**Illawarra Shoalhaven Joint Organisation** 

# **Circular Economy Investigation Consolidated Report**

Edge April 2023



#### **Executive Summary**

The Illawarra Shoalhaven Joint Organisation engaged Edge to undertake a circular economy investigation of the region to develop the local circular economy and identify opportunities to keep products and materials in the productive economy. The overarching aim of this work is to identify three to five short and medium-term opportunities able to be implemented within the next five years that harness the economic, social and environmental benefits of a circular economy.

Opportunities were identified, prioritised and analysed through a sequential and iterative methodology including a material flow analysis; desktop research; ideation; and stakeholder engagement; and detailed analysis comprised of cost-benefit analysis, carbon footprint, and multi-criteria analysis.

The primary opportunities explored throughout include:

- A platform for recirculating materials in the region
- Localised circular procurement with councils
- Circular Economy Collaborative Model

- Elevating Circular Outcomes for Commercial and Industrial Food Organics
- Circular Textiles Hub
- Circular E-product Hub
- Elevating Circular Outcomes for Timber and Garden
   Organics
- Expanding Circular Outcomes for Plastics

This report provides a high-level summary of the feasibility of these opportunities based on material circularity, economic, environmental and social criteria. Insights and recommendations for implementation are also provided. Based on the results, three enabling and three technical opportunities are recommended for further development. A summary of the materials retained in the productive economy and recommended opportunities can be found on the following pages.



## **Summary of Opportunities**

Opportunity Type	Opportunity	Description
Enabling	A platform for recirculating materials in the region e.g., ASPIRE platform	Identified early in the project as a key enabling opportunity to support the recirculating of materials and enhance end markets. Endorsed by the Illawarra-Shoalhaven Joint Organisation as an initiative of interest within their influence.
	Localised circular procurement with member councils	Identified early in the project as a key enabling opportunity to influence end markets. Endorsed by the Illawarra-Shoalhaven Joint Organisation as an initiative of interest within their influence.
	Circular Economy Collaborative Model e.g., a working group	A key enabling opportunity to drive coordinated and integrated actions for the region. Prioritised by local and state government, and research institutions as an opportunity of interest during the workshop.
Elevating	Elevating Circular Outcomes for Commercial And Industrial Food Organics	Improve the outcomes for food organics from small- and medium-sized businesses through (i) a campaign for businesses to address knowledge and attitude challenges, and (ii) trialing on-site processing of food waste to remove the need for collections in the first instance and create a high-value output that is differentiated from the outputs of existing processors in the region. The component modelled focuses on the latter initiative.
Elevating	Circular Textiles Hub	Improve the outcomes for textiles from households and businesses through a range of repair / upcycling, resale, and sorting activities clustered around a Circular Textiles Hub. The component modelled aims to increase the value and outcomes of residual textiles waste by technology-assisted sorting into segregated material streams. The initiative looks at exporting the higher-value segregated streams in the medium-term while there is no on-shore processing of waste textiles, with the scope to consider local markets for further processing if they emerge.
Elevating	Circular E-product Hub	Improve the outcomes for e-products from households and businesses through a range of activities including communications, repair, refurbishment, resale, and recycling of component materials to establish the Illawarra-Shoalhaven as a circular hub for e-products. The component modelled focuses on extending the life of a growing segment of e-waste, whitegoods, through refurbishment and subsidised resale to social groups in need to complement existing social enterprises who provided refurbished small appliances to such groups.
Elevating	Elevating Circular Outcomes for Timber and Garden Organics	Improve the outcomes for timber and garden organics through a range of activities across communication, business-to-business trading of reusable timber, local government procurement of products containing recycled organics, and production of biochar to complement existing organics recycling options in the region. The component modelled focuses on partnering with the ANZ Biochar Industry Group to explore overcoming regulatory barriers for developing a small-scale biochar production facility in the region given the significant environmental benefits of the solution.
Expanding	Expanding Circular Outcomes for Plastics	Improve the outcomes for plastics and align with the NSW Plastics Action Plan's goal of tripling recycling rates by 2030 through a range of activities across communications; business-to-business trading of reusable plastics, and local government procurement of products containing recycled plastics (connecting with the enabling opportunities listed above), and recycling. The initiative modelled focusses on a chemical recycling technology targeting hard-to-manage plastic wastes including mixed plastics, agricultural plastics, pallet wrap, and potentially residual plastics from current and planned facilities in the region.

#### Glossary

Abbreviation	Working Definition
СВА	Cost-Benefit Analysis
CE	Circular Economy
C&D	Construction and demolition
C&I	Commercial and industrial
EPA	Environmental Protection Authority
ISJO	Illawarra Shoalhaven Joint Organisation
MCA	Multi-Criteria Analysis
MFA	Material Flow Analysis
MSW	Municipal solid waste
NSW	New South Wales
R&D	Research and development
Term	Working Definition
Cost-Benefit Ratio	An indicator to summarise the overall value for money of the initiative based on the ratio of the benefits.
Net Present Value (NPV)	An indicator of the current value of a future stream of payments presented as the difference between the costs and benefits over the evaluation period.
Present Value (PV)	An indicator of the current value of a future stream of payments.



#### Contents

Section	Page
Background	6
Project Approach	15
Material Flows	19



# Background

#### **Circular Economy Background**

Circular economy is a framework to use and manage materials required to meet the needs of society in such a way that does not deplete finite resources, retains value in closed-loop systems, and regenerates degraded ecological systems. To achieve this, the circular economy framework provides the following three guiding principles:<sup>1</sup>

- 1. Design out waste and pollution.
- 2. Keep materials in use.
- 3. Regenerate natural systems

From a waste management focus, the transition to a circular economy is driven by surmounting waste management costs; negative environmental impacts such as from litter or unsophisticated waste processing facilities offshore; domestic landfills reaching capacity; changing regulations such as waste export bans, bans of specific materials to landfill, or new product stewardship schemes; and volatility associated with relying on overseas supply chains for products, and materials processing.

Transitioning to a circular economy presents a suite of economic, environmental, and social benefits including:

- Estimated economic benefit of \$69 billion to Gross Domestic Product by 2048 in New South Wales (NSW),<sup>2</sup> by implementing circular economy initiatives across the food, transport and built environment sectors alone.
- Job creation of up to 50,000 jobs in NSW by 2025 as the circular economy expands across the industries of built environment, transport, manufacturing, and recycling.<sup>2</sup>
- Greenhouse gas emissions reduction with a study in South Australia indicating that a circular economy could reduce greenhouse gas emissions by 27% or 7.7 million tonnes of CO<sub>2</sub> equivalent by 2030 through materials efficiency, energy efficiency and renewable energy initiatives in comparison with a 'business as usual' scenario.<sup>3</sup> Similar benefits are expected for NSW, scaled to context.



7 1. Ellen Macarthur Foundation, <u>What is circular economy?</u>

#### **Circular Economy Background**

Prioritising the reuse of materials and maintaining the highest order value is an important consideration within the circular economy and should be applied upstream and downstream across the value chain.

The R-strategies (pictured)<sup>1</sup> provide a valuable framework for assigning and understanding the comparative value of resource management activities.

Each of the opportunities within this project has been assigned an R-strategy to provide context on the type of opportunity that it is, and where it sits in the scale of a circular economy.



#### **Project Background**

The Illawarra Shoalhaven Joint Organisation (ISJO) and its four member councils (Wollongong, Shellharbour, Kiama, and Shoalhaven) represent a region on the South Coast of New South Wales (NSW) with a growing population, innovative economy, and diverse transport infrastructure. The region has a strong industrial, as well as a strong service base across tourism, healthcare, and defence. The region is also an emerging centre for innovation and technologies including seaweed production, green steel and green hydrogen, and biogenic gas.

As the region continues to grow, the ISJO is seeking to develop the local circular economy and support opportunities to keep products and materials in the productive economy. This action is well timed with announcements in late 2022 from the Minister for the Environment and Water on transitioning Australia to a circular economy by 2030, and the appointment of the Circular Economy Ministerial Advisory Group in early 2023.

The ISJO has supported the transition by undertaking this strategic study to demonstrate the high-level costs and benefits of the opportunity for the region. The ISJO's ongoing role, as well as that of other stakeholders, is highlighted throughout this report

The overarching aim of this project is to **identify three to five short and medium-term opportunities** that:

- Harness the economic, social and environmental benefits of a circular economy
- Meet regulatory requirements
- Can be implemented within the next five years,
- Meet key project outcomes including value retention of materials; leadership opportunities in circular economy solutions; and diversion of targeted materials from landfill, and
- Align with strategic priorities for the region including waste reduction; a resilient and diverse economy with an emphasis on growth; decarbonisation; and sustainable resource management.



#### **Project Background**

This report outlines key opportunities, benefits and recommendations for implementation including overarching viability. In the context of evolving industries, infrastructure and legislation, the viability of opportunities is subject to change. As such, the landscape relating to these opportunities should be monitored and the information should be reviewed prior to implementation.

The majority of the opportunities focus on recycling, with an exception of one focusing on repair and refurbishment. This has evolved from identified opportunities that were prioritised during stakeholder engagement and modelled accordingly based on the methodology. To support a truly circular economy at a regional level, the recommendation section includes enabling elements that can be actioned by a range of stakeholders to boost higher-order outcomes.

The figures presented from the MFA are subject to limitations including data reliability, integrity and availability for Commercial & Industrial (C&I) and Construction & Demolition

(C&D) waste. As a result, the data was generated using state and national data overlayed with assumptions to downscale the data to a regional level. This provides an estimate of waste tonnages and end-of-use management as an indicator for decision-making.



#### **Summary of Opportunities**

**The opportunities presented** have been the result of detailed research, stakeholder engagement, and industry knowledge. The stakeholder engagement in particularly has played an important role in informing and prioritising opportunities. The opportunities to elevate circularity in the region, as presented on the following two pages, are categorised as:

- Enabling opportunities that play a pivotal role in driving regional change and can be driven by the Illawarra Shoalhaven Joint Organisation, and
- Expanding and elevating opportunities that address key material challenges and opportunities for the region to improve outcomes.

The opportunities put forward in this study were informed by a workshop that Edge conducted on 21<sup>st</sup> October 2022 with councils, ISJO, state government representatives and researchers to explore the feasibility, viability, and desirability of pre-identified opportunities. The workshop provided broad insights including a clear call for action and appetite for change, and an acknowledged need for engagement from multiple stakeholders to activate change.

It is important to note that the workshop included representatives from local government, state government and research institutions. Part of the evolvement of these opportunities post-workshop has included capturing insights from the workshop, as well as consideration of industrial stakeholders that were not represented in prioritising opportunities but play a key role in material outcomes.



## **Enabling Opportunities**

Opportunity	Rationale
A platform for recirculating materials in the region e.g., ASPIRE platform	Identified early in the project as a key enabling opportunity to support the recirculating of materials and enhance end markets. Endorsed by the Illawarra-Shoalhaven Joint Organisation as an initiative of interest within their influence.
Localised circular procurement with member councils	Identified early in the project as a key enabling opportunity to influence end markets. Endorsed by the Illawarra- Shoalhaven Joint Organisation as an initiative of interest within their influence.
<b>Circular Economy Collaborative Model</b> e.g., a working group	A key enabling opportunity to drive coordinated and integrated actions for the region. Prioritised by local and state government, and research institutions as an opportunity of interest during the workshop.



## **Expanding and Elevating Opportunities**

Opportunity	Rationale
Elevating Circular Outcomes for Commercial And Industrial Food Organics	<ul> <li>There is an estimated 48,000 tonnes of food organics generated in the region, with approximately 38% being recovered. However, on the whole, the recovery rate is estimated to be much lower for businesses (excluding construction) in the region.</li> <li>There are significant barriers for commercial operators and small- and medium-sized businesses to capture organics including cost of collections, lack of regulatory drivers, and lack of know-how and interest.</li> <li>There is a latent processing capacity of up to 39,000 tonnes per annum for organics in the region, across two processors (SoilCo and Re.Grow). The NSW Waste and Sustainable Materials Strategy flagged that new FOGO processing capacity and minor food only processing capacity is required for the Illawarra Shoalhaven region to meet forecasted 2030 waste volumes.</li> <li>Upcoming legislation changes mandating food waste collections by 2025 from businesses generating high volumes (e.g., supermarkets and hospitality), may also improve access for smaller businesses through economies of scale.</li> <li>The focus of this opportunity is to improve the outcomes for food organics from small- and medium-sized businesses through (i) a campaign for businesses to address knowledge and attitude challenges, and (ii) trialing on-site processing of food waste to remove the need for collections in the first instance and create a high-value output that is differentiated from the outputs of existing processors in the region.</li> </ul>
Circular Textiles Hub	<ul> <li>Around 90% of textiles waste in the region is landfilled (it's one of the key materials behind organics, paper &amp; cardboard, and plastics in councils' residual waste streams and a contaminant appearing in recycling streams).</li> <li>Current circular options are focused on reusable clothing, such as resale through the Charitable Recyclers Network, user-to-user marketplaces, or small upcycling businesses.</li> <li>There are limited collection options for unwearable clothing and residual textiles: they are not captured through Community Recycling Centres except for Shoalhaven Council's existing partnership with DLG Australia, and few retailers offer a take-back scheme.</li> <li>Issues with landfilling of exported mixed residual textiles waste have received media attention of late.</li> <li>Federal government is focused on improving circular outcomes for textiles with a starting focus on clothing through a national product stewardship scheme.</li> <li>The modelled opportunity covers a focus on increasing the value of residual textiles waste by local sorting into segregated material streams is likely to improve the outcomes for a waste stream with little options for higher value retention activities. The initiative looks at exporting the higher-value segregated streams in the medium-term while there is limited on-shore processing of waste textiles, with the scope to consider local markets for further processing if and when they emerge.</li> </ul>

## **Expanding and Elevating Opportunities**

Opportunity	Rationale
Circular E-product Hub	<ul> <li>E-waste is a growing problem in Australia, with notable increasing volumes of solar PV and batteries, large household appliances, and temperature exchange equipment forecasted for Australia.</li> <li>While there is limited visibility on total e-waste in the region, there is an estimated over 3,300 tonnes of mostly small electronics and peripherals from households, with approximately 40% being recycled.</li> <li>E-waste contains a mixture of high and low value materials, sometimes in large quantities (such as metals in whitegoods).</li> <li>There are unique challenges and opportunities in improving circular outcomes for e-products due to the diverse and complex nature of the products, variations in their potential for product life extensions, and other aspects like data privacy, environmental and health risks of mismanagement, and logistics.</li> <li>There are e-waste recycling schemes in place for some e-products (TVs, computers, phones, etc.) but limited options for other products such as white goods.</li> <li>Australia is set to harmonise disposal guidelines for e-waste, with some states already having banned e-waste from landfill (not currently including NSW).</li> <li>The NSW Waste and Sustainable Materials Strategy flagged that new facilities are needed to manage e-waste across NSW, including facilities for repair and reuse, sorting and recycling, and downstream processing of materials.</li> <li>The initiative modelled focuses on elevating current white goods recycling options in the region and moving outcomes further up the R-ladder to extend the life of products, and support social outcomes.</li> </ul>
Elevating Circular Outcomes for Timber and Garden Organics	<ul> <li>Approximately 33,000 tonnes of timber and garden organics from the region are sent to landfill each year (30% of overall generation), predominantly from households (33%), construction (27%), SMEs (8%) and manufacturing (7%).</li> <li>There is a latent processing capacity of up to 39,000 tonnes per annum for organics in the region, across two composting facilities (SoilCo and Re.Grow).</li> <li>Biochar is a complementary and emerging organics management solution in Australia which can provide significant environmental benefits across carbon sequestration, improving soil health and water retention when applied to land. Biochar can provide operational efficiencies applied in other settings, such as water treatment and to speed up processing times in composting.</li> <li>Currently there are regulatory challenges to producing biochar (under the NSW EPA Energy From Waste Policy Statement) and in applying biochar to land in NSW (there is no Resource Recovery Order/Exemption), however applications for an exemption are invited.</li> <li>To overcome these, the modelled initiative includes initially partnering with the ANZ Biochar Industry Group to further investigate challenges in biochar production and use, and advocate for an update to regulations given the significant environmental benefits of the solution. To provide evidence to support advocacy efforts, this study undertook an analysis of the environmental and economic costs and benefits of a small-scale biochar production facility.</li> </ul>
Expanding Circular Outcomes for Plastics	<ul> <li>An estimated 34,000 tonnes of plastics is generated in the region with around 80% going to landfill across households, C&amp;I and C&amp;D, comparable to national outcomes.</li> <li>The NSW Waste and Sustainable Materials Strategy has set improving the outcomes for plastics as a priority, with the NSW Plastics Action Plan including a target to triple the plastics recycling rate by 2030.</li> <li>To meet these strategic goals, an infrastructure capacity shortfall have been noted for NSW. However, it is unclear if this factored in a 200,000 tonne per annum chemical processing facility opening in Parkes Special Activation Precinct within the next 2 years.</li> <li>The Illawarra-Shoalhaven is already expanding its plastics focus with a mechanical sorting and reprocessing facility for PET, HDPE and LDPE planned as part of Shoalhaven's recovery precinct expansion.</li> <li>Chemical recycling technologies are known to be capital intensive and require significant scale to achieve commercial viability. However, to provide a local solution for harder to manage plastic wastes such as mixed plastics, pallet wrap waste, and agricultural plastics; the environmental and economic costs and benefits of a medium-scale chemical recycling facility were modelled in this study in order to provide a contextual evidence base for any further investigations.</li> </ul>





Stage	Objective/s	Activities
1a. Material flows review	Gain visibility over the key materials being wasted in the region, their flow pathways, and the stakeholders controlling the materials at different stages of the material flows.	<ul> <li>Desktop research to explore economy and industries in the region, and strategic priorities.</li> <li>Stakeholder engagement with strategic conversations to understand key material flows in the region.</li> <li>Material Flow Analysis based on ISJO and member council's data to explore waste volumes generated in the region; material types and volumes; and waste flows. Supplementary data sets sourced to cover data gaps (see Appendix A).</li> <li>Shortlist of key materials to focus on based on key project outcomes i.e., value retention, diversion from landfill, and leadership.</li> </ul>
1b. High-level opportunities assessment	Develop a long list of potentially feasible opportunities that could be implemented in the Illawarra Shoalhaven in the short and medium term. Stimulate local dialogue among, and gain insights from, a range of stakeholders on circular economy initiatives and opportunities.	<ul> <li>Desktop research exploring domestic and international case studies and best practice.</li> <li>Stakeholder engagement with industry, government, and academia in relation to opportunities and technologies (see Appendix B). High-level stakeholder map of key stakeholders with level of influence and interest.</li> <li>Consolidate a short-list of identified circular economy opportunities with high potential feasibility and/or stakeholder interest.</li> </ul>



Stage	Objective	Activities
2. Prioritisation stakeholder workshop	Prioritise six circular economy opportunities specific to the Illawarra Shoalhaven region with stakeholder input. Stimulate local dialogue among, and gain insights from, a range of stakeholders on circular economy initiatives and opportunities.	• <b>Workshop</b> with key stakeholders (Appendix B) to compare, prioritise, and align on shortlisted opportunities to be put forward for more detailed assessment.
3. Detailed opportunities assessment	Develop a detailed overview of economic, social, and environmental costs and benefits for expanding and elevating opportunities. Provide a view of how each opportunity compares to others to determine the most promising three opportunities.	<ul> <li>High-level cost-benefit analysis (Appendix C) on prioritise opportunities (not including Circular Economy Collaborative Model).</li> <li>High-level carbon footprint modelling (Appendix D) on prioritised opportunities (not including Circular Economy Collaborative Model).</li> <li>Further research and engagement as required to provide inputs needed for modelling.</li> <li>Multi-criteria analysis to evaluate opportunities (Appendix E).</li> </ul>
4. Recommendations	Provide the ISJO with a recommended set of viable and actionable circular economy opportunities that can be implemented in the region within the next one to five years.	<ul> <li>Present findings and recommendations from previous phases, including a shortlist of three opportunities. Noting that these opportunities will be the subject of further implementation efforts in 'Stage 2' from 2023.</li> </ul>



# **Material Flows**

#### Evidence based approach to opportunity identification

This project adopted a bottom-up evidence-based approach to identifying circular economy opportunities for the region. As such, a material flow analysis was conducted for the Illawarra Shoalhaven region to understand the key materials being wasted in the region, and where possible, their flow pathways, and the stakeholders controlling the materials at different stages of the material flows. This, combined with the desktop research and stakeholder consultation, provided the evidence for identifying key opportunities for the region to increase circularity. The material flow analysis covered waste flows in the Illawarra Shoalhaven region from the consumption stage to the end-of-use management stage of the lifecycle. It covered council managed wastes, commercial and industrial waste, and waste from construction and demolition activities. A range of primary and reference data sources were used. Further details of the methodology, scope, data source assessment, and assumptions are provided in Appendix A.



#### MATERIAL FLOWS

#### System overview of wastes generated in the Illawarra Shoalhaven

The system flow diagram to the right shows an overview of wastes generated in the Illawarra-Shoalhaven region, across household. commercial and industrial, and construction and demolition waste The diagram presents estimated tonnages by waste generating sector, material, and waste management outcome.



#### MATERIAL FLOWS

#### Waste materials generated in the Illawarra-Shoalhaven (MSW, C&I & C&D)

The figures below show the estimated volumes and sources of waste materials generated in the Illawarra-Shoalhaven region, across MSW, C&I, and C&D.





#### Focus waste materials generated in the Illawarra-Shoalhaven to landfill (MSW, C&I & C&D)

The figures below show the estimated volumes and sources of waste materials to landfill that would be covered under the circular economy opportunities explored and analysed in this study. The Opportunities section provides a deeper dive on the material flows for the relevant focus materials.



334.10K

#### MATERIAL FLOWS

# Materials retained in the productive economy

The system flow diagram to the right shows an overview of wastes generated in the Illawarra-Shoalhaven region, across household, commercial and industrial, and construction and demolition waste that are retained in the economy through reuse or recycling. The diagram presents estimated tonnages by material and the sector that is undertaking reuse or recycling.





Christian Keel, Head of Circular Economy and Lifecycle Thinking Phone: 0405 755 472 Jess Braun, Senior Circular Economy Consultant Phone: 0422 992 199

# DGE

Sydney | Melbourne | Adelaide | Auckland | Boston | Santiago edgeenvironment.com

