

National Environmental Science Program

SCaW Hub research plan 2024
Attachment B project plans - IP5



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Project IP5.04 – Waste Impact Management Research

Preamble

This document lays out Research Plan 2024 (RP2024) for impact priority 5 (IP5) Waste Impact Management Research. It builds on Research Plan 2022 (RP2022) which consisted of four key projects three of which were planned over multiple years. For this reason, IP5 did not submit a research plan for 2023.

RP2024 presents three projects. One is a new project on metrics, data and indicators and two are variations to multi-year project from RP2022 which require adjustment to reflect research progress and changing circumstances.

Project type:	
<ul style="list-style-type: none"> • Hub research project 	
Project status:	
<ul style="list-style-type: none"> • New project submitted for approval and existing projects requiring amendment to scope and budget 	
Cross-cutting initiative:	No, but there is potential for IP5.04.02 and IP5.04.03 to become part of a cross-Hub initiative in future.
Project start date: 01/04/2022	Project end date: 30/06/2027
Project leader details:	Name: Dr Heinz Schandl, Dr Stefan Kaufman Organisation: Commonwealth Scientific and Industrial Research Organisation, Monash University Sustainable Development Institute

Project description

Project summary

Within the Sustainable Communities and Waste (SCaW) Hub, the theme called Impact Priority 5 Waste Impact Management (IP5) applies both qualitative and quantitative research focusing on research-user application for waste management, resource recovery and of circular economy and waste policy implementation.

RP2024 aims to address five important aspects of waste impact management research:

- To provide information, data and management tools
- To inform design for repurposing waste and circular economy focussing on business models and enabling conditions
- To inform the institutional and governance needs of community-based resource recovery and circular economy initiatives
- To identify waste management and resource recovery opportunities for Indigenous communities
- To create an evidence-base for decision makers based on novel science contributions and informing solutions for problems of national significance.

In RP2024, the IP5 proposal contains three projects:

- Project IP5.04.01: Metrics, data and indicators for material flow and stocks, waste and emissions to monitor progress of Australia's circular economy transition.
- Project IP5.02.03 Governing community-based waste management and resource recovery and circular economy initiatives.
- Project IP5.02.04 Identifying opportunities from waste management and resource recovery and the circular economy for Indigenous communities and Indigenous businesses.

These projects each span three years to create continuity necessary for high quality research outputs and the desired outcomes and impacts. The projects will provide novel information about the state of circularity and resource recovery in Australia, identifying priorities and opportunities in different material supply chains. It will also develop guidance on the governance of a community based circular economy with examples for communities in Victoria and Tasmania, and with indigenous communities and businesses in Western Australia.

Design of the projects was informed by broad co-design with a range of research-users within and external to the Department and research achievement of RP2021 and RP2022 (ongoing).

Project description

RP2024 for the waste impact management research builds on the achievements of RP2022 and RP2023. Over the last 2 years significant research progress has been achieved on which RP2024 can now build to scale-up and scale-out activities in the domains of metrics, data and indicators, regional circular economy governance models and their application at council scale and research collaboration with Indigenous communities and businesses.

Each project

- describes the problem that it will address and has been identified in close collaboration with prospective research contributors and research-users

- outlines the science response and the outcomes and impacts of the research
- reflects on the science and national dividend of the research
- identifies linkages with research in other impact priority areas of the SCaW Hub.

Project IP5.04.01: Metrics, data and indicators for material flow and stocks, waste and emissions to monitor progress of Australia's circular economy transition

This is a new project to build on the work undertaken under IP5.02.01.

The problem

Australia's environment ministers met in Brisbane in October 2020 and committed to work with the private sector to design out waste and pollution, keep materials in use and foster markets to achieve a circular economy by 2030. Subsequently, the Australian Minister for the Environment and Water has established a circular economy ministerial advisory group who, as one of its priorities will advise the Minister on **effective measurement and communication about progress towards Australia's circular economy**. Despite this articulated need for metrics, data and indicators to measure and monitor progress of Australia's circular economy transition, the Government lacks a good understanding of Australia's material and waste flows within our borders and in global supply chains. In this regard we are falling behind the success of measuring the circular economy in the European Union, Japan and China among others. This is despite Australia's competitive strong research and development ecosystem with Australia's universities and research institutes actively engaged in advancing the global knowledgebase of measuring progress of the circular economy. The CSIRO, University of Sydney and UNSW have been world leading for more than a decade in this area of research but this has not resulted in commensurate research activity for Australian policy makers.

Our response

Building on foundational work on material flows for the Department of Environment (Schandl et al. 2018) and a study to implement an update of Australia's material flows for the year 2019 including an assessment of Australia's circularity (Miatto et al. 2023) in the context of this research Hub (project IP5.02.01), we will further improve Australia's knowledgebase for measuring progress of circular economy at the national, State and territory and industry and product level. This will include investigating opportunities for growing Australia's circularity potential and achievement.

Activities and research methodology

This project will employ the most up-to-date international methodologies and analytical tools for the assessment of Australia's material and waste flows. This includes full alignment with the UNEP, OECD and EUROSTAT methods handbook (UNEP, 2021) which has been drafted by a global consortium under the leadership of the CSIRO. It is fully compatible with the System of Environmental Economic Accounting (SEEA) framework and therefore also complementary to the system of economic accounts. We also employ the most advanced and most detailed global multi-regional input-output database GLORIA (Lenzen et al. 2022) and a highly detailed Australian input-output table which is nested in the GLORIA framework. This arrangement allows investigation of domestic and global material supply chains across their whole life cycle, from source to sink and to calculate production and consumption-based indicators of material use, waste and emissions in one analytical framework. We will use Australian and global datasets for materials extraction, trade of materials and consumer goods, waste and emissions and calculate indicators according to globally agreed

methodology. The analytical capacity of our research frameworks will allow us to push the cutting edge of the current understanding of measuring circularity and hence improve the knowledgebase for policy making and monitoring and evaluation of policy efficacy, efficiency and effectiveness.

Outputs

This project will produce yearly reports on Australia's material flows, waste and recycling including a detailed dataset. It will extend the current accounts initially to a time series 2010 – 2024 establishing a baseline for Australia's per capita material use (SDG 12.2), resource productivity (SDG 8.4) and circularity. It aims for a high-level of data granularity to address the policy needs of the Department and address the whole spectre of circular economy opportunities that exist across material supply chains. It will look at direct and embodied flows (i.e., footprints) to assess volumes managed in Australia and within Australia's international supply chains. The level of data detail will depend on data availability and will be reviewed and agreed on with the Department.

- The 2025 report will include a time series of data and indicators for the 2010 – 2024 period to establish a baseline of Australia's performance in sustainable materials management, resource efficiency and circular economy. The baseline can inform future policy ambition and potentially establishing targets for key indicators.
- The 2026 report will align the assessment of Australia's material flows with the associated environmental impacts of climate change, biodiversity loss, resource depletion and pollution. This can be linked to different policy domains and the connections with the planetary boundaries framework and indicators will be discussed.
- The 2027 report will include an outlook for Australia's material flows, waste and circularity to 2050 for two scenarios – a baseline scenario based on current policies and an ambitious policy scenario developed with input of the Department.

The specifics of each yearly report can be further framed by input from the Department, and other stakeholders and thematic extensions can be considered pending additional funding. The project team will engage with the Australian Bureau of Statistics (ABS) to ensure complementarity of work programs and adding value to the ABS data sets.

Outcome and impact

The recent report developed under IP5.02.01 on material flows, waste and circularity (Miatto et al. 2023) presented an initial assessment of resource efficiency and circularity for the Australian economy. The availability of a yearly comprehensive report of material flows, waste (and emissions) and circularity will inform the policy process in Australia and will position Australia well internationally in several processes and for specific reporting initiatives.

- Australian environmental (Federal and State and Territories) policy makers will have metrics data and indicators available to assess the state of sustainable material management, resource efficiency and circularity of the Australian economy. This will ensure consistency for reporting for different levels of government and will avoid costs caused by potential duplication and contradiction of effort. The reporting and associated datasets will be a service the Department can provide to state and territory environmental departments.
- The fact that the Australian accounts adhere to complementarity between environmental and economic accounts will enable an economically informed environmental policy perspective. Linking environmental impacts to material flows employing the Driver-Pressure-State-Impact-Response (DPSIR) framework allows to harmonise economic and conservationist policy stances.

- Indicators derived from the accounts can inform the environmental domain of the Treasury's 'Measuring What Matters' report. Initially, headline indicators such as material footprint, domestic material consumption and resource productivity can be supplied to the Treasury report. In future, additional indicators can be included.
- Through regular reporting, Australia will be on par with countries that are leading in environmental economic reporting such as the European Community and Japan. It will allow Australia to assume an international leadership role which can positively influence other players in our region, including the fast-growing economy of India or the ASEAN community creating new opportunities for collaboration for regional sustainability initiatives.
- Regular reporting will allow Australia to deliver against the SDG indicators and the SEEA data initiative. Australia, as a resource extractive economy (posing very specific challenges and opportunities), will provide valuable insights about sustainable materials management and circularity to the global science and policy community.

Research-users

The knowledgebase created by this project will be used by the Department and by State and Territory environment departments to support their efforts to transition the Australian economy to a circular economy. The focus for the yearly reporting will be agreed with the Department's waste policy and circular economy teams and will adapt to those needs as needed. The project team will seek feedback from the ABS and State governments for key outputs.

The Australian material flow and circularity data can be shared with users through an online data portal depending on additional funding for a data platform and data visualisation. This needs to be achieved in the context of the SCaW Hub data strategy.

Special attention will be given to communicate research results that can have benefit for indigenous communities and businesses.

Science innovation and national importance

Research undertaken in this project addresses several knowledge gaps including:

- developing a data infrastructure based on digital capability and a collaborative network of data providers and research-users
- extending the analytical tools of material flow analysis, life cycle analysis and environmentally extended input output analysis to address the whole life cycle of materials, from cradle to grave
- Continued development of novel datasets, construction of meaningful indicators
- to deliver a circularity gap report for Australia for the first time.

The detailed data set that will underpin the circularity gap assessment will allow for identifying priorities and aligning policy needs with data and information at the national, state and industry level and for specific material and waste flows.

Linkages

This work creates synergies with IP3 "Hazardous waste, substance and pollutants" by allowing for analysing environmental impacts and eco and human toxicity of waste flows. It also creates contamination pathways for the Resilient Landscapes and Marine and Coastal Hubs.

Project IP5.02.03 Governing community-based waste management and resource recovery and circular economy initiatives

The problem

Our initial co-design and investigations during RP2021 and RP2022 highlighted that regional and remote Australia faces distinct challenges and opportunities transitioning to the circular economy (CE). Much of the existing research, practice and policy focuses on metropolitan locations, and surprisingly little is known about the good, and the bad, of what is happening in remote and regional areas, which makes up most of Australia. Our initial depth case studies of three regional council areas in Victoria and Tasmania highlighted that CE innovations in these areas depend as much on ‘circular society’ (i.e., civil, community and government actors) as entrepreneurs and business. If it generally true that good governance strategies and well-functioning institutional arrangements are required to maximise the benefits of community-based resource recovery and realise the ‘triple bottom line’ potential of CE in urban Australia, it is likely to be even more so in regional and remote Australia. Further, opportunities for CE differ depending on the character of regional populations, industries and logistics, strategies developed need to be responsive to location-specific characteristics and offer practical solutions for remote and regional communities.

Our response

We have identified that regional and remote local governments could be, and in some cases, are, playing a pivotal role, working closely with state and federal programs and industry from the ‘top down’ while also serving local community and business. This means they can play a role as ‘transition brokers’, working across different levels of government, industry and community. Recognising this, the overarching theory of change for this initiative is that by collaborating with local governments, the Australian Circular Economy Hub (ACE Hub) and relevant state and federal agencies, we can develop a model for networked CE governance best suited to supporting regional CE in Australia. This research complements the information sharing role of ACE Hub’s local government portal with knowledge generation on fit-for-purpose networked governance. By proto-typing and developing tools and responses to this challenge, we will both fill gaps in research and knowledge, and help advance practical outcomes on the ground. We will extend existing local government networks of regional CE stakeholders and provide a platform to facilitate future CE collaborations between different local government areas that also links regional community-led initiatives with state and federal government initiatives for CE.

The outcome will be a networked governance strategy that can be rolled out nationally that will facilitate forms of ‘bottom-up’ initiatives that encompass social as well as technological solutions and draws on relevant geographically coded data-collection initiatives including household behaviour change surveys.

Activities and research methodology

Work in year 2 and year 3 (RP2022 and RP2023) focused on developing a national baseline survey of the CE challenges faced by local government in regional and remote Australia, their capacity to be transition brokers, and what innovations are emerging in response. In RP2024, we are deploying the survey, and using the analysis to describe the profile of challenges, capability and responses across regional and remote Australia. The results will be presented at Circularity in November 2023, where we will also be inviting expressions of interest from innovative local government champions, and build connections between them, supporting knowledge sharing and collaboration. This will be achieved by sharing the data via ACE Hub Planet Ark and creating a space for a Community of Practice area on their platform in the first half of 2024. With existing funding, this will be a minimum viable product

supported by the project team and in-kind investment from ACE hub. However, we anticipate that launching the survey, and insights generated, will motivate state, federal and NGO partners to potentially co-invest in supporting a more extensive dashboard presenting council by council data and peer to peer matching of needs and innovations, plus active support and facilitation of the online community.

Also at this stage, we will seek expressions of interest for placed based trials. We will simultaneously pro-actively identify and approach councils where trials will be most illuminating and generalisable, in terms of identifying key segments of regional and remote Australia. This will be based on survey results (i.e. CE issues, and innovative solutions and capability to broker), geography and Waste Demographics Data generated by IP2.02.02. This combined view will provide a 'socio-technical profile' of CE in remote and regional Australia.

In RP2024 (July 2024-June 2025) we will co-design and conduct at least 2 place-based trials, while seeking external funding to expand the number of trials across multiple locations. The intention is to generate cross-case comparisons in 'socio-technical transect', which will facilitate teasing apart how different elements of council capability, regional characteristics and location shape the capacity and success of CE innovations with local government in regional and remote Australia. Each trial will produce scalable products and resources from the interventions, and these will be progressively documented and shared in the online community with ACE hub. Trials can also vary by intervention type – for example we can try combinations of more governance, behaviour and collaboration focused interventions such as deploying circular strategies CE actor ecosystem workshops; but also explore combining this with more technological interventions such as MICROfactorie deployment in collaboration with IP2. A third combination might be deploying the circular strategies workshop format with IP1.02.02 focusing on water related circularity (to be explored in RP2024).

The focus of RP2026 (July 2026-June 2027) will be finalising any ongoing trials and consolidating and sharing learning and resources. We will also repeat the survey conducted in RP2023 to track changes and trends in issues and capability in regional and remote local governments, and update and refresh the data portal and online community contacts. The results will give some indication of population level changes and trends the initiative has contributed to. The most direct evaluation of impact will be via the trial studies in RP2024, where we can attempt to benchmark changes in the trial council areas against their peers in the broader population of regional and remote Australian local governments.

This sets the stage for the capstone report), where learning will be documented into a national networked governance strategy for CE in regional and remote Australia.

Outputs

Key outputs will include:

- In-depth case studies report of three regional local government areas (LGA)
- Survey of regional and remote CE issues and capacity, national baseline
- Online regional and remote LGA community of practice
- Report - Generate socio-technical profile, research design and recruit trial participant
- Report - Trial co-design and deployment (2 minimum, additional if funding secured)
- Report – dashboard

Report – summative report presenting national networked governance strategy.

Outcome and impact

RP2023 feeding into RP2024

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- Outcome: CE ecosystem of Australia (as represented by Circularity 2023 participants) have increased understanding of CE challenges, capabilities and innovative responses in regional and remote local government areas
 - Impact: state, federal and community organisations see value in co-investment of in-kind and direct funding for dashboard, community and trial preparation.
- Outcome: Increased connection, knowledge sharing and collaboration between regional and remote area local government CE champions (via online community)
 - Impact: high levels of organic engagement in the online community (3+ posts a week)
 - approximately 30 EoIs for trial participation (e.g., approx. 10% of the regional and remote Australian LGA areas).
- Outcome: Shared understanding of the socio-technical profile of CE innovation in regional and remote Australian amongst the Community of industry, government and community stakeholders formed around the project, and agreement on key knowledge and action gaps suitable for trials
 - Impact: agreement to co-invest in additional trials.

RP2025

- Outcome:
 - Co-designed trials with high levels of ownership, relevance and coherence **within** trials at each location selected (locally valid insights)
 - Increased understanding of what works for whom, under what circumstances, and why, to facilitate CE innovations in regional and remote Australian locations represented by each trial
 - Insights into implementation and integration challenges and solutions in each trial
- Impact:
 - While each trial will have local level impacts, tracked as part of the impact and process evaluation of each trial and specified as part of the co-design process for the trial, broader identifiable impacts are not expected in this year.

RP2026

- Outcome:
 - Understanding of what works for whom, under what circumstances and why **across** trials (generally valid insights)
 - Increased capability, collaboration and knowledge sharing between regional and remote local government areas and their stakeholders
 - Uptake and engagement with knowledge products and resources generated in trials
 - Increased understanding of trends and changes in CE issues, brokering capability and solutions in regional and remote Australia amongst project stakeholders
 - Shared understanding of a potential model for network governance towards the CE in regional and remote Australia amongst project stakeholders.
- Impact:
 - Transfer and uptake of specific interventions used in trials in new locations

- Increased overall incidence of CE innovations across regional and remote Australia
- Increased capability for transition brokering in regional and remote LGAs
- In principle support of in-kind and financial support for capstone year (RP2027).

Research-users (as at August 2023)

Organisations/agencies	Co-design	Information sharing	In kind support	In principle Funding support
Local governments,	Y	Y		
Community organisations (including Indigenous organisations)	Y	Y		
Charitable Recycling Australia		Y	Y	
Champion Centre, WA	Y	Y		
ACE Hub	Y	Y	Y	
DCCEEW policy areas (note we are actively reconnecting after MoG changes and project focus update)		Y		Y
Sustainability Victoria / Recycling Victoria		Y		Y
Victorian Department of Energy, Environment and Climate Change Action		Y		
Victorian Circular Economy Business Innovation Centre (CEBIC)		Y		
Circular Economy Victoria		Y		
ASPIRE (strong presence in Ballarat)		Y	Y	
State Growth and Rethink Waste Tasmania				Y
Northern Tasmania Waste Management Group	Y	Y	Y	
Northern Tasmania Development Corporation	Y	Y	Y	
Tasmanian Farms and Graziers Association			Y	Y
Bell Bay Aluminium		Y	Y	Y
Environex		Y	Y	Y
Launceston City Mission	Y	Y	Y	
Australian Packaging Covenant Organisation		Y	Y	Y

Special attention will be given to communicate research results that can have benefit for indigenous communities and businesses.

Science innovation and national importance

In local governments and regional communities across Australia there are many ‘bottom-up’ initiatives relevant to transitioning to a CE with less waste, yet existing models for CE policy prioritise commercial actors and top-down approaches. Our research will develop an innovative networked governance approach to CE modelled on the Cities for Climate Change Program and informed by Jacquelin Cramer’s work on ‘How Networked Governance Powers the Circular Economy’. Generating a socio-technical transect of regional and remote Australia for CE transitions will add to both scientific and policy understanding and action on how to transition towards the CE in these challenging locations.

Linkages

The project aligns with IP5.02.04 study creating opportunity from waste in Aboriginal Communities in Western Australia, in that the local government data collected will help with contextualising, scaling and translating from the Armadale research to other contexts. We also anticipate the online community will be interested in learning from the results. We have completed indigenous cultural awareness training and are consulting with Indigenous researchers within the SCAW Hub about approaches to engaging with Indigenous community organisations in RP2023.

The project aligns closely with IP2.02.02 “Reduced impact of plastics and other materials” and, less directly, with IP3.02.01 “Hazardous waste, substance and pollutants” as community-scale CE initiatives contribute to overall reduction in waste generation. There are further linkages with IP1.02.02 due to the focus on local scale community-based initiatives, especially as they have recently completed a survey of regional and remote Australia’s engagement with water sensitive cities and nature-based solutions.

We are actively exploring integrating the socio-technical transect analysis and trial selection approach described above with IP2 and IP1.

Project IP5.02.04 Identifying opportunities from waste management and resource recovery and the circular economy for indigenous communities and businesses

The problem

According to the 2016 census, Western Australia represents the largest population who live in remote and very remote communities. Waste management and the lack of appropriate infrastructure and human resources for waste management and resource recovery in Indigenous communities is a perennial problem creating environmental and health risks and presenting a missed economic opportunity. According to APCO’s recent report on waste management in regional communities (APCO 2020), the number of different types of waste, including automotive waste and end-of life appliances and other consumer waste, is growing fast in Indigenous communities. Waste management in urban and remote Aboriginal communities is limited. Indigenous communities in regional and remote settlements are often poorly equipped to benefit from repurposing waste and instead suffer the consequences of accumulating waste and pollution.

Our response

In a scoping study the project team, in close collaboration with the SCAW Hub’s Senior Indigenous Facilitator and an Indigenous researcher, will identify suitable Aboriginal communities and engage in a process to identify the magnitude and characteristics of the local waste problem. The project will also explore potential opportunities for managing waste, recovering resources, and creating economic and employment opportunities.

As a first step, a listening tour will be undertaken to find interested communities who wish to engage with the Hub research. The project will also aim to identify local community champions and will engage in a co-design process that is respectful of the local culture and practices. Aboriginal voices and representation will be ensured at all stages of the project. Consultation will be undertaken in first language to the extent possible.

Initially, the team will work with the Indigenous communities to describe the problem and the issues well and will start to identify possible solutions enabled through logistics, technologies, behaviour change and capacity building.

Activities and research methodology

This project is a continuation of work undertaken in RP2022, however is requesting an extended timeframe to allow adequate time for effective and appropriate discussion and engagement with Aboriginal communities. In RP2022, it took longer than anticipated to secure the interest of the Aboriginal community in the Swan-Canning area. The Whadjuk Noongar community in the Armadale area has been identified for the project. The community is ready for yarning and sharing their knowledge to the project, and the yarning will start upon securing ethical approval (submitted in July 2023). Moreover, the co-design of yarning activities with the community representatives has been incorporated in the revised RP2023 timeframe.

RP2022 (Year 1) This scoping study in RP2022-2023 sought to engage the Aboriginal Land and Sea Councils in Western Australia, particularly in the Swan-Canning catchment area to identify Aboriginal communities interested in engaging in this project. As WA has the highest representation of remote and very remote population in Australia, the study approached interested communities to conduct co-design workshops to help identify the significance of the waste problems in the Aboriginal communities and the communities' willingness to participate in the IP5 project. Western Australia was also chosen because of strong existing networks with Indigenous communities of Curtin University. The Whadjuk Noongar community in WA has been identified as a representative Aboriginal community based on the interest expressed by local Aboriginal communities and the potential for collaboration with the research project. To conduct yarning activities with the Aboriginal communities, the research team will be working with the Champions Centre, which serves as a gathering place for Aboriginal peoples and agencies working with Aboriginal families and communities. The Champions Centre offers an inclusive, neutral environment to promote healing for various groups within the local area, facilitate reconciliation, build bridges for families, share knowledge, and connect with the Armadale community to promote hope and opportunities.

RP2023 (Year 2) Building upon the relationship formed in RP2022, the nominated and interested Indigenous communities will be considered as focus groups in RP2023. Yarning circles and one-on-one yarning (interview) with the relevant community members will be conducted to understand community priorities in addressing the waste problem through various circular economy approaches. This will build on existing Indigenous knowledge about resource efficiency and circularity and how they can be applied for today's product and waste flows. As part of the research team, an Indigenous researcher will assist in communicating with Indigenous communities regarding various waste management provisions and opportunities and seeking community feedback.

RP2024 (Year 3) A participatory and co-design approach of multi-stakeholders' engagement will be considered to develop a deployable and practical implementation plan for the identified (in year 3) waste management priorities (e.g., education, knowledge and capacity building) and circular economy solutions (e.g., decentralised/community-based resource recovery provisions). The circular economy solutions considered most suitable through the codesign process to enable resource recovery and job creation while addressing waste management challenges in urban Indigenous communities will be chosen.

RP2025 (Year 4)

Building upon the understanding of circular economy solutions for Aboriginal communities in urban areas, RP2025 will focus on exploring circular economy solutions in Aboriginal communities located in remote and rural Australia. This study will consider the diverse socio-economic and geographical contexts of these communities and identify opportunities for resource recovery from waste in rural and remote settings.

RP2026 (Year 5) The key findings regarding opportunities in Aboriginal communities, both urban and rural, will be synthesized, highlighting commonalities and differences between these two settings. The project will identify and report on the necessary infrastructure maps for both urban and rural Aboriginal

communities and businesses in a final project report. By combining the insights from both urban and rural areas, the project aims to create a comprehensive understanding of circular economy solutions that can benefit Aboriginal communities across various locations.

Output with amended deadlines for deliverables

Key outputs include:

- A list of key Aboriginal stakeholder groups identified for the scoping study
- A series of yarning circles with communities on waste management (urban and regional/remote)
- A series of yarning circles with communities on waste management priorities and possible CE solutions (urban and regional/remote)
- Report summarising results from community discussions and presentation of findings to the community – urban

Report - summarising results from community discussions and presentation of findings to the community – regional/remote.

Outcome and impact

The research will identify a community, establish a relationship of trust and mutual understanding, and engage in a co-design process to identify the relevant waste management problems and possible circular economy solutions in the urban and regional/remote Aboriginal communities. Through co-design workshops and yarning circles, the project will ensure active participation and decision-making by Indigenous communities, respecting their self-determination and leadership. The project's commitment to ongoing engagement, co-design, and knowledge exchange will work to foster long-lasting relationships with Aboriginal communities, ensuring the research's relevance, value, and positive impact. The findings and recommendations from the project will provide valuable insights to inform policies, programs, and practices for waste management and circular economy initiatives, ultimately benefiting Aboriginal communities across various locations. The project's adherence to the AIATSIS Code of Ethics principles will lay a strong foundation for responsible and culturally sensitive research, and its outcomes are expected to contribute positively to community well-being, environmental sustainability, and social equity.

Indigenous land councils and Indigenous communities and business which will be identified in the process of the scoping study, along with the end-user identified by the department.

Research users

Insights from this research will benefit indigenous communities and businesses and will be communicated in face-to-face workshops in verbal presentations and tailored communication pieces. It may also guide State and local government initiatives in enabling indigenous circular economy initiatives.

Science innovation and national importance

Addressing the waste management problems of regional and remote Indigenous communities and the identification of the possible economic and employment opportunities based on resource recovery is a central objective of the National Environmental Sciences Program. Research into creating wealth from waste at the community level is still in its infancy and the solutions-oriented approach taken by the Hub research will, if successful, inform local solutions more generally and will create insights that are applicable in other geographical and cultural context.

Linkages

The project has indirect linkages with project IP5.02.02 looking into tyre and conveyor belt recycling which focuses on the opportunities for the rural/remote communities.

Is this a cross-hub project?

No, but there is potential to collaborate in cross Hub activities when they occur.

Does this project contribute to a cross-cutting initiative?

No, but there is potential to collaborate in the Resilient Landscape cross cutting initiative potentially as the project progresses.

Pathway to impact

Outcomes

The waste impact management research will deliver several outcomes, including:

- knowledge products that include metrics and data on material flows, waste, emissions, resource recovery and circular economy for decision makers in Commonwealth, state and local governments and for businesses in the waste management and resource recovery sector.
- identifying novel approaches for specific resource recovery problems achieved through novel science and engineering contributions and amenable to be put to national and local use.
- fostering a science-based understanding of the institutional and governance arrangements that can enable regional community based circular economy initiatives and networks that encourage value add to materials to occur many times over resulting in economic and employment benefits. The science informs business decision and communal approaches that result in reduce primary material requirements, increased secondary content in products and infrastructure, and workable cycles arrangements leading to tangible reduction in material use, waste to landfill and emission and also reducing the environmental impacts (climate change, natural resource depletion, biodiversity loss, toxic waste issues) that are related to natural resource use creating significant and measurable environmental benefits.
- Capacity building and collaboration with Aboriginal communities: Through the co-design process, the project will involve Aboriginal communities, fostering their self-determination and decision-making capabilities in addressing waste issues. Additionally, the project will create opportunities for promoting circular economy practices within both urban and remote Aboriginal communities.
- Institutional and Governance Enablers: The project will contribute a science-based understanding of institutional and governance structures that effectively support regional, community-based circular economy initiatives. This comprehension will facilitate the enhancement of material value, driving economic growth and employment benefits. Active engagement with Indigenous communities and businesses will remain a pivotal aspect of this endeavour.

Research-user	Engagement and communication	Impact on management action	Outputs
DCCEEW waste policy and circular economy and international teams; environment departments of States and Territories; industry representatives in	Engaging in research framing and co-delivery; regular reports; tailored presentations; online database and visualization tools; peer-reviewed publications	The data and indicators will enable to establish a baseline of circularity in the Australian economy and alternative scenarios and can inform policy statements and allow to set targets and monitor achievements	Datasets; reports; peer-reviewed journal publications; webinars; fact sheets; policy briefings

IP5.04 Waste Impact Management Research

Research-user	Engagement and communication	Impact on management action	Outputs
the waste management and resource recovery sector (IP5.04.01)			
ACE Hub (IP5.02.03)	Input into regional survey, collaborating on distribution and recruitment,	Our collaboration has increased their engagement and attention on the experiences and challenges of regional and remote LGA areas, and they are highly interested in working further with the project.	Sharing results with Aus CE community; opening a dedicated regional and remote LGA space on their platform, sharing learning and resources from trials.
Regional and remote LGA CE staff (IP5.02.03)	Piloting survey, sharing experiences and cases, and later, participating in online community, participating in trials, co-designing network governance approach.	None at present. By 2027 it is expected that there will be widespread adoption of the resulting regional and remote network governance for CE framework.	It is expected that peer to peer learning will occur in the online community, councils will want to participate in trials co-design and implementation; and benefit from learning (locally) and share them widely (across the population). Specific trials will have specific outputs emerging from the co design process.
DCCEEW policy areas (note we are actively reconnecting after MoG changes and project focus update) (IP5.02.03)	Invited for input into survey at March 2023 showcase, participating in online community, participating in trials, co-designing network governance approach.	None at present. We anticipate the survey results and socio-technical transect analysis to generate strategic and practical policy insights and will be working across 2023 to build relationships towards this outcome.	Survey report and analysis Socio-technical transect Resources and insights from trials Insights across trials relevant to key policy issues.
Various state government agencies with CE responsibilities (IP5.02.03)	Consultation and information sharing thus far	None at present. We anticipate the survey results and socio-technical transect analysis to generate strategic and practical policy insights and will be working across 2023 to build relationships towards this outcome.	Survey report and analysis Socio-technical transect Resources and insights from trials Insights across trials relevant to key policy issues.
Various Aboriginal Land and Sea Councils (IP5.02.04)	Engage in co-design workshops with selected land councils and community organisations	Identify suitable and representative Aboriginal communities for the project	List of selected Aboriginal stakeholder groups for the scoping study
Indigenous Communities (IP5.02.04)	Listening tour and codesign process	Explore potential waste management and circular economy solutions	Yarning circles on identified waste management issues and circular economy solutions
Project Team and Researchers (IP5.02.04)	Work closely with Indigenous facilitator and researcher	Develop deployable implementation plan	Final project report synthesizing key findings and infrastructure maps
Additional outputs			

IP5.04 Waste Impact Management Research

Research-user	Engagement and communication	Impact on management action	Outputs
<ul style="list-style-type: none">• Important scientific contributions of national significance communicated to various audiences via targeted short and accessible communication pieces such as short articles in industry journals and generally accessible media such as The Communication• Presentations and short videos for industry partners, communities and the government sector as well as the public• Research findings will be peer-reviewed through scholarly publication.• On-demand policy and business briefs to inform planning and decision making as part of the ongoing engagement with research users and other interested parties			

Indigenous consultation and engagement

IP5.04.01 is an assessment of Australia's material and waste flows at national, State and industry sector level. It does not consider socio-economic or cultural criteria in the analysis and hence does not specifically engage with or address indigenous communities. Results will be made publicly available and can be accessed by the general public. It is hence classified as **Category 3 (Communicate)**.

IP5.02.03 in its current phase classifies as **Category 3 (Communicate)**. The current national scope of the survey means there is limited opportunity to engage in a meaningful way with Indigenous groups. We anticipate that the place-based pilots informed by the survey and data integration activities detailed in our plan, taking place in 2024-2025, will present opportunities to work with local Indigenous communities depending on the pilots chosen. This will depend on existing relationships and engagement held by local government bodies; however we look forward to sharing and applying the SCaW Indigenous engagement framework, tools and resources in how we work with local pilot partners to engage with local Indigenous communities. Note the team have all completed basic cultural awareness training and will continue to build our capabilities and stay abreast of SCaW Indigenous engagement developments in anticipation of higher levels of engagement with Indigenous partners in future activity.

IP5.02.04 is committed to a comprehensive and respectful approach to Indigenous consultation and engagement and to that end is considered a **Category 2 (Co-design)** project. From the outset, the project team, in close collaboration with the SCaW Hub's Senior Indigenous facilitator and an Indigenous researcher, will prioritize engagement with Aboriginal communities in Western Australia. The project will begin with a listening tour to identify interested communities willing to engage with the research. Local community champions will be identified, and a co-design process, guided by cultural respect and practices, will be fostered to ensure Indigenous voices are heard and represented at all stages of the project. Consultation will be conducted in the first language wherever possible, ensuring accessibility and cultural sensitivity. The team will work collaboratively with Indigenous communities to describe waste management challenges and potential solutions, considering infrastructure, technologies, behaviour change, and capacity building. Throughout the research, the project will actively involve Indigenous communities through yarning circles, one-on-one yarning with community members, and other inclusive methods. These engagement activities will build on existing Indigenous knowledge about resource efficiency and circularity, allowing for the integration of traditional wisdom in addressing contemporary waste management issues.

The research will apply a co-design approach which involves multiple Indigenous communities and community representatives in Western Australia. Through a co-design process, we will ensure research is relevant and beneficial to Indigenous Australian communities and organisations by:

- Engaging with Indigenous communities and organizations from the early stages of the project to identify their needs, priorities, and aspirations related to waste management and resource recovery.
- Conducting co-design workshops, yarning circles, and other participatory activities to involve Indigenous stakeholders in shaping the research agenda, methodologies, and objectives.
- Respectfully listening to Indigenous voices, perspectives, and traditional knowledge, ensuring that research outcomes address their unique challenges and opportunities.
- Regularly seeking feedback and input from Indigenous stakeholders throughout the research process to ensure continuous alignment with their needs and expectations.

IP5.04 Waste Impact Management Research

The rationale for the co-design process in the project lies in its adherence to the principles of genuine partnership and shared responsibility with Indigenous partners. This approach ensures that research is relevant and beneficial to Indigenous Australian communities and organizations by actively involving Indigenous voices in shaping the project's plan, objectives, and methodologies. The co-design process fosters opportunities for Indigenous peoples to engage in research and capacity-building, acknowledging shared benefits and promoting ethical practices such as obtaining free, prior, and informed consent and respecting Indigenous data sovereignty. Additionally, the project provides avenues for Indigenous employment and skill development, prioritizing Indigenous businesses in procurement and offering training to community-based researchers and volunteers. Effective communication and knowledge sharing with Indigenous stakeholders further enhance the co-design process's success in generating culturally appropriate and accessible research outcomes. The following action items will be considered as part of the codesign process to meet the co-design research objectives:

- Actively involve Indigenous researchers, scholars, and community members in the project team, fostering a diverse and inclusive research workforce.
- Provide scholarships, internships, or paid positions for Indigenous students, postgraduates, and community members to actively contribute to the research and gain valuable experience.
- Develop a research ethics framework that aligns with the AIATSIS Code of Ethics and other relevant guidelines, ensuring respect for Indigenous cultural protocols and consent procedures.
- Establish an Indigenous Advisory Committee or equivalent body to oversee and guide the research process, including project governance and decision-making.
- Facilitate knowledge exchange between Indigenous and non-Indigenous team members, fostering cultural awareness and mutual understanding.
- Utilize culturally appropriate and accessible communication methods to disseminate research findings, such as yarning circles, community workshops, or visual storytelling.
- Undertake training in Indigenous cultural and intellectual property (ICIP) and cultural awareness (including localised cultural awareness provided by partnering Indigenous organisations).
- Produce plain-language summaries or multimedia resources to make research findings more easily understandable and relevant to Indigenous audiences.
- Foster ongoing engagement with Indigenous communities beyond the project's conclusion, nurturing long-term relationships based on trust and mutual respect

A summary of the Three-category approach that each project meets is as follows:

Project IP5.04.01	Communicate <u>(3)</u> <input checked="" type="checkbox"/>	Co-design <u>(2)</u> <input type="checkbox"/>	Indigenous-led <u>(1)</u> <input type="checkbox"/>
Project IP5.02.03	Communicate <input checked="" type="checkbox"/>	Co-design <input type="checkbox"/>	Indigenous-led <input type="checkbox"/>
Project IP5.02.04	Communicate <input type="checkbox"/>	Co-design <input checked="" type="checkbox"/>	Indigenous-led <input type="checkbox"/>

Project milestones

Project IP5.04.01: Metrics, data and indicators for material flow and stocks, waste and emissions to monitor progress of Australia's circular economy transition

No.	Deliverables	Delivery Date	Responsible Person
IP5.04.01-D1	Workshop with the Department to discuss and agree the focus of the Australian Material Flow, Waste and Circularity Report	TBD	Heinz Schandl
IP5.04.01-D2	Draft report shared with research-users of the Department and State governments.	01/01/2025	Alessio Miatto
IP5.04.01-D3	2025 Australian Material Flows, Waste and Circularity Report launch and presentation	28/02/2025	Alessio Miatto
IP5.04.01-D4	Publication of key results in a peer-reviewed journal	30/06/2025	Alessio Miatto
IP5.04.01-D5	Draft report shared with research users of DCCEEW and State governments.	28/02/2026	Alessio Miatto
IP5.04.01-D6	2026 Australian Material Flows, Waste and Circularity Report launch and presentation	30/04/2026	Alessio Miatto
IP5.04.01-D7	Publication of key results in a peer-reviewed journal	30/06/2026	Alessio Miatto
IP5.04.01-D8	Draft report shared with research users of DCCEEW and State governments.	28/02/2027	Alessio Miatto
IP5.04.01-D9	2027 Australian Material Flows, Waste and Circularity Report launch and presentation	30/04/2027	Alessio Miatto
IP5.04.01-D10	Publication of key results in a peer-reviewed journal	30/06/2027	Alessio Miatto

Project IP5.02.03 Governing community-based waste management and resource recovery and circular economy initiatives

No	Deliverables	Delivery Date	Responsible Person
IP5.02.03-D1	Survey deployment	Oct 2023	Stefan Kaufman
IP5.02.03-D2	Publication of three regional LGA in depth case studies	Nov 23	Stefan Kaufman
IP5.02.03-D2	Survey report and presentation at Circularity 2023	Nov 23	Stefan Kaufman
IP5.02.03-D4	Share results and launch online regional and remote LGA community (if additional funding secured, dashboard development then launch, recruit facilitator)	Mar 24	Stefan Kaufman
IP5.02.03-D5	Report - Generate socio-technical profile, research design and recruit trial participants	June 24	Stefan Kaufman
IP5.02.03-D6	Report - Trial co-design and deployment (2 minimum, additional if funding secured)	June 25	Stefan Kaufman
IP5.02.03-D7	Share learnings and resources from trials via online community, publications, webinars and events	Nov 25	Stefan Kaufman

IP5.04 Waste Impact Management Research

IP5.02.03-D8	Report, dashboard (deploy and report survey results and update socio-technical profile and online dashboards)	June 26	Stefan Kaufman
IP5.02.03-D9	Summary report about generalisable insights from engagement and research with regional councils for scaling up and scaling out in future activities at regional council level	June 27	Stefan Kaufmann

Project IP5.02.04 Identifying opportunities from waste management and resource recovery and the circular economy for indigenous communities and businesses

No.	Deliverables	Delivery date	Responsible Person
IP5.02.04-D1	Short summaries of outcomes of each yearning circle	ongoing until May 2024	Atiq Zaman
IP5.02.04-D2	Yearning circles (group discussion) on the identified waste management issues and presentation of research outcomes with the relevant community members will be conducted to seek feedback and suggestions.	May 2024	Atiq Zaman
IP5.02.04-D3	Yearning circles on waste management priorities and possible circular economy solutions	Sep 2024	Atiq Zaman
IP5.02.04-D4	Report on the community consultation and presentation to the participating Aboriginal communities for feedback and suggestions	May 2025	Atiq Zaman
IP5.02.04-D5	Yearning circles on waste management issues, priorities and possible circular economy solutions in Aboriginal communities in the rural/remote area	May 2026	Atiq Zaman
IP5.02.04-D6	Report on the circular economy implementation strategy for urban and rural Indigenous communities	May 2027	Atiq Zaman

Data and information management

All output of the research will be made freely and openly available as per the NESP data and information guidelines.

All reports will have a summary for a general audience and will be accessible on the Hub's webpage. Outreach meetings with research-users will ensure that scientific information can be translated to practically usable knowledge products that can guide decision making.

Datasets, metrics and indicators will be coordinated by the Hub's Data Wrangler and be initially stored in an intermediary data repository. The open access of datasets and of analytical tools used to generate data will be discussed with the Department to ensure the way data is shared contributes to the various data initiatives undertaken by the Department and the Australian Government more generally. The primary data concerning the exploration of waste-related opportunities within Aboriginal communities will be stored within Curtin University's repository, in accordance with the stipulations of ethics approval. Following discussions with the department and end-users, only coded or unidentifiable data will be made available in the public domain, ensuring the safeguarding of data privacy.

A dedicated NCRI facility for material flow and supply chain data will be explored with the NCRIS team.

Project output	Data management and accessibility
Metrics, data and indicators of Australia's material flows, recycling and circular economy (project IP5.04.01)	The information system will be set up to adhere to the principles of the data and information guidelines to ensure information is findable, accessible, interoperable and reusable. All data will be peer-reviewed.
Research report and peer-reviewed journal publications (activities 1-5)	All research outputs will be made open access
Analytical tools, modelling platforms, etc.	Analytical tools such as research questionnaires, analytical tools and models will be made available open source to the extent possible

Location of research

Research will be undertaken by researchers located across Australia and from the five core research partner institutions and additional research partners when required.

The proposed project is a national scale project. Outcomes will be used for setting the forward R&D agenda for the theme of the Hub. As such, the projects will have scaled benefits. It is also envisioned that the outcomes of this project will be used to inform the National Waste Policy and National Waste Policy Action Plan as well as industry and state and local government stakeholders.

The co-design process undertaken in RP2021 included research-users from urban, regional and remote Australia, and a range of government and industry agencies, and communities.

The activities identified during co-design are located at:

- National - A national level assessment developing metrics, data and indicators for waste management and resource recovery with geographical and sectoral detail (including global supply chains).
- In selected local government areas in remote and regional Australia, as indicated by the integrated survey and waste demographic portal assessment for the regional governance project, and by the willingness and ability of trial partners to participate, plus third-party funding, ideally.
- In the Whadjuk Noongar community (along with another Aboriginal communities in the remote area-yet to be confirmed) in Western Australia to explore circular economic opportunities for Indigenous businesses and communities

The findings for Western Australia, for communities in Victoria and Tasmania and Indigenous communities in Western Australia are expected to yield insights of significance for national decision making. The co-design process will continue to explore additional partnerships and impact pathways for the waste impact management research and will allow IP5 to contribute to the national footprint of the SCaW Hub.

At which spatial scale is the project working	National <input checked="" type="checkbox"/>	Regional <input checked="" type="checkbox"/>	Local <input checked="" type="checkbox"/>
Location(s) – gazetted region /place name	The Whadjuk Noongar community, Armadale City Council, Western Australia Previous RPs saw work in Launceston, Ballarat and Bendigo. Place based trials will be selected in LGAs in remote and regional Australia. Online community and survey will address LGAs across Australia, with a focus on remote and regional LGAs.		
Aboriginal or Torres Strait Islander nation or traditional place name(s)	The Whadjuk Noongar community in Armadale area (within Swan Canning Catchment) of Western Australia has been identified for the IP5.02.04 project. Remote and rural Aboriginal communities will be identified in a later phase of the project duration upon consultation with the Hub Indigenous Facilitator and interested community representatives of the Aboriginal communities.		

Project keywords

Sustainable materials management; circular economy; waste management and resource recovery; resource governance; industrial ecology.