

# Project description

## Project summary

Chemicals in waste streams pose challenges to the development and implementation of waste reuse strategies and to achieving National and State waste policy action plan targets. Even trace levels of chemicals in waste materials can result in a hazardous waste classification. In some cases, the trigger limits for hazardous waste classification are not well characterised. The presence of chemicals of concern can impact recyclability and reuse of materials in the economy. As part of Research Plan 1 (RP1) for the Hazardous Waste, Pollutants and Substances Impact Area, and in collaboration with research users, we will codesign a program of work that aims to identify and address national challenges for management of hazardous waste substances and pollutants, including those identified through national hazardous waste audits, the *National Pollutant Inventory*, and the *PFAS National Environmental Management Plan 2.0*. Threats posed to environmental and human health, and impediments to waste reuse will be key focus areas, working at the nexus of waste and pollutant impacts. The codesign process will prioritise hazardous waste management needs and future research plans and assist with policy direction and reform for hazardous waste management in Australia. The focus will be driven by product stewardship obligations, pinch points in current hazardous waste policy, regulation and classification standards, waste stream volume and type, chemical entrainment in waste streams, and legal and international obligations and constraints.

## Project description

The Australian Government is driving the transformation of Australia's waste and recycling capacity, including the diversion of 10 million tonnes of waste from landfill for reuse or commercial gain, and recovery of 80% of all wastes by 2030. There has been a strong and increasing trend in the generation of hazardous waste per annum in Australia, likely due to the generation of large volumes of asbestos and per- and polyfluoroalkyl substances (PFAS) contaminated soils. Whilst minimising the generation of hazardous wastes is a key priority to mitigate the environmental and human health impacts, ensuring the appropriate management of waste materials at end of life and identifying appropriate reuse pathways represents a significant opportunity for the Australian economy. Without defining and addressing the key waste-hazardous pollutant priorities, achieving waste minimisation and resource recovery targets for many waste materials will not be possible by 2030. Export pathways for recycled materials will continue to be impacted, and there is a threat of incidental accumulation of emerging contaminants of concern in the environment. A national program of assessment is required to identify critical waste-pollutant combinations and to clarify waste classifications that are limiting resource recovery, export, reuse, and otherwise beneficial recycling and reuse of waste materials.

To achieve resource recovery targets for hazardous waste, the waste must be rendered benign, have low or nil leachable contaminants, and have options for reuse without further impacting the quality of materials or accumulating in the environment. The presence of entrained chemicals in waste materials and potential release to the environment through disposal or reuse, limits resource recovery and the retention of materials in the economy. Emerging wastes such as textiles, tyres, demolition waste, broader organics and difficult plastics all require further characterisation to determine the best treatment and resource recovery options and to identify constraints for reuse and retention in the materials economy. Chemicals of concern (CoCs) such as organohalogen and organophosphorus compounds (e.g., PFAS, flame retardants) and microplastics can leach from waste materials and enter the environment when materials are reused. Even at low levels, entrained contaminants of concern and persistent pollutants can be deleterious to environmental and human health.

Building on current understanding of waste generation (such as *Hazardous Waste in Australia 2019* and *National Waste Report 2020*), the link between contaminant bioavailability and release from waste, and treatment or resource recovery technology and methods is critically important to understand the risk and fate of emerging and existing contaminants of concern, and to ensure that impacts to ecosystems and human health can be minimised. Key examples include the generation, mobility, fate and treatment of contaminants such as PFAS in soils and waters, microplastics, fibres and organic pollutants (e.g., flame retardants such as hexabromocyclododecane (HBCD) found in foams and other products) from other wastes (e.g., plastics, textiles, e-waste, tyres, and construction and demolition waste). These contaminants can be persistent and accumulate in the environment, yet their detrimental impacts on ecosystems and human health are still being established.

In collaboration with Hub partners, this project aims to develop a codesigned plan to target key hazardous waste priorities in relation to their generation, management, resource recovery and recycling and reuse, giving consideration to identified chemical threats present in waste materials. A national program of assessment for hazardous wastes, pollutants and substances will be collaboratively generated to identify and address Australia's challenges and opportunities for management of hazardous wastes for the short, medium and longer term. This will be achieved through a series of facilitated codesign workshops, focus groups and interviews with partners such as the DAWE, State regulators, industry and other partner research users. Currently available Federal and State Government policy documents and report resources along with scientific and non-scientific literature will be viewed to ensure a focused, adaptive and complementary program of investigation is scoped. The codesign process for developing a national program of assessment for hazardous wastes, pollutants and substances will include (but is not limited to):

- identification of priority waste-pollutant combinations through national and state waste audits and hazardous waste management plans, and through engagement with Hub partners (i.e., HBCD in polystyrene plastics; microfibres in textiles, CoCs in waste tyres, PFAS in materials);
- analysis, measurement and quantification of hazardous chemicals in waste streams
- risk assessment for potential release and accumulation in the environment as a result of treatment, resource recovery, recycling or reuse of hazardous wastes
- assessment of environmental and human health impacts linked to management, treatment, resource recovery, recycling and reuse of hazardous wastes
- identification of new pathways for treatment and reuse of priority hazardous wastes and chemicals of concern
- identification of Australian technological expertise for treatment of complex and hazardous wastes.

As part of RP1 for the Hazardous Waste, Pollutants and Substances Impact Area, this project will focus on identifying emerging priorities for hazardous wastes, while conscious of potential changes in Federal and State Government priorities. We will seek to link with current management and treatment strategies for hazardous wastes to identify opportunities for improving efficiency for hazardous waste management and treatment in Australia. Capacity, limitations and barriers in the current waste management environment will be identified. Targeted discussions with Federal and State government representatives, industry partners and research users, will also provide an in-depth understanding of how wastes and contaminants move through treatment, processing and reuse systems, and assist with the identification of IP3 research priorities for RP2 and beyond. The codesigned program will ensure national benefit through, for example, cost reductions, consolidation of hazardous waste priorities and the management of hazardous wastes, identification of new market pathways, jobs creation, support of industry and/or manufacturing sector, and Government drivers.

This project will identify research opportunities that link to the research of other NESP hubs, including the Resilient Landscapes Hub (impact of chemicals of concern and waste on ecological communities), the Climate Systems Hub (temperature and rainfall impacts on waste pollutant impacts), and Marine and Coastal Hub (plastics and waste leachability and impact on marine ecosystems). We will also explore links across our Hub impact priority areas such as the use of chemicals in urban landscape management (IP1), the management of agricultural plastics contaminated with pesticides and chemicals of concern in difficult plastics (IP2), interactions between hazardous waste and air quality (IP4), and the role of hazardous waste in the broader waste management system and a circular economy (IP5).

A codesigned national assessment program for hazardous waste will help to drive policy and on-ground actions on use and reuse of hazardous waste, will define threats and risks of waste pollutants for use by regulators, and identify more pathways for reuse by industry and agencies who manage waste. The project will design a national assessment program for hazardous wastes centred around strong stakeholder engagement, intrinsically framed and driven with DAVE and other primary stakeholders as the research users, which will be captured in a final report as the primary deliverable. The project will be aligned with national needs and knowledge of global science directions in hazardous waste management and will assist with policy decisions and reform, in consideration of Australia's international obligations for hazardous waste management. The pathway to impact will be ensured through the stakeholder engagement, establishment of advisory panels and communication regarding project progress and outputs.

# Pathway to impact

This section describes how the project will inform decision making and on-ground action, and the outputs that will be delivered to research users throughout the life of the project.

<b>Outcomes</b>			
<p>The expected outcomes and value for this RP1 project include:</p> <ul style="list-style-type: none"> <li>• identification of priority 'wastes-hazardous pollutant' combinations for short-, medium-, and long-term research and investment effort</li> <li>• diversion of hazardous wastes, substances, and pollutants from landfill to meet waste reduction and landfill diversion targets outlined by DAWE and the National Waste Report 2020</li> <li>• reducing the cost and impact of unusable hazardous waste as new treatments and alternatives are identified</li> <li>• understanding trans-jurisdiction waste management and hazardous waste priorities</li> <li>• identification of new market opportunities for some hazardous waste streams</li> <li>• identification of gaps and limitations to manage wastes at a reduced cost and justification for further investment into hazardous waste management and reduction</li> <li>• evidence-based research and policy decisions and education informed by this study that drives engagement and promotes shared views across relevant industry, government, and community stakeholders</li> <li>• inputs for the implementation of the National Waste Policy Action Plan 2019, the Recycling Modernisation Fund, and Product Stewardship Investment Fund</li> <li>• measurement of value, both economic and environmental, as a result of strategic management of wastes and their hazardous components.</li> </ul>			
<b>Research-user</b>	<b>Engagement and communication</b>	<b>Impact on management action</b>	<b>Outputs</b>
<p>DAWE: Chemicals Management Branch, Environmental Protection Division - Nicola Powell, Sara Broomhall, Mathew Jones, Glen Walker  Waste Policy and Planning Branch - Jason Dunn, Amanda</p>	<p>Key DAWE personnel linked regularly via IP3 and Project lead.  Input across Government priorities and initiatives.  Engaged in the development and design of the assessment program of activities and outputs.</p>	<p>Findings will be used to assist regulator/s identify and frame waste management policies around identified key hazardous waste priorities for Australia.</p>	<p>Final report identifying hazardous waste, substances and pollutants priorities for Australia.  Codesigned research and development priorities that form the platform for medium/longer term knowledge products and outcomes for mitigating threats of hazardous waste substances and pollutants and enabling safe reuse of wastes, including developing thresholds for chemicals of concern in waste materials which enables recycling</p>

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<p>Watson, Rebecca Drown, Lara Martin</p> <p>Waste Action and Modernisation Branch - Rob Quinn, Elaina Lobendahn</p> <p>Also representatives of the Climate Adaptation and Resilience Division; Parks Australia, Atmosphere and Reporting Branch</p> <p>All other research users identified including waste managers, Government (all levels), Indigenous Communities, research partners, NESP SCaW Hub.</p>	<p>Research plan and recommendations will be communicated to DAWE regularly, as required.</p>		<p>of a broad range of materials in an environmentally sound manner.</p>
<p>Waste managers and partners. (Industry and non-industry)</p> <p>Examples:</p> <p>Tellus Holdings</p> <p>Department of Defence</p> <p>Veolia</p> <p>AusRoads</p> <p>Vinyl Council</p> <p>Ewaste recyclers</p>	<p>Will establish a project reference group of representative stakeholders to guide the project, who will provide feedback through the codesign process in relation to the stakeholder engagement, identified research priorities and key outcomes of RP1.</p> <p>Partners and research users will be engaged to develop and codesign project and outputs.</p> <p>Findings and outputs to be communicated to project contributors</p>	<p>Will assist industry and non-government stakeholders to make decisions regarding business and investment for treatment and resource recovery from hazardous wastes.</p> <p>Will identify new market pathways for priority hazardous wastes in Australia.</p> <p>Will create symbiosis between industry stakeholders across material and resources supply chains.</p>	<p>Final report identifying hazardous waste, substances and pollutants research priorities for Australia, including identified market pathways for materials and resources.</p>

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	via project workshops, informal communication and presentations.		
<p>Federal, State, Regional and Local Government</p> <p>Examples:</p> <p>EPA Victoria</p> <p>EPA Tasmania</p> <p>WA Waste Authority</p> <p>Department of Defence</p> <p>Department of Biodiversity, Conservation and Attractions</p>	<p>Will establish a project reference group of representative stakeholders to guide the project, who will provide feedback through the codesign process in relation to the stakeholder engagement, identified research priorities and key outcomes of RP1.</p> <p>Partners and research users will be engaged to develop and codesign project and outputs.</p> <p>Findings and outputs to be communicated to project contributors via project workshops, informal communication and presentations.</p>	<p>Research findings will be incorporated with existing hazardous waste rankings to develop a national priority ranking system that considers waste generation volumes, toxicity, bioavailability, and technology.</p> <p>Research findings will be used to consolidate data collected at State and Regional Government level.</p> <p>Findings will be used to assist regulator/s identify and frame waste management policies around identified key hazardous waste priorities across Australia.</p>	<p>Final report identifying hazardous waste, substances and pollutants research priorities for Australia.</p>
<p>Indigenous communities</p>	<p>Research needs will be identified through engagement with Indigenous communities, in accordance with the Indigenous Partnerships Strategy of the Hub.</p> <p>Representation will be linked via the Hub Indigenous Leader, and via advisory panels.</p>	<p>Research findings will identify key waste priorities impacting Indigenous communities in Australia, including the identification of harm caused to regional communities by poor hazardous waste management practices.</p> <p>Research findings may identify new market pathways and roles for Indigenous communities in hazardous waste management.</p>	<p>Final report identifying hazardous waste, substances and pollutants research priorities for Australia, with reference to the impacts on Indigenous communities, harm caused by hazardous waste management practices, and potential benefits for identified markets and roles for communities.</p>

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<p>NESP SCaW Hub</p>	<p>Engaged in the development and design of project and outputs.</p> <p>Findings and outputs to be communicated to project contributors via project workshops, informal communication and presentations.</p>	<p>Research results will be used by the SCaW Hub and IP3 to identify priority hazardous wastes for short-, medium- and long-term research and development effort.</p> <p>Inform the development of strategy for the Hazardous Wastes, Substances and Pollutants Impact Priority Area.</p>	<p>Final report identifying hazardous waste, substances and pollutants research priorities for Australia.</p>
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# Indigenous consultation and engagement

The effect of hazardous wastes on the health, cultural, social and economic well-being of Indigenous communities is not well understood and offers a significant research opportunity. What research may be undertaken will be driven by the priorities of Indigenous communities involved in the codesign, but could include the identification of hazardous waste types harmfully impacting Indigenous communities and beneficial opportunities for treatment and identification of potential employment and market opportunities for Indigenous communities. For this, we need to have a clear understanding on generation, toxicity, bioavailability and ecological and cultural impacts of hazardous wastes. We will also require understanding about the economics associated with treatment. Improved understanding of these areas will lead to the prioritisation of key hazardous wastes for management in Australian Indigenous urban, regional, and remote communities for the short, medium and long term. The potential for Indigenous cultural and intellectual property will be explored throughout the project and will be managed through the Hub's Indigenous Partnerships Strategy and Indigenous leaders involved in codesign, with strengthened dialogue and participation from communities and their partners.