Typology of options for metal recycling: Australia’s perspective

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Presentation Overview

• Metals flows in the Australian economy
• Recycling value chain for end-of-life products
• Typology of options and the recycling/reuse value chain
• Concluding comments
Australian export of metal concentrates

Data source: Bureau of Resources and Energy Economics (BREE, 2014).
Estimation of true (final) metal consumption in Australia

Metal inputs and outputs in the Australian economy

**INPUT (consumption)**

12 Mt

- Buildings and infrastructure [45%]
- Vehicles [25%]
- Machinery, consumer products, other [30%]

**IN-USE STOCKS**

~300 Mt

- Buildings and infrastructure [50-70%]
- Vehicles [15-25%]
- Machinery, consumer products, other [15-25%]

**OUTPUT (scrap & losses)**

7 Mt

- Buildings and infrastructure [35%]
- Vehicles [30%]
- Machinery, consumer products, other [35%]

Recycling value chain for end-of-life (EoL) products

- **Collection** → **Separation** → **Smelting** → **Fabrication** → **New product**
- **EoL products** → **Metal scrap export** → **Refined metal/alloy export**
- **Product reuse and/or refurbishment**

**Value chain**

**Economic value**

- **negative/low** → **high**

**Downcycling ↔ Cycling → Upcycling**
# Recycling value chain for end-of-life (EoL) products

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Options</th>
<th>Point(s) of influence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Re-use and recycling route</td>
<td>Reuse, repair, refurbishment; Disassembly for parts/material streams; Bulk recycling</td>
<td>Product design, recycling technology</td>
</tr>
<tr>
<td>Recovery approach</td>
<td>Product centric; Material centric</td>
<td>Product design, recycling technology</td>
</tr>
<tr>
<td>Reuse channels</td>
<td>Formal/ regulated; Informant</td>
<td>Regulation, business model, public education</td>
</tr>
<tr>
<td>Regulatory regime for recycling</td>
<td>Voluntary; Co-regulation; Regulation</td>
<td>Regulation, stewardship programs</td>
</tr>
<tr>
<td>Infrastructure and collection system</td>
<td>Centralised collection; Special outlets for collection; Take-back schemes</td>
<td>Regulation, stewardship programs</td>
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<tr>
<td>Typical consumer behaviour</td>
<td>No interest in reuse and recycling (disposal); Giving away (for reuse); Centralised recycling (e.g. kerbside, self-delivery); Long-term storage of obsolete devices</td>
<td>Public education, regulation</td>
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<tr>
<td>Collection and recycling costs are covered by</td>
<td>Producer; Consumer; Recycling company; Government</td>
<td>Regulation, stewardship programs, public education</td>
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<tr>
<td>Relative recovery value</td>
<td>High; Medium; Low to zero; Negative</td>
<td>Product design, recycling technology</td>
</tr>
</tbody>
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Typology of options and the recycling/reuse value chain

- **EoL product**
  - **Long-term storage**
  - **Disposal**
  - **Aimed for recycling**
    - **Informal**
      - **Take-back schemes**
    - **Formal**
      - **Centralised collection**
        - **Self-delivery**
          - **Special outlets**
            - **Disassembly for parts**
              - **Reuse, repair, refurbishment**
                - **Product reuse**
          - **Take-back schemes**
            - **Material recovery**
  - **Aimed for reuse and recycling**
    - **Informal**
    - **Formal**
      - **Material recovery**
Progression in maturity towards a circular economy requires significant changes in main drivers for economy.

Such as environmental regulation; public awareness; business reputation; product design; and supply of secondary resources.

Other factors include national targets; regulation and policies across value chain; producer responsibility; existing infrastructure/technology; consumer behaviour; information availability; and recycling rates.