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ICEG Sustainability Lead

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Content

• Background – the issue
• Turning waste into wealth – the solution
The link between economic development and resource use is strong

Log plot of Resource use and Economic development (2010, 166 countries)¹


² OECD Development Centre, Working Paper No. 285, The Emerging Middle Class in Developing Countries
Un fortunately supply seem unlikely to catch up with our growth aspirations

Global supply and demand for constrained natural resources 1960-2050

Resource demand (business as usual)
Resource supply

Improved material management needed

Sources: Accenture analysis, Global Footprint Network
The supply/demand imbalance is bad news for business

GDP and commodity price development 1960-2014

1960-2000
+1% growth in GDP →
-0.2% commodity price index

2000-2014
+1% growth in GDP →
+1.5% commodity price index

Growth in cost of extracting different resources will impact business more than physical supply limitations...

Years left for selected major commodities

- Bauxite: 96 Reserves, 39 Sub-economic reserves, 135 total
- Black Coal: 60 Reserves, 37 Sub-economic reserves, 97 total
- Oil: 70 Reserves, 90 Sub-economic reserves, 160 total
- Iron ore: 45 Reserves, 40 Sub-economic reserves, 115 total
- Copper: 38 Reserves, 132 Sub-economic reserves, 135 total
- Lead: 84
- Nickel: 
- Zinc: 58

Rising energy & economic cost of extraction

Data: Mudd (2010), Resources Policy, Volume 35, Issue 2, June 2010, Pages 98–115
...but the likely strongest driver of disruption will be commodity price driven technological innovation

Example disruption: Urban mining

RECYCLING SCRAP VS DIGGING HOLES

1 TONNE of mobile phones yields 50–150 kg COPPER 3.7 kg
500–700 g SILVER 4.2 g
150–400 g GOLD 0.2 g

1 TONNE of gold ore yields

10 KILOGRAMS yield

10 TONNES yield

ONE GOLD RING

Source: Boliden, Future Exploration Network
Policymakers around the world are implementing programs to promote acceleration of the Circular Economy

**Selected policy examples**

**Policymakers around the world are taking action...**

**CHINA: Circular Economy Development Strategy and Immediate Plan of Action (2013)¹**

- **Goals:** by 2015 3R (Reduction, Reusing, Recycling) technologies widely applied; **Resource Productivity** increases at least by 15%; 70% of **wasted** products **recovered**; >72% of **industrial waste reused**
- **Results:** Energy consumption decreased by 13.3%, Water by 24.2% and Built-up Land Consumption by 22.4% per Unit of GDP; resource productivity increased more than 15%; recycling industry output is about 270b€

**EU: Circular economy package²**

- Boosting recycling
- Preventing loss of valuable materials
- New business models
- Zero waste

**Example: EU Targets to 2030⁴**

<table>
<thead>
<tr>
<th>Job creation</th>
<th>Economic value</th>
<th>Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>+580 000</td>
<td>+€600bn</td>
<td>-20% of material requirement 70-80% recycling</td>
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</table>

**JAPAN: Promotion of resource efficiency³**

- Law for Promotion of Effective Utilisation of Resources (1991) and Basic Law for Establishing a Material-cycling Society (2000)
- **2015 targets** were 3400 € of GDP per tonne of resources used (resource productivity); 14–15% for recycle rate; and 23 million tons for waste disposal revised for 2020 to 3700 € of GDP per tonne, 17% and 17 million tons respectively

**EUROPE: Successful Policy examples**

- **Germany:** ProgRess Programme, part of National Sustainable Development Strategy, targeting to double resource efficiency by 2020
- **Sweden:** Circular Economy Action Plan including financial incentives and promoting Green Public Procurement
- **Denmark:** Public Procurement as a Circular economy enabler leveraging on CE based partners
- **Netherlands:** Green Deal Programme setting the goals to accelerate the creation of a sustainable growth

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¹ China Development Path ² EU Commission ³ Indicators for a circular economy ⁴ EU Commission
Companies need to consider four types of wasted opportunities to go circular

**Waste of the linear economy**

**Wasted resources**
- Material and energy that cannot be continually regenerated
- Components, material and energy not recovered at disposal

**Wasted capacity**
- Underutilized or unused products and assets
- Premature end of working life of products

**Wasted embedded values**

**Wasted lifecycles**

**Wasted resources**
- Manufacturing
- Logistics
- Marketing & sales
- Product use
- Reverse logistics
- End of life disposal

By eliminating waste trillions of dollars of value can be created

The Circular Economy opportunity

**Substitute wasted resources**

Introduce renewable energy, fully recyclable and bio-based fuel, chemicals and materials

$1 700 billion

**Growth potential 2030**

$1 300 billion

Increase recycling, upcycling, component reuse and energy recovery

**Recover wasted embedded values**

**Monetize wasted capacity**

Increase sharing, co-owning, co-using, and resource pooling

$600 billion

**Lengthen wasted lifecycles**

Market lifecycle services for resell, maintain, repair, remanufacture and grow in used markets

$900 billion
Content

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The shift towards a circular value chain can lead to greater growth and a much reduced environmental footprint.

**Circular Value Chain – The evolution**

**From linear…**
- Low return & recycling rates
- Rocketing waste & externalities
- Transactional sell stuff philosophy and set-up
- Linear system not scalable within planetary boundaries

**…to circular…**
- Focus on full lifecycle resource productivity: design, manufacture, sell, retake, repurpose, resell
- Product end of life wastage is avoided with new business models & return chains monetized
- Decoupling of growth from resource consumption

**…creating opportunities**
- 7% GDP growth potential in EU in ‘circular’ market segments
- 75-85% reduced environmental footprint of products
- 600bln€ Cost saving opportunities in EU to 2030
- 72% Europeans willing to pay premium for sustainable products
Resource ‘cascades’ can be used to identify opportunities

Business models of the circular economy

5 key questions to move revenues from the core chain to cascades through circular business models

1. What are the potential actions per cascade?
2. What is the opportunity of combining actions to business models?
3. What is required to operationalise the new models?
4. What models to prioritize?
5. What steps to implement new models of choice?
Accenture and WEF YGL have studied 120 successful circular pioneers

Example companies studied

50 executive interviews  120 case studies  5 business models  5 capability shifts  10 enabling technologies
In our research we found five circular economy business models:

**Circular Supply-Chain**: Provide renewable energy, bio based- or fully recyclable input material to replace single-lifecycle inputs.

**Recovery & Recycling**: Recover useful resources / energy out of disposed products or by-products.

**Product Life-Extension**: Extend working lifecycle of products and components by repairing, upgrading and reselling.

**Sharing Platform**: Enable increased utilisation rate of products by making possible shared use / access / ownership.

**Product as a Service**: Offer product access and retain ownership to internalise benefits of circular resource productivity.

Source: Circular Economy book project
### Circular economy success stories (1/5)

<table>
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<tr>
<th><strong>Circular Supply-Chain:</strong> Provide renewable energy, bio based- or fully recyclable input material to replace single-lifecycle inputs</th>
<th><strong>Company</strong></th>
<th><strong>Examples</strong></th>
<th><strong>Impact</strong></th>
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<tbody>
<tr>
<td>DSM</td>
<td>Sustainable biofuels and bio-based materials, as the first chemical renewable building block derived from non-fossil feedstock. Application ranges from packaging to footwear</td>
<td>Project Liberty plant opened with $75m annual production value $100M grant from US Department of Energy Potentially 35-70k jobs created</td>
<td></td>
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<tr>
<th><strong>Recovery &amp; Recycling:</strong> Recover useful resources / energy out of disposed products or by-products</th>
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| **Product Life-Extension:** Extend working lifecycle of products and components by repairing, upgrading and reselling | **AeroFarms** | AeroFarms delivers aeroponic technology, which enables to grow plants indoors in an air or mist environment without the use of soil | Reduces use of water by 90% and the need of pesticides by 50%¹ An immediate addressable market of $1B |

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<th><strong>Sharing Platform:</strong> Enable increased utilisation rate of products by making possible shared use / access / ownership</th>
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| **Product as a Service:** Offer product access and retain ownership to internalise benefits of circular resource productivity | **ecovative** | Grows “Mushroom Materials” by combining agricultural byproducts with mushroom mycelium. Mycelium is a natural, self-assembling glue that digests crop waste | Signed a licensing deal with $7.5B packaging company Sealed Air Corp in 2012 According to CEO able to price 10-30% below traditional alternatives one it scales |

¹ Estimated from company data
## Circular economy success stories (2/5)

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<td>Landfill-free manufacturing facilities: GM first reduces waste and then focuses on recycling and reuse. The materials that GM can’t reuse, they convert to energy</td>
</tr>
<tr>
<td><strong>Impact</strong></td>
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<tr>
<td>$1bn in annual revenue by product recycling and reuse in GM <strong>152 landfill free facilities</strong> (52 non-manufacturing sites and 100 manufacturing sites)</td>
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<td>Reducing manufacturing waste sent to landfills and optimizing energy consumption</td>
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<td><strong>Impact</strong></td>
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<tr>
<td><strong>56% of P&amp;G global production sites</strong> have achieved zero manufacturing waste to landfill[^1]</td>
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<td>Possibility to give back discarded clothing, shoes or accessories such as belts or bags to the places where they were bought receiving vouchers</td>
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<td><strong>Impact</strong></td>
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<tr>
<td>**I:CO collects clothes in more than <strong>60 countries</strong>, offering more than <strong>8 million customers</strong> a month</td>
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[^1]: Estimated from company data
Success stories are becoming many

Circular economy success stories (3/5)

**Circular Supply-Chain:** Provide renewable energy, bio-based or fully recyclable input material to replace single-lifecycle inputs

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<td>CAT</td>
<td>Remanufacturing of industrial equipment; accepted components are converted into production material through advanced salvage techniques. Rejected parts are recycled.</td>
<td>$3bn turnover¹, 4000+ employees, 50% lower price, 60% less CO₂</td>
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<td>Apple</td>
<td>New service to recollect end-of-life products, invented Liam to disassemble iPhone6</td>
<td>Apple launched the Renew &amp; Recycle Program and the take-back initiatives in 2015 recollected more than 27,800 tons²</td>
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<td>Splosh</td>
<td>Customers buy bottles and concentrate detergents sachets to be mixed with water, then order concentrate refills which are delivered home.</td>
<td>The business model reduces CO₂ emissions from transport with up to 95%. Annual turnover is estimated £6.5 million or less³</td>
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Success stories are becoming many

Circular economy success stories (4/5)

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<td>Mosaic</td>
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Established **12,000** members within one year

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1 Estimated from company data
Success stories are becoming many

Circular economy success stories (5/5)

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**Company** | **Examples** | **Impact**
---|---|---
**PHILIPS** | Lighting as a Service: Philips manages the whole creation and implementation of a lightning solution or Philips guarantees only the maintenance and performance of the system | 13k lightings upgraded at 0 cost in WDC, **$2m per year** value split |
**MICHELIN** | By offering leasing instead of buying Michelin turns the case of re- and upcycling end of life tires upside down | Used tires are **100% recovered as secondary raw material** or as alternative energy |
**MUD JEANS** | Lease a Jeans: A deposit of €20 is made after which a monthly subscription fee of €5 per jeans is paid. The deposit creates an incentive to return the jeans after which it is recycled | **Certified**: Max Havelaar, Fair Trade; Global Organic Textile Standard; Business Social and many more |

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1 Estimated from company data
Three types of technologies are key

Circular economy enabling technologies

**Digital**
Enabling entirely new ways to access and understand product use-phase and aid customers in use efficiency

**Hybrid**
Enabling moving physical objects back and forth from value chains with digital services to drive down cost

**Engineering**
Enabling production and supply of new types of resources as well as new product designs to use them
Leading adopters build five critical business capabilities

1. **Strategy**
   Engage in circular ecosystems

2. **Innovation & product development**
   Design for many lifecycles and users

3. **Sourcing and manufacturing**
   Cascade resources

4. **Sales & product use**
   Excel in lifecycle customer engagement

5. **Return chains**
   Do opportunity driven take-back

Source: Circular Economy book project
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Our website