputtering targets
 - Recycling of cobalt and titanium based superalloys
- Metals are infinitely recyclable and can be used again and again
- Urban mines contain many high value metals, unlocking a new 'reserve'

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The aim of circular economy plans, in particular for metals, is to implement conditions across the metals value chain to secure cost-efficient access to secondary raw materials by region. Recycling would be prioritised, with the emphasis on recovery of valuable metals from recyclable waste and end-of-life products. The anticipated benefit of this would be job creation and economic growth resulting from support given to the recycling and downstream industries by government. In addition, recycling materials lowers environmental impacts and the energy intensity of materials' supply.

High volume metals, including aluminium, copper, nickel, zinc and lead, already have high recycling rates, but great potential remains for increased recycling of other metals, including minor metals and other critical raw materials. However, the industry still faces challenges at all stages of the metals value chain, from leakage of waste, to the continued lack of implementation of measures to reduce landfilling in some regions.

So isn't the circular economy just another way to describe recycling?

The circular economy is much more than recycling. A linear economy makes, uses and then disposes of materials. The circular economy looks at all the options across the chain to use as few resources as possible in the first place, keep resources in circulation for as long as possible, extract the maximum value from them while in use, then recover and regenerate products at the end of service life. This means designing products for longevity with reparability in mind, so that materials can be easily dismantled and recycled, not to mention the alternative business models that encompass trade-ins, sharing models and service packages.

What about primary production-won't we need mining anymore?

Even if 100% of metals used in the past were to be recycled, this would not meet the material requirements of today. This is due to increased population and demand for consumer goods. Also, due to the expected lifespan of metals in some applications, such as construction, aerospace and automotive, the metals used here cannot be expected to be recycled for at least 30+ years. There will continue to be a demand for primary production.

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