Industrial Ecology Forum:

*Shifting the Australian resources paradigm*

**Venue:** Museum of Contemporary Art, Sydney

**Time:** 10.30am – 4.00pm

(preceded by Circular Economy breakfast 8.00 for 8.30am – 10.00am)

**Organised by:** Wealth from Waste Cluster

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Industrial ecology forum: Shifting the Australian resources paradigm

By drawing on the knowledge and experience of a broad range of stakeholders, this forum will facilitate a pathway forward for greater levels of industrial ecology uptake and practices in Australia, which will deliver substantially higher levels of metals and minerals recycling.

Objectives

- Establish current status of industrial ecology and recycling in an Australian context
- Understanding from first-hand experiences of industry, government and research stakeholders the key issues for recycling and re-use of metals and minerals
- Elicit potential opportunities and enablers for greater uptake based on international leading and emerging practices

Why attend

- This is an opportunity to contribute and influence the research program of the Wealth from Waste Cluster project, a the major research initiative under the CSIRO Cluster and flagship programs
- To ensure your contributions are incorporated into the project, a second workshop will be held later in the year to update on progress and seek further input
- Your contribution will help support the planned paradigm shift in Australian recycling systems and subsequent higher levels of metals and minerals recycling

Agenda

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<th>Time</th>
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<td>10.30 – 10.40</td>
<td>Welcome – Research and Forum Aims</td>
<td>Glen Corder</td>
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<td>Part I. Circular economy and Australian national initiatives</td>
<td>Prof Saleem Ali – Director of the Centre for Social Responsibility in Mining, University of Queensland (via video)</td>
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<td>10.40 – 10.55</td>
<td>World Economic Forum Circular Economy</td>
<td>Prof Rod Eggert - Colorado School of Mines, USA</td>
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<td>10.55 – 11.15</td>
<td>International Perspectives on Recycling and Industrial Ecology</td>
<td>Bruce Edwards - Waste Policy Branch, Department of the Environment</td>
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<td>11.15 – 11.35</td>
<td>Australian national waste policy and stewardship initiatives</td>
<td>Group work – groups select one topic</td>
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<td></td>
<td>• How can Australia learn from global practices and initiatives?</td>
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<td>11.35 – 12.10</td>
<td>• What is the role of recycling and stewardship programs in modern economy: application to Australian context?</td>
<td>Group work</td>
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<td>12.10 – 12.40</td>
<td>Outcomes from group work</td>
<td>Groups report to forum</td>
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<td>12.40 – 12.50</td>
<td>Developing a feasible exemplar project</td>
<td>Glen Corder</td>
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<td>12.50 – 1.35</td>
<td>Lunch</td>
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<td>Part II. Recycling sector in Australia: innovations or business as usual?</td>
<td>Anna Minns – General Manager of TerraCycle</td>
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<td>1.35 – 1.55</td>
<td>New business models in recycling and upcycling</td>
<td>Rod Clare - Office of Environment and Heritage, NSW Department of Premier and Cabinet</td>
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<td>1.55 – 2.15</td>
<td>Industrial ecology and waste management at the state level</td>
<td>Luke Parker - Sell &amp; Parker</td>
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<td>2.15 – 2.35</td>
<td>Metal scrap collection and recycling in NSW</td>
<td>Group work</td>
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<td>• What are the practical responses to deliver industrial ecology at regional levels?</td>
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<td>2.35 – 3.15</td>
<td>• How can innovation drive better industrial ecology practices in Australia</td>
<td>Group work</td>
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<td>3.15 – 3.35</td>
<td>Outcomes from group work</td>
<td>Groups report to forum</td>
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<td>3.35 – 4.00</td>
<td>Shaping the pathway to shift the resources paradigm</td>
<td>Glen Corder &amp; Damien Giurco</td>
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Metal recycling for an export-oriented economy


Highlights
We estimated that:
- there is between five and six million tonnes of metal content in the waste streams in Australia a year,
- which could cover 60-70% of annual metal consumption within the country,
- with an estimated worth of more than A$5 billion if the metals are fully recovered.

As a result, the estimated potential for "wealth from (metal) waste" is A$2 billion a year.

The recycling or secondary production of metals helps to save significant amounts of energy required to produce metals from virgin ores, thus minimizing environmental impacts and supporting sustainable development through the efficient use of resources. The world demand for metals however is still mostly covered by primary production. In the export-oriented resources rich countries such as Australia, it is an ambiguous question how metal-recycling efforts can contribute to a greener economy allowing for continuing economic growth and preserving a country's natural resources. The closed loop economy model actively promoted in the European Union, Japan, and other countries presupposes predominantly cyclical use of metals within the system. It is however economically impractical to limit the system to the national or regional borders, and it should be justified and achievable at the global scale. This means that some countries still may need to play the role of net providers of primary (mined) material resources. However, it should not undermine the need for recycling and reuse of materials within the domestic borders.

The Australian economy has relied on mining for successive generations. The abundance of natural resources and the relatively low population has predetermined the role of Australian economy on the global market as a resources supplier. Metals and metal concentrates currently deliver the country's main export revenue (A$101.2 in 2012/13), followed by energy resources such as coal, natural gas and uranium (A$67.4). More than 90% of minerals mined in Australia are directly exported; for metals and metal concentrates this figure is close to 98%. In 2012-13, Australia exported more than 300 million tonnes of metallic content. Some metals are primarily exported as concentrates (e.g. iron ore, alumina, copper, zinc, lead, manganese), while others in the form of refined metals (e.g. nickel, gold, silver) or chemicals (e.g. titanium dioxide pigment). Additionally, more than 2 million tonnes of scrap were also shipped overseas.

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**Fig. 1.** Australian metals export revenue in 2012/13. Source: BREE, 2013.

The statistics on domestic consumption of metals (including imported products) is not accurate worldwide. It is not officially estimated in Australia; however we have assumed that it is in the range of 300 to 400 kg per
capita versus about 250 kg world average and about 400 kg in EU-27 countries and the USA (USGS, 2008, 2014). This gives a total metal consumption rate in Australia at about seven to nine million tonnes a year (2012/13), which is in agreement with the apparent metal consumption rate based on production and export-import flows (BREE, 2013).

Based on reports from UNEP and USGS we have estimated that the annual waste metal generation level could account for 60-70% of the current consumption (taking into account the average period of metal use within the economy, metal consumption and population growth over the last few decades). For Australia, this results in 200-250 kg per person or five to six million tonnes in total of metals in the waste streams a year. This figure is close to data derived from national waste reporting (DSEWPAC, 2012, 2014).

Fig. 2 (a, b). Metals in waste streams in Australia (2012/13). Source: Authors estimation.

Fig. 3. World estimates for end-of-life recycling rates (EoL-RR). Source: UNEP, 2011.
References


The Status of Industrial Ecology in Australia: barriers and enablers


Over the last 15 years, the concept of industrial ecology has been applied in Australia at different levels – from small to medium enterprise-focused waste exchange networks to heavy industrial areas – with varying degree of success. Undoubtedly, it is now a well-recognised approach to increase resource efficiency and minimise environmental impacts associated with industrial and consumer activities. The country's unique geographic location as a continent, with long distances between major cities and industrial centres in regional areas, being the major challenge, also shapes the opportunities to enhance the application of industrial ecology.

The history of applying the concept of industrial ecology in Australia is closely related to cleaner production techniques, eco-efficiency and waste management practices. The combined efforts of the state and federal government, industry associations, academic institutions and environmental organizations in mid-1990s resulted in the successful demonstration of these approaches to minimize environmental impacts arising from industrial activities within different sectors, and in recommending the development of national guidelines for companies based on this experience (Dames&Moore, 1997; Dempster et al., 1997; ANZEC, 1998). Further application and promotion of industrial ecology approaches has been attributed to several initiatives supported by the Australian government, such as Green Stamp Program, Centre for Sustainable Resource Processing, and others (van Beers, 2007; van Berkel, 2007).

More recently, the 2013 New South Wales (NSW) Government Waste and Resource Recovery Initiative has recognised the potential of industrial ecology by prioritising the establishment of four industrial ecology networks as part of its Business Recycling Program (NSW Govt, 2013). This industrial ecology initiative is driven from the success of the NSW Sustainability Advantage program, which supports businesses to reduce risk and cost by reducing their environmental impact. This includes identifying and implementing industrial symbiosis opportunities. The program has resulted in 530 businesses reducing costs by $75 million a year due to reductions of energy, water, waste and raw materials (NSW Govt, 2013). The support of industrial ecology or symbiosis within government marks a strategic turning point in waste management, recognizing waste as a potential resource. It supports both environmental goals to reduce waste to landfill and industry goals to improve resource efficiency and competitiveness.

Most of the Australian examples of industrial ecology initiatives were implemented with the local and state government support (in different forms), while there are very few projects that have been developed and have succeeded solely on the basis of industry interest and funding. With a focus on technical feasibility and establishing inter-industry collaboration in the existing cases, there are still other barriers preventing waste and by-product exchanges from happening. The economic driver usually predetermines the investigation for waste reuse options, with environmental regulation being another important factor to stimulate or prevent any interest in establishing synergy connections.

Answers to the following questions could greatly help enhancing industrial ecology applications in Australia:

- How would better information availability, including detailed reporting on economic and environmental achievements from implementing synergy projects assist uptake of industrial ecology applications?
- Would recognition and active promotion of national champions in industrial ecology, for advertising and sharing best practices and experience increase uptake?
- What further improvements in the environmental regulation could contribute and encourage the adoption of best-known technologies and waste reuse projects?
- Would defining of long term targets for waste reuse and recycling, supported by the development of specific projects drive better industrial ecology outcomes?
- Could sharing of common failures and successful factors between local and State government efforts across Australia expand the collective knowledge base and increase support and acceptance of industrial ecology applications?
References


