Annual progress report
1 January–31 December 2022

National Environmental Science Program
Resilient Landscapes Hub

Version	Date of issue	Author	Comments
1	7 April 2023	Michael Douglas	Draft
2	19 May 2023	Michael Douglas	Final

Certification of *2022 Annual progress report*

Hub Leader certification

As Hub Leader, I certify that I have taken adequate steps to reasonably assure that:

- each required report component is attached
- the contents of each component of the report are complete and accurate in all material respects
- funds have been used for the purpose for which they were provided and all funding conditions have been met, recipient and other contributions have been received, and appropriate oversight has been maintained of hub projects, their progress, performance and budgets during the reporting period
- all relevant risks to project delivery have been notified to the department in this and previous reports and that appropriate steps are being taken to manage those risks
- the hub and its sub-contractors have current workers compensation and public liability insurances, as required under the funding agreement
- any carryover of project funds has been allocated as required under the funding agreement, to projects or hub activities in the next reporting period/research plan.

Signature	*Michael Douglas*
Name	Michael Douglas
Position	Hub Leader
Date	19 May 2023

Hub Steering Committee Chair certification

As Steering Committee Chair, I certify that any issues of concern or matters raised during steering committee meetings where the draft progress report was discussed have been adequately resolved, amended or incorporated into the final report submitted to the department.

This annual progress report was endorsed by the steering committee on 7 April 2023.

Signature	*Ian Cresswell*
Name:	Ian Cresswell
Position:	Hub Steering Committee Chair
Date:	19 May 2023

Acknowledgement of Country

We acknowledge the Traditional Owners of Country throughout Australia and their continuing connection to and stewardship of land, sea and community.

We pay our respects to them and their cultures and to their Ancestors, Elders and future leaders.

Our Indigenous research partnerships are a valued and respected component of National Environmental Science Program research.

Contents

Letter from the Hub Leader

I am pleased to present the *2022 Annual progress report* for the Resilient Landscapes Hub of the Australian Government's National Environmental Science Program (NESP).

Resilient landscapes are those able to recover from disturbance, whether that is fire, flood, drought, invasive and feral species, clearing or climate change. The Resilient Landscapes Hub has a unique opportunity to make a positive impact on the management of Australian terrestrial and freshwater ecosystems and improve their resilience. The hub began this journey by listening to policy-makers and decision-makers within the Department of Climate Change, Energy, the Environment and Water (the department) to ascertain their research needs and subsequently co-develop projects to meet those needs. Given the recent development of policy initiatives such as the *Threatened species action plan 2022–2032* and the next phase of the **National Landcare Program**, it is timely that the hub is collaborating with department staff to design user-driven research to inform policy and practice.

In addition to the department, we have reached out to other research users including Natural Resource Management (NRM) Regions Australia, National Landcare Network (NLN), Australian Land Conservation Alliance (ALCA), and state and territory governments. These consultations will continue into 2023 as we shape our research portfolio around aligning shared priorities.

We have close working relationships with the other 3 NESP hubs (Climate Systems Hub, Marine and Coastal Hub, Sustainable Communities and Waste Hub) and have met with the other hub leaders on numerous occasions. We can clearly see the importance of the cross-cutting initiatives and how they intersect with the initiative hosted by our hub – the 'Threatened and migratory species and threatened ecological communities' initiative. For example, many of these species and communities may be affected by climate change and many occur in marine and coastal ecosystems and protected places, so they are relevant to the work of the other hubs.

Our Hub Steering Committee (HSC) met 3 times during 2022, supported by the Research Executive Committee (REC) that provides project development and management guidance. We also extended our partnership agreements with our research-provider partners from 7 to 11 organisations.

Our hub **website** contains information on all the people involved with the hub, our projects and updates on news from the hub. Resources from the previous Northern Australia Environmental Resources Hub (from the first phase of NESP) are also contained within the website. The hub's social media channels are engaging with research users and the broader community.

Our website also provides an overview of research activity from Research Plan 2022 (RP2022) and tranche 1 of Research Plan 2023 (RP2023). This research builds the

foundation for the hub by investing in projects that support the scoping, planning and co-design of our priority research focused on themes that are critical for resilient landscapes.

In 2022, we consolidated the hub's research planning functions and built on the 7 theme-based research projects from 2021 that laid the foundation for the applied research that commenced in 2022.

The first step in our co-design process is to consult with research users to identify priority knowledge gaps and research needs. RP2023 is focusing on high-priority projects that meet the needs of the department and other stakeholders with aligned priorities. Consultation meetings with research users continued through 2022 and we are currently finalising projects for tranche 2 of RP2023.

RP2023 includes research projects to support major new investments by the department. For example, one research project will develop tools for the management of grassy weeds which will complement and support the Australian Government's $10 million commitment for the management of gamba grass in the NT. The government also made a $200 million commitment to the Urban Rivers and Catchments Program, which our hub will support through a project on urban river restoration. This is one of 4 projects in RP2023 focused on the conservation of freshwater biodiversity, including prioritising and evaluating management actions for threatened fish species in Victoria, Queensland and Western Australia.

Recognising the government's commitment to doubling the Indigenous ranger program, RP2023 includes the development of a platform that will support Indigenous rangers to monitor and manage Country as well as an expansion of our research partnership with the Indigenous Desert Alliance (IDA) focused on threatened species in desert landscapes. RP2023 also includes 2 projects aimed at supporting Australia's recent commitments to the goal of protecting 30% of our land and oceans by 2030, with research on identifying important areas for protection and as well as improved methods for monitoring and managing the resilience of existing protected areas.

Our current research project activities include:

- **Solutions science for resilient landscapes**
- **Strengthening resilience to threatening processes and extreme events**
- **Restoring and recovering landscape resilience**
- **Socioeconomic insights for resilient landscapes**
- **Monitoring resilient landscapes**
- **Indigenous knowledge and managing the Indigenous estate**
- **Cross-cutting initiative research**
- **Addressing Kakadu's strategic research needs**
- **Best-practice management for feral cats and red foxes**
- **National overview of monitoring frameworks and tools for Ramsar sites**
- **Protecting threatened species in safe havens**
- **Queensland threatened lizard survey**
- **Using integrated data analysis to assess regional transferability**
- **Water planning in north Queensland**

- **Supporting the strategic management of invasive grasses**
- **Planning for catchment resilience and threatened-species recovery from extreme events in Queensland's Moonaboola (Mary River)**
- **Enhancing the resilience of urban rivers: informing the regional restoration of the Djarlgaroo Beeliar (Canning River, Perth)**
- **Guiding the strategic management of freshwater fish**
- **Ecological and Indigenous values of south-western Australian rivers**
- **Developing an Indigenous monitoring platform**
- **Research to support the management of priority desert threatened species**
- **Methods for mapping areas important for biodiversity**
- **Managing and monitoring resilience in Australia's national parks**.

2023 will be an even bigger year for research planning and project development, with a second tranche of RP2023 projects being considered by the HSC in March 2023 and submission of Research Plan 2024 in September. The new research plans include a broader range of research partners and research users, and framing is in response to an updated set of research priorities.

The hub's research priorities were refined through a series of co-design workshops with sections of the department and were updated following the change of government and subsequent restructure of the department in late 2022. They were endorsed by the HSC in December 2022.

It is with great enthusiasm that I provide this *2022 Annual progress report* for the Resilient Landscapes Hub.

Management

NESP is a long-term commitment by the Australian Government. The program funds environmental and climate research. The second phase of NESP builds on the foundations of past work and funds 4 research hubs from 2020–21 to 2026–27.

The Hub Leader, Michael Douglas, is based at the host institution, The University of Western Australia (UWA). The Deputy Hub Leader and Senior Indigenous Facilitator, Stephen van Leeuwen, is based at Curtin University (Curtin). The Cross-cutting Initiative Leader, Helene Marsh, is based at James Cook University (JCU).

Our HSC was established in 2021 and is led by an independent Chairperson. In addition to members from the department, the HSC includes a representative from the Cross-Jurisdictional Chief Environmental Scientists (scientists from state and territory governments), as well as representatives from 3 key research users with a national membership (NRM Regions Australia, NLN and ALCA). The terms of reference for the HSC include:

- providing strategic direction for the activities and research conducted by the hub
- ensuring the alignment of activities and research to the interests and needs of the hub's research users
- connecting the hub's research questions, activities and outputs to relevant policy, planning and action relevant to the hub and research users
- reviewing and endorsing research plans prior to approval by the department
- reviewing and endorsing progress and financial reports prior to approval by the department
- making recommendations for addressing project-level issues, supported by user-satisfaction reporting and related key performance indicators.

Membership of the HSC is currently: Ian Cresswell (Chair), Michael Douglas (Hub Leader; UWA), Stephen van Leeuwen (Deputy Hub Leader and Senior Indigenous Facilitator; Curtin), Kate Andrews (NRM Regions Australia), Margaret Byrne (Western Australian Department of Biodiversity, Conservation and Attractions), Kerry Olsson (NLN, as a proxy for Jim Adams), Jody Gunn (ALCA), and from the department: Lisa Nitschke (Environmental Science and Nature Based Solutions Branch), Ilse Kiessling (Protected Species and Ecological Communities Branch), Fiona Fraser (Office of the Threatened Species Commissioner) and Barbara Musso (Parks Australia). Helene Marsh (Cross-cutting Initiative Leader) is an observer on the committee.

The committee met on 3 occasions during 2022 and endorsed the *2021 Annual progress report*, RP2022 (tranche 1 and tranche 2) and RP2023 (tranche 1). With the support of the Australian Government and the HSC, we have continued to support 4 key strategies that provide critical program guidance:

- *Indigenous partnerships strategy*
- *Communication strategy*
- *Knowledge brokering strategy*
- *Data management strategy.*

In 2022, the REC continued its important role with the following terms of reference:

- lead and manage the research program
- monitor and review research project design and delivery
- provide advice and report to the HSC on program progress, financial management and strategic direction of the program
- facilitate collaborative arrangements among consortium members by agreeing on a set of partner operating principles
- ensure that if scientists leave the hub, arrangements are put in place so that the meeting of milestones and delivery of project outputs are not compromised
- support preparation of an annual report and progress reports to funders and program partners
- monitor the implementation of the hub's strategies (knowledge brokering, communication, Indigenous partnerships and data management)
- represent, coordinate and communicate on behalf of consortium members' interests.

Membership of the REC includes Michael Douglas (Chair), Libby Pinkard (CSIRO), Jennifer Firn (Queensland University of Technology [QUT]), Diane Jarvis (Northern Node host – JCU), Helene Marsh (JCU), Guy Ballard (University of New England [UNE]), Vanessa Adams (Southern Node host – University of Tasmania [UTas]), Samantha Setterfield (Western Node host – UWA), Stephen van Leeuwen (Curtin) and Mark Kennard (Eastern Node host – Griffith University [GU]).

The committee met regularly throughout the year, normally on a fortnightly basis.

We finalised agreements with our partners comprising the REC membership in 2021 and 2022, closely following the format of the Head Agreement established between the department and UWA. These agreements included JCU (including funding for the Cross-cutting Initiative Leader), GU, CSIRO, UTas, Curtin (including funding for the Senior Indigenous Facilitator), UNE, QUT, University of Newcastle, IDA and Charles Darwin University.

In 2022, the Head Agreement between the department and UWA was revised to address a number of changes including:

- updated department name and contact details
- changed 'mission' to 'initiative'
- changed name and role of the cross-hub committee
- updated hub research partners and specified personnel
- changing milestone schedule to payment on acceptance of final report, rather than draft.

We have completed recruitment action that has built our administration, communication and knowledge brokering teams.

Research

NESP hubs have been designed to deliver world-class, practical, evidence-based research to inform on-ground management and policy decisions. This investment helps build adaptation capacity and resilience in Australia's natural environment and communities.

NESP research has real impact through partnerships and collaboration between researchers and research users, including policy-makers, to deliver proven outcomes. Environmental decision-makers are key partners and are encouraged to articulate their needs to researchers, provide feedback on the quality and usefulness of the research outputs, and be engaged in the communication of how this information has informed policy.

NESP research listens to and prioritises the research needs of Indigenous land and sea managers, weaves together Indigenous and western environmental knowledge systems, and supports Indigenous-led approaches to strengthening and sharing knowledge.

New and existing NESP research findings are available to use and are accessible at Australian Government and hub websites.

The Resilient Landscapes Hub is delivering a body of research that includes short-term and long-term projects. Broadly, the research priorities of the Resilient Landscapes Hub are:

- applied research to support the management of Australia's terrestrial and freshwater habitats, including a focus on bushfire recovery, impacts of feral animals and invasive species, and accessible science to assist land managers to create and maintain resilient, sustainable and productive landscapes
- targeted biodiversity and taxonomy products to support efficient system monitoring
- environmental monitoring systems and decision-support tools
- cross-hub coordination for the cross-cutting 'Threatened and migratory species and threatened ecological communities' initiative to support policy development, program management and regulatory processes to protect Australia's environmental assets in terrestrial, Ramsar and marine environments.

Our current key research themes include:

1. **Solutions science for resilient landscapes**
   - research approach and planning
   - building capacity for 'solutions science'
   - evaluation and learning
2. **Strengthening resilience to threatening processes and extreme events**
   - environmental weeds and diseases
   - invasive animals
   - bushfire management
   - wetlands and water management
3. **Restoring and recovering landscape resilience**
   - landscape restoration
   - species recovery

4. **Socioeconomic insights for resilient landscapes**
   - evaluating the effectiveness of environmental plans, policies and actions on biodiversity outcomes
   - planning for resilient landscapes
   - implementing plans, policies and actions
5. **Monitoring resilient landscapes**
   - the role of new technology in monitoring
   - prioritisation and integration of monitoring activities
   - citizen science and community-based monitoring
   - management of monitoring data
   - monitoring, evaluation and standards frameworks
6. **Indigenous knowledge and managing the Indigenous estate**
   - research to support Indigenous Australians and their joint-management partners in managing the Indigenous estate
   - mobilising Indigenous knowledge to better understand, manage and conserve Australia's environments
7. **Cross-cutting initiatives**
   - Threatened and migratory species and threatened ecological communities (led by the Resilient Landscapes Hub)
   - Protected place management (led by the Marine and Coastal Hub)
   - Climate adaptation (led by the Climate Systems Hub)
   - Waste impact management (led by the Sustainable Communities and Waste Hub).

Progress towards research delivery

As outlined in the Head Agreement established between the department and UWA (signed 21 May 2021), activity outcomes include research that supports:

- management of Australia's terrestrial and freshwater habitats, including a focus on bushfire recovery, feral animals and invasive species impacts
- targeted biodiversity and taxonomy products to support efficient system monitoring
- environmental monitoring systems and decision-support tools.

The activity also includes delivering the cross-cutting initiative research focused on threatened and migratory species and threatened ecological communities. As stated in the Resilient Landscapes Hub research scope, the activity outcomes related to this initiative include:

- delivering tools and advice to support the conservation of habitats important for priority threatened species, threatened ecological communities and migratory species
- updating the national list of threatened ecological communities and species
- improving detection of cryptic, 'difficult' and other data-deficient species
- monitoring and supporting the management of the recovery of species and communities after extreme events.

Our research is designed around a participatory approach that is driven by research users, as outlined in Figure 1 below.
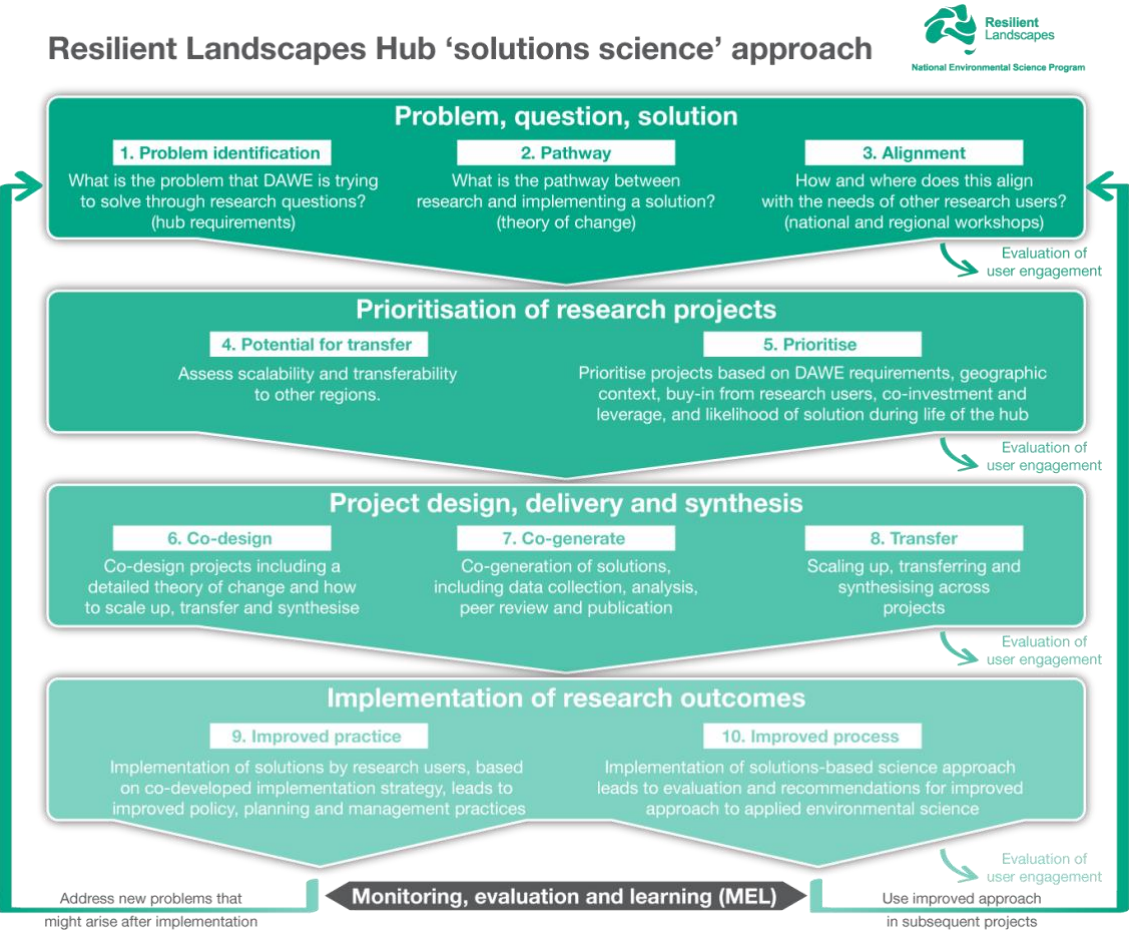

Figure 1. Research design, implementation and evaluation process.

In 2021 and 2022, we held a range of consultation meetings with department staff and external research users to better identify research needs and priorities. These consultations resulted in the identification of a number of potential areas where research could make a significant contribution to solving key environmental challenges. The outcomes of these workshops were the development of 7 projects that were approved in RP2022 and an additional 8 projects that were approved under tranche 1 of RP2023. A second tranche of projects under RP2023 is being developed for approval prior to June 2023.

A summary of these projects follows.

Title	Summary
Project 2.1. Assessing risks to the environment from water-resource development in northern Australia, using north Queensland as a case study	To ensure biodiversity is protected, individual developments in northern Australia are currently assessed under the *Environment Protection and Biodiversity Conservation Act 1999* and state planning legislation. However, there is a need to take a broader regional approach to assessing risks from cumulative impacts of multiple developments. This project will use the western Cape York Peninsula and south-eastern Gulf of Carpentaria region in north Queensland as a case study to examine existing risk-assessment frameworks for water-resource development. The project will collate information on environmental and cultural values for waterways in north Queensland and will synthesise potential environmental impacts on freshwater species from across northern Australia. It will develop a pathway to improve community engagement and identify knowledge gaps to guide NESP research to improve outcomes for environmental and cultural values. The project will also contribute to integrated planning/assessment work within the department's North Queensland Assessments contract project (CI: A. Dale).
Project 2.2. Best-practice management of feral cats and red foxes	This project will utilise facilitated expert workshops to identify (i) best-practice management methods for invasive meso-predators and (ii) key knowledge gaps that require further research to inform best-practice management. This information will support practitioners to improve real-world management outcomes and provide clear direction for research on invasive meso-predator management in Australia.
Project 2.3. Using integrated data analysis to assess regional transferability	This project will help decision-makers determine the extent to which research that is undertaken in one region is transferable to another. It will also help identify areas that are most and least suited to different regional-planning approaches. First, it will add relevant climate and threatened-species data to an existing integrated dataset. Second, it will analyse the data to identify (i) groups of regions that share 'similar' social, economic and biophysical characteristics and regions that are 'similar' to particular locations (e.g. priority places, protected areas) and (ii) regions that have characteristics most suited to particular planning approaches (that focus on conservation and ecological systems).
Project 2.4. National overview of monitoring frameworks and tools for Ramsar sites	One of Australia's key obligations under the Ramsar Convention is to maintain the ecological character of its internationally listed Ramsar wetlands, with these responsibilities shared by the Australian Government in partnership with state and territory governments and non-government site managers. Australia's 66 Ramsar wetlands cover more than 8.3 million hectares and exhibit a range of biophysical and ecological characteristics. Each Ramsar wetland is essentially unique in the context of spatial and temporal pressures on ecological character. Appropriate monitoring using context-specific indicators is key to understanding changes in condition and ecological character of Ramsar sites in response to natural and anthropogenic disturbances. A well-designed monitoring program can provide critical information to enable site managers to adaptively manage and assess the effectiveness of management interventions and actions to restore and improve condition. Given the specific spatial and temporal context of each Ramsar wetland, this project will develop a better understanding of the monitoring frameworks appropriate for use at Ramsar sites and identify current knowledge gaps to guide research and development of tools to build capacity to monitor and manage Ramsar wetlands.

Title	Summary
Project 2.5. Addressing Kakadu's strategic research needs	The Indigenous-owned lands of Kakadu National Park are World Heritage-listed and globally significant. The natural and cultural values of Kakadu are at risk from a range of threats that will intensify over time. To manage these threats, there is a pressing need to develop a Kakadu research strategy. This project will deliver a research strategy that will provide guidance on both what research needs to be done in Kakadu and how it should be conducted. The project will also provide the foundation for a co-designed program of research in which NESP hubs and their cross-cutting initiatives address Kakadu's research priorities.
Project 2.6. Protecting threatened species in safe havens	This project will assess the current safe-haven network, which is designed to protect predator-susceptible species, especially those that are threatened. Currently, safe havens are generally designed to protect mammals from introduced carnivores, such as foxes and feral cats, and use either fenced areas or islands from which predators have been removed. There is a need to develop a list that identifies other predator-susceptible, threatened species that are currently not represented in safe havens. Such a list will assist with the prioritisation of resources to support the expansion of species in safe havens. This project will update the status of the network and identify additional species that could potentially be protected in safe havens. These species may be expanded from just mammals to, for example, reptiles and ground-dwelling birds.
Project 2.7. Research to support the management of priority desert threatened species	This project aims to support Indigenous rangers to reverse the trajectories of 3 priority desert species – the bilby, great desert skink (Tjakura) and night parrot. The hub will provide scientific support to desert ranger groups through co-development of standardised monitoring techniques for these species and co-design of research projects that will lead to improved management of introduced predators and fire to protect threatened species. All programs will use a 2-way science approach that integrates local Indigenous knowledge with the latest technologies to develop efficient, effective and user-friendly monitoring techniques and threat-management programs.
Project 3.1. Supporting the strategic management of invasive grasses	This project aims to support the strategic management of invasive grasses in northern Australia – in particular, gamba grass, para grass and olive hymenachne – to reduce their impacts on biodiversity. This project will provide support to managers of protected areas and Indigenous ranger groups through co-development of user-friendly mapping, monitoring and decision-support tools. The project will also support more effective threat-abatement programs by identifying methods for prioritising areas for on-ground control and rehabilitation of ecosystems invaded by these weeds.

Title	Summary
Project 3.2. Planning for catchment resilience and threatened species recovery from extreme events in Queensland's Moonaboola (Mary River)	This project aims to identify practical solutions for catchment-scale restoration and threatened-species recovery in south-east Queensland. Recent extreme weather events (causing severe droughts, heat waves, wildfire and floods), habitat degradation and invasive species are posing increasing risks to the resilience and long-term persistence of highly valued and threatened freshwater species and the integrity of critical wetland habitats in the region. The project will focus on the Mary River (Moonaboola) catchment in Queensland – a hotspot of threatened freshwater and riparian species (including the Mary River turtle, Australian lungfish, giant barred frog and water mouse) that flows into the Ramsar-listed Great Sandy Strait, adjacent to the K'gari (Fraser Island) World Heritage area. By working with local natural resource management groups, Traditional Owners, governments and other stakeholders, this project will (i) fill critical knowledge gaps on threatened species distributions and habitat requirements, ecological and cultural values, and threats, (ii) prioritise on-ground restoration actions to benefit multiple threatened species, (iii) undertake targeted implementation trials of habitat-restoration measures for key species, and (iv) design a monitoring program to evaluate restoration success. The project will deliver applied research outcomes to support ecosystem restoration after extreme events and planning for threatened-species recovery at national and state levels. The approaches developed and trialled in this project will be transferable to other catchments and threatened species.
Project 3.3. Enhancing the resilience of urban rivers: informing the regional restoration of the Djarlgaroo Beelier (Canning River, Perth)	Urban rivers sustain biodiversity and provide important amenity and connections to Country but they face complex and accelerating threats. Creating resilient urban rivers that protect biodiversity requires strategic landscape-level prioritisation, targeted on-ground actions based on evaluation of past efforts, and appropriate monitoring of future outcomes. This project seeks to achieve this using the Djarlgarro Beeliar (Canning River, Western Australia) as a case study. It will build on research from the first phase of NESP and work collaboratively with key stakeholders, including Whadjuk Noongar Traditional Owners, to help implement and evaluate the Australian Government's Urban Rivers and Catchments Program.
Project 3.4. Guiding the strategic management of freshwater fish	This project will develop a strategic approach to identifying cost-effective management actions aimed at protecting freshwater fish biodiversity in rivers and streams across Victoria. We will develop up-to-date information describing (i) current and potential future species distributions and biodiversity patterns across the region, (ii) how those patterns are influenced by historic and emerging threats, and (iii) the costs and relative impact of different combinations of management actions that can mitigate those threats. We will work closely with river managers to develop principles and approaches to assist them in managing freshwater fish, including the protection and restoration of populations of threatened species.
Project 3.5. Ecological and Indigenous values of south-western Australian rivers	This project aims to support water management that protects ecological and Indigenous values by undertaking targeted research on rivers in south-western Australia. Subject to further consultation, the study will assess the transferability of a hydro-socio-ecological model developed in northern Australia to systems in south-western Australia. The Donnelly River catchment has been identified as a priority system by Western Australian Government water managers and will be the initial focus area for research. Project outcomes will support water-management decisions to protect river flows for aquatic and riparian habitats that support 5 species listed in the Australian *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Research will also address priorities identified in the 2020 Samuel review of the EPBC Act and the

Title	Summary
	Productivity Commission's 2020 National Water Reform inquiry, providing a framework for the inclusion of Indigenous knowledge and cultural values in water planning.
Project 3.6. Methods for identifying areas important for biodiversity	Protected areas are frequently called the 'cornerstones' of global biodiversity conservation strategies. Covering 17% of land and 8% of sea areas, protected areas are also one of the largest land uses in the world. The Convention on Biological Diversity specifies global goals and targets for conserving biodiversity – in particular, the role of conserved and protected areas. The post-2020 global biodiversity framework is expected to, among other things, commit signatories to protecting 30% of land and sea areas by 2030, with an emphasis on conserving and protecting areas that are important for biodiversity. This project will review the methods available for identifying areas important for biodiversity to guide future national-scale efforts to delineate these areas and prioritise appropriate actions within them.
Project 3.7. Managing and monitoring resilience in Australia's national parks	Protected areas are essential to address the species-extinction crisis and restore biodiversity and resilient landscapes. The government has committed to protecting 30% of land and sea by 2030. Alongside a more expanded and representative network, it is essential to ensure that the values of existing national parks are maintained. This requires strategic prioritisation of management activities, informed by rigorous monitoring and evaluation, targeted research on critical gaps in our knowledge about species and systems, and development and testing of new technologies and methods for monitoring and management. This project will address urgent questions for the management of Commonwealth national parks (which include World Heritage areas, Ramsar sites and priority places under the Australian Government's *Threatened species action plan 2022–2032*) and provide tools and case studies to benefit research users in other places. It has 3 components: (i) developing an integrated monitoring program for desert flora and fauna, (ii) developing acoustic monitoring methods to support species recovery and conservation, and (iii) informing the strategic management direction of an island restoration program.
Project 3.8. Developing an Indigenous ranger monitoring program	This project aims to provide guidance and support to Indigenous practitioners on the protocols and appropriate technologies to employ to facilitate effective and efficient monitoring and evaluation of on-Country management programs. This will be achieved by: (i) developing an Indigenous-tested toolbox of protocols and technologies appropriate for monitoring which are accompanied by guidance from Indigenous practitioners on how, why, when and where to deploy the tools, (ii) building of and honouring established Indigenous monitoring projects through making them available to new Indigenous practitioners, (iii) validating the veracity of methodologies and technologies employed by and recommended to Indigenous practitioners to ensure they are fit for purpose and culturally appropriate, and (iv) support the development of methods by data managers (e.g. Terrestrial Ecosystem Research Network) for the enduring storage, management and subsequent analyses of monitoring data where Indigenous practitioners maintain sovereignty over their data and how it is used, in keeping with the principles of FPIC (free, prior and informed consent), CARE (collective benefit, authority to control, responsibility, ethics) and FAIR (findability, accessibility, interoperability, reusability).

Research projects

Attachment A lists the projects currently funded under the Resilient Landscapes Hub and provides information on the project status, information on outputs, and links to products for all projects (where available). Exceptions to the *NESP Data and information guidelines* are also noted.

Cross-cutting initiatives

The Resilient Landscapes Hub leads the cross-cutting 'Threatened and migratory species and threatened ecological communities' initiative. This initiative supports policy development, program management and regulatory processes to improve the status of Australia's threatened and migratory environmental assets in terrestrial, freshwater and marine environments by working with all NESP initiatives and hubs to add value to the outcomes of the overall program.

The Hon Tanya Plibersek, Minister for the Environment, launched Australia's *Threatened species action plan 2022–2032* in late 2022. The plan identifies 110 priority threatened species and 20 priority places, as well as 22 targets to achieve by 2027 for species, places and habitats, insurance, First Nations, planning, research and engagement. The Resilient Landscapes Hub will address the research needs and targets identified in the action plan and work with land managers to design, implement and monitor priority on-ground activities.

All 4 hubs are working together in the delivery of research plans. Planning activities include scoping, prioritising and co-designing a suite of projects to be considered for inclusion in the research plans of all 4 hubs and the strategic research plans for the other 3 cross-cutting initiatives.

The hub developed a *Cross-cutting initiative strategy* in late 2021. This living document was updated in 2022 and includes a summary of the actual and proposed investments in the first 4 years of NESP in this initiative. The estimated budget (including NESP funding and co-contributions) totalled more than $65 million (GST-exclusive). The strategy was submitted to the Senate Inquiry into Australia's Faunal Extinction Crisis.

Hub activities relevant to the cross-cutting initiative to RP2023 (tranche 1) are summarised in the following table (note: some projects are relevant to more than one thematic area):

Solutions science for resilient landscapes	Further developing and implementing a user-driven, solutions-science framework for research to facilitate recovery of threatened and migratory species and threatened ecological communities: (i) using integrated data analysis to assess regional transferability.
Strengthening resilience to threatening process and extreme events	Developing project plans for research to support the management of threats to listed entities caused by the following key threatening processes: (i) invasive grasses in northern Australia (Kakadu, West Arnhem, North Qld), (ii) best-practice management for feral cats and red foxes, and (iii) protecting threatened species in safe havens.

Restoring and recovering landscape resilience	Developing project plans for research to support the restoration of threatened ecological communities and improve the recovery of threatened and migratory species: (i) planning for catchment resilience and threatened-species recovery from extreme events in Queensland's Mary River, (ii) guiding the strategic management of freshwater fish, and (iii) addressing Kakadu's strategic research needs.
Socioeconomic insights for resilient landscapes	Developing project plans for testing and articulating processes to implement a conceptual framework of socioeconomic factors that need to be considered to promote conservation, especially of threatened and migratory species and threatened ecological communities.
Monitoring resilient landscapes	Developing project plans for research on how to develop robust multi-methods and emerging technologies to monitor threatening processes, threatened and migratory species and threatened ecological communities: (i) managing and monitoring resilience in Australia's national parks – Christmas Island, Uluru, (ii) national overview of monitoring frameworks and tools for Ramsar sites, (iii) methods for mapping areas important for biodiversity, and (iv) Qld threatened lizards survey.
Indigenous knowledge and managing the Indigenous estate	Developing project plans to emphasise how Indigenous knowledge is employed to help Traditional Owners manage the Indigenous estate and support research to monitor threatened and migratory species, threatened ecological communities and threatening processes, especially on Indigenous Protected Areas: (i) developing an Indigenous ranger monitoring platform and (ii) research to support the management of priority desert threatened species.
Cross-cutting research	Conducting a desktop study to improve conservation planning for nationally listed species and ecological communities through regulation and management principles co-designed with the department. The project focus expanded in response to the government's *Nature positive plan* and will inform the department's extension work on conservation planning when the draft environment bill is released mid-year.

Emerging priorities

Each year, specific emerging priorities may be identified by the department, hubs or third parties for delivery as research projects. If endorsed by the department, the hub will develop research project/s to address the emerging priority.

Hubs will be flexible and adaptable to respond to emerging priorities, with the ability to rapidly scale output, bring in external expertise or respond if additional resources are made available. Hubs are required to set aside 10% of their annual funding (in any category) so that they can respond to emerging priorities. These funds can be rolled into the subsequent year if they are not used.

Emerging-priority projects will be developed outside the hub's annual research-proposal process. Once emerging-priority projects have been approved, the hub's research plan and activity budget for the relevant calendar year will be amended and emerging priorities will be included in the hub's annual progress reports.

There were no emerging-priority projects in 2022.

Performance against milestones

Performance against funding agreement milestones

All milestones for the reporting period and to date have been met as per the funding agreement (Milestones 1 to 12).

Performance against the research plan milestones

Information on project progress and performance is provided in **Attachment A**.

Measuring success

Hub outcomes and outputs

In 2022, the hub was primarily scoping, planning and delivering some early projects. Accordingly, while we aim to deliver best-practice, publicly available research, most outcomes and outputs from our research will not become available until 2023 and beyond. Research projects are being designed to have outcomes that are transferable to research users and regions beyond the specific target audiences directly involved in our projects.

In 2023, we also anticipate working with the department and other NESP hubs to develop the NESP monitoring and evaluation plan (at a program level) and any NESP-specific impact statement/s, pathway and evaluation activities.

Short-term to medium-term outcomes – quantitative measures

Table A: Quantitative performance measures (short-term to medium-term outcomes).

Notes: Reporting period means the calendar year preceding the annual progress report. For the second year of these NESP hubs, the reporting period is January to December 2022. Unless specified otherwise, the term 'research user' refers to departmental or external users. The data below will ideally provide numbers derived from routine hub monitoring and reporting. Where an estimate is provided, please explain how it was determined.

No.	Performance measure	Result for reporting period (numerical only)	Explanation, if any

1	Proportion of projects (active or completed in the reporting period) for which there is a research user actively engaged in the project:
	  a) co-design
	  b) research delivery
	  c) use and research uptake
		a) 18 / 18
		b) 18 / 18
		c) 18 / 18
			All projects have research-user engagement.

2	Research outputs in the reporting period provided to research users on time and as identified in the approved research plans:
	  a) total number
	  b) proportion
		a) 1
		b) 100%
			Project 2.2 produced a workshop report for the department.

3	Proportion of completed research projects that are confirmed to meet the needs of departmental research users as identified at project co-design stage	nil	There are currently no completed projects.

4	Number of projects that:
	  a) are Indigenous-led
	  b) meet research and management priorities of Indigenous stakeholders
	  c) are Indigenous-led projects that also meet research and management priorities of Indigenous stakeholders.
		a) 2 / 18
		b) 2 / 18
		c) 2 / 18
			The Indigenous Desert Alliance leads project 1.7 and Stephen van Leeuwen leads project 2.8.

5	Number of peer-reviewed, NESP-funded publications during the reporting period	2	Projects 1.4 and 1.5 have produced scientific papers.
6	Number of NESP research citations in other researchers' publications during the reporting period	nil	No citations were recorded during the reporting period.
7	Number of completed NESP products, research publications, datasets and metadata that are discoverable and accessible in accordance with *NESP data and information guidelines* and the funding agreement	nil	No datasets were planned to be completed in the reporting period.

No.	Performance measure	Result for reporting period (numerical only)	Explanation, if any
8	a) The number of datasets and management tools produced by hub research and made public b) The number of other datasets and management tools that benefited from hub research and outcomes. Management tools include but are not limited to monitoring systems, web-based decision support systems; environmental management tools for Indigenous communities, waters and land management; plans of management for Indigenous Protected Areas (IPAs), co/jointly managed parks, marine park plans of management, conservation agreements).	a) 1 b) nil	Project 2.3 produced a dataset of NRM region profiles.
9	Number (full-time equivalents) during the reporting period of: a) PhD students b) post-doc and early-career researchers c) mid-career researchers d) Indigenous researchers e) Individual volunteers (total) f) Individual Indigenous volunteers (total) g) Indigenous sub-contractors.	a) 1 b) 13 c) 19 d) 2 e) 1 f) 33 g) 13	Because the program has only recently commenced field-based research, the number of researchers is relatively low. This will increase significantly in 2023 and beyond.
10	Number of knowledge-sharing and communication events and activities held or shared: a) with on-ground managers (general) b) jointly with Indigenous researchers and Traditional Custodians c) that are Indigenous-led.	a) 61 b) 33 c) 11	Primarily these meetings were to engage with research users to scope areas of research activity and to engage with recently commenced projects.
11	Proportion of hub staff and researchers who have completed: a) Indigenous cultural capability training b) Indigenous cultural and intellectual property (ICIP) training c) both Indigenous cultural capability training and Indigenous cultural and intellectual property training.	a) 28% b) 28% c) 28%	A number of members of the HSC and REC have completed True Tracks® training in Indigenous intellectual and cultural property. Further training has been scheduled for project leaders and researchers in 2023. (21 Hub staff out of a total of 76 staff.)
12	Proportion of hub projects overall that fall within the categories of the **Three-category Approach**: a) Category 1 b) Category 2 c) Category 3.	a) 2 /11% b) 11 / 61% c) 5 / 28%	All hub projects fall within one of the 3 categories of the Three-category Approach to Indigenous engagement.
13	Proportion of hub projects that have been developed in consultation with the hub Indigenous facilitator or the Indigenous Facilitation Network	18 / 100%	The hub's Senior Indigenous Facilitator (also Hub Deputy Leader) sits on the HSC and REC and is consulted in the development of all projects.

No.	Performance measure	Result for reporting period (numerical only)	Explanation, if any
14	Number of guidelines about best-practice that the hub has produced or co-produced in the reporting period for: a) knowledge brokering (e.g. *Connecting research with policy: Guide to writing for policy-makers*) b) Indigenous partnerships and products (including design of flagship engagement activities e.g. *Our knowledge our way*, *Three-category Approach*) c) environment and climate management within the scope of the hub's research (e.g. *Guidelines for the translocation of threatened plants in Australia, third edition*, *Standard operating procedures for survey design, condition assessment and trend detection*.	a) 1 b) 1 c) nil	The hub's knowledge brokering and Indigenous partnerships strategies are continuously updated as required.

Longer-term outcomes – qualitative measures

As the hub is at its formative and establishment stage, there are no longer term impacts that can be reported at this time. When available, we will report evidence of emerging, longer term impacts from the hub's research, including:

- proportion of completed research products that have been used by research users to inform policy, programs and management decisions
- evidence of public interest and enhanced understanding about our environment
- improved environmental and waste management
- changes in practices by community or industry
- measures being developed to ensure relationships are maintained between researchers, Indigenous research users and other research users.

NESP impact stories

NESP impact stories are provided at Attachment B (**The long-term impact of research investment**, **Innovative, accessible science communication** and **Embedded partnerships facilitate the design of environmental research**). Impact stories showcase the contribution of NESP-funded research beyond contributions to academia, including to the environment, economy, society, culture, public policy and quality of life.

In future years, we plan to focus our impact stories to address:

- how the hub has collaborated with research users to better understand decision-makers' needs or the key questions that research needs to address
- how the hub is successfully partnering with government, community and industry stakeholders
- how the hub is successfully partnering with Indigenous Australians throughout the work of the hub
- how the hub is using innovative approaches to connect science with policy-making and decision-making
- how the research conducted by the hub has been used to inform on-ground action or policy
- how the hub has improved the national environmental information base through delivery of open-access data or other data-related activities.

Collaboration and partnerships

NESP encourages a collaborative, multidisciplinary approach to environmental and climate research. Key to the success of the hub will be the capacity to foster partnerships across hubs and with a wide range of decision-makers across Australia, including Indigenous communities, to achieve positive environmental, social and economic outcomes.

The hub builds on the leadership and governance model of the previous NESP Northern Australia Environmental Resources Hub which demonstrated excellence in solutions-focused, impactful research that was co-designed with stakeholders, responsive to evolving management priorities, and strongly embraced Indigenous partnership and knowledge. While being hosted by UWA, we have a national footprint based on 4 regional nodes led by universities (Western: UWA; Northern: JCU; Eastern: GU; Southern: UTas) and a national node hosted by CSIRO.

Meetings and engagement

Governance

- Hub Chairs (monthly)
- REC (fortnightly)
- HSC (2–3 times per year)
- All Hub Leaders, Cross-cutting Initiative Leaders, Senior Indigenous Facilitators x 1
- Hub Leaders' meetings (informal)
    - Marine and Coastal Hub, Sustainable Communities and Waste Hub
- Initiative Leaders/Knowledge Brokers
    - Climate adaptation x 2 , Protected place management x 3, Waste impact management x 1.

Department

- Minister's Office
- Hub Liaison Officer (monthly)
- Cross-hub data management group (monthly)
- Co-design workshops
    - invasive species
    - fire
    - water and wetlands
    - restoration and recovery
    - socioeconomic insights
    - monitoring
    - regional planning
- Environment Approvals Division, Queensland North Assessments.

States and territories

- Cross-jurisdictional Chief Environmental Scientists x 2
- State government NRM and environment agencies (most states and territories)

Hub research providers and research users

- Project and priority setting meetings with multiple research-user organisations (non-exhaustive list below)
- Australian Landcare Alliance board, Bush Heritage Australia, IDA, NLN, NRM Regions Australia, Australian Wildlife Conservancy, Centre for Invasive Species Solutions, Feral Cat Taskforce, Kakadu Board of Management, Telstra Foundation, Microsoft, North Australian Indigenous Land and Sea Management Alliance, Water Trust Australia, regional NRM groups (Kangaroo Island Landscapes Board, Mary River) .

Knowledge brokering

The Resilient Landscapes Hub will maximise the impact of its research through the implementation of its *Knowledge brokering strategy* that commits to knowledge brokering activities that:

- contribute to program-level knowledge brokering planning and activities
- strengthen the connections, synthesis and collaboration between other hub staff and the broader NESP partnerships team
- are designed, planned, prioritised and delivered in consultation with the department, research users and other stakeholders to ensure they meet user needs at times and in formats that are most useful
- involve research users in research design, development and implementation to ensure the research meets their needs and aligns with policy, planning and management objectives
- facilitate delivery and adoption of research outputs by research users
- inform the hub's cross-cutting research initiative of threatened and migratory species and threatened ecological communities
- build the capacity of the hub's knowledge-brokering team so that the hub implements best-practice approaches to knowledge brokering
- develop processes and products that synthesise hub outputs and establish a legacy.

In implementing this strategy, the hub will ensure alignment with the broader NESP *Knowledge brokering and communications strategy*.

The hub is well underway in addressing all the major points of the strategy above and has achieved this by primarily focusing on facilitating meetings between researchers and research users during 2022. These meetings reached a broad range of departmental users and the hub has also been flexible in having subsequent meetings with any sections that were missed initially. Synthesising priorities and feedback from such a broad suite of research users has guided the hub in creating a range of projects that have a clear pathway for uptake by research users.

Additionally, the hub has refined our internal processes to ensure that project teams are doing everything possible to facilitate increased knowledge brokering throughout projects. This has included providing them with more information around timelines for feedback and supporting researchers to seek feedback on research outputs.

Communication

The Resilient Landscapes Hub will maximise the impact of its research through communications activities and products outlined in the its *Communication strategy* that:

- contribute to program-level communications planning and activities
- are designed, planned, prioritised and delivered in consultation with the department, research users and other stakeholders to ensure they meet user needs at times and in formats that are most useful
- raise awareness of the hub, its projects and their outcomes, and its cross-cutting research initiative of threatened and migratory species and threatened ecological communities
- meet acknowledgement and accessibility requirements
- support projects to plan and implement knowledge brokering and communication activities
- make research products and findings accessible to decision-makers, communities and other research users during and beyond the life of the program
- develop processes and products that synthesise hub outputs and establish a legacy.

In implementing this strategy, the hub will ensure alignment with the broader NESP *Knowledge brokering and communications strategy*.

Since launching the hub, we've continued to expand our library of **freely available symbols**. Our symbols are a great tool for diversifying and broadening approaches to science and environmental communication. More than 1,000 people have registered to download these symbols and we continue to see them used in innovative and diverse ways.

We're also pleased to share our **updated website** which emphasises improved navigation and accessibility. You can continue to find all the project information and outputs from past research programs, including the Northern Australia Environmental Resources Hub from the first phase of NESP, on the website.

Website and social media statistics for 2022

- Website
    - 43,000 unique page views and 22,300 visitors (2021: ~3,500 views and ~850 visitors)
    - 3 highest-traffic pages: Homepage; Graphics Library; Why barramundi switch sex
    - most came in through 'organic search' (54%) and 'direct' (i.e. typing in our URL) (40%)
- E-newsletter
    - distributed to 2,194 recipients (net gain of 238 subscribers or 12%)
    - 861 opened the email, 264 clicked something in the email
    - 'Symbol library update' news post got the most clicks, then 'Research overview' page, then main homepage
    - 42% open rate vs 33% open rate of our peers
    - 13% click rate vs 6% click rate of our peers
- LinkedIn (note: Feb 22–Feb 23)

- 7,835 impressions (2021: 755 impressions)
- >200% increase in page likes
- Twitter
  - 50,000 impressions (2021: 35,000 impressions)
  - top 3 tweets (impressions) were (i) Symbol library update, (ii) World Wetlands Day, (iii) feral cats/foxes project announcement
  - top 3 tweets (engagement) were (i) Symbol library update, (ii) feral cat workshop report, (iii) Daly River project findings (Northern Australia Hub project)
  - >10% increase in followers
- Facebook
  - reach: 11,500
  - page visits: 467
  - 25% increase in followers.

Indigenous partnerships

The Resilient Landscapes Hub will facilitate effective Indigenous participation and Indigenous-led involvement in the research program (co-design through to co-evaluation) through a participatory '2-way, right-way' approach.

This participatory approach is outlined in our *Indigenous partnerships strategy* and will:

- honour the perspectives and aspirations of our Indigenous partners
- be authentic, inclusive and culturally safe
- seek community consensus on pathways to progress
- build the capacity of both Indigenous and non-Indigenous partners
- utilise appropriate metrics to assess effectiveness and efficiency
- be cognisant of the need to take time.

Our participatory approach will be well planned, tailored, targeted and evaluated with our Indigenous partners. The hub will provide meaningful opportunities for our Indigenous partners to contribute to strategies, initiatives, programs and projects from their conception to completion across the entire life of the hub.

Operationally, our participatory approach will, for example:

- contractually bind all hub partners to the *Indigenous partnerships strategy*
- support induction and training programs that build the cultural competency of our researchers (e.g. True Tracks® training)
- acknowledge community Elders as experts of their Country and ensure they are acknowledged and remunerated appropriately
- initiate procedures to ensure Traditional Owners with the cultural authority to speak for Country are partners of our hub
- celebrate the mutual benefits derived from undertaking research together to find solutions to identified needs.

Project 1.6 (Indigenous knowledge and managing the Indigenous estate) has progressed at a steady pace over 2022, acknowledging the challenges in consultation with First Nations communities and organisations imposed through COVID-19 restrictions and delays in the announcement of the priority places associated with the *Threatened species action plan 2022–2032* and subsequent hub planning processes. As a result of this project, the project leader and team have been able to liaise with several First Nations peak organisations and representative bodies, First Nations research users and non-Indigenous researchers to commence work to identify research priorities or initiate research proposals that address long-standing, no-regrets, First Nations-identified research needs.

Initiated project proposals have includes approval to undertake Project 3.8 (Developing an Indigenous monitoring platform), augment Project 2.7 (Research to support the management of priority desert threatened species), and commence Project 3.3 (Enhancing the resilience of urban rivers: informing the regional restoration of the Djarlgaroo Beeliar [Canning River, Perth]) and Project 3.5 (Ecological and Indigenous values of south-western Australian rivers). Concept plans for proposals associated with culturally significant entities and the national Indigenous environmental research network have also been submitted for review and subsequent endorsement by the HSC and department.

Much of the impetus for the existing projects (approved or concept) has been derived from the Senior Indigenous Facilitator's engagement with other First Nations colleagues at conferences and workshops or on advisory committees and through identification of research priorities identified by First Nations representative bodies, organisations and communities. This has included an ongoing synthesis of the research needs identified in respect to First Nations aspirations as articulated in submission to the *Independent review of the Environment Protection and Biodiversity Conservation Act 1999* and a synthesis of the research needs identified by managers of the Indigenous estate in healthy Country plans or similar biodiversity, culture and land-management documents. Some key outputs and activities from the project are outlined below:

Output or activity	Description and status
Conference, workshop or lecture presentation	Delivered keynote presentation at 2022 National Natural Resource Management Knowledge Conference in Margaret River on 'Healing Country'. Also chaired Indigenous symposium on 'Caring for Country'.
	Delivered keynote presentation on 'Healing Country' at 2022 Western Australian State Natural Resource Management Land and Coastal Conference.
	Delivered keynote presentation at Danjoo Koorliny Social Impact Summit 2022: Caring for Boodja: By Us, For Us, With Us on 'Yarning about boodja – 2-way learning of Noongar and scientific knowledge and how this improves the management of Country'.
	Delivered keynote presentation at Clean Energy and De-carbonisation Masterclass series on 'Balancing the impact of renewable energy projects: environmental and stakeholder engagement'.
	Participated in panel discussion on 'Values of land' on World Soils Day for SoilsWest and Soil Science Australia.
	Participated in panel discussion on 'Best-practice Indigenous inclusion' at Rangelands WA Natural Resource Management annual workshop.

	Participated as an invited facilitator in the 2022 Australian Marine Science Association's Indigenous-led Sea Country workshop in Cairns.	
	Delivered lecture on 'Indigenous land management' to UWA Conservation Biology students	
	Presented lecture and attend Q&A tutorial on 'Indigenous biocultural knowledge and the Indigenous estate' at UWA master class for 'Managing threatened species and ecological communities'.	
	Delivered lecture on 'The Indigenous land estate and stewardship of Country' to Curtin environmental restoration students.	
	Presented lecture on 'The Indigenous land estate and stewardship of Country' to Curtin undergraduate students of 'Integrating Indigenous science and STEM'.	
Training and ranger sector development	In collaboration with IDA and Curtin, developed a field school program that provides exposure for Curtin STEM students to remote Indigenous communities and their needs.	
	In collaboration with IDA, provided oversight to the development of a program to identify and quantitatively assess the cultural key performance indicators to support ranger program funding.	
	Participated on the moderation panel for rounds 4 and 5 of the Western Australian Government's Aboriginal Ranger Program.	
	Progressed alternative models for employment of Indigenous PhD candidates. Alternative model includes increasing the scholarship scheme for Indigenous higher degree by research candidates to $70,000 per annum. Alternative model also encompasses the employment of PhD candidates as a lecturer for 5 years to do research (80%) and mentor (20%) Indigenous undergraduate students. Obtained endorsements from Curtin to mirror UWA Indigenous PhD lecturing agreement.	

Data management

The hub has prepared a *Data management strategy* that aims to:

- manage all data collected through hub activities in accordance with the FAIR (findable, accessible, interoperable, reusable) data principles in a sustainable manner for the long term
- make all hub data and data products freely and openly available unless specific restrictions apply (indefinitely or for a limited time) for reasons of privacy, ethics, sensitivity or commercial-in-confidence
- ensure research outputs are presented in an accessible form that encourages reuse and maximises impact on management, policy-making and decision-making
- ensure published data acknowledges the hub and associated researchers and requires subsequent citation and acknowledgement when reused by implementing appropriate licensing, persistent identifiers and acknowledgment guidelines
- apply existing established research-data management policies, standards and guidelines, and support and engage in the development of evolving standards guiding the direction of national data networks

- promote collaboration and support the work of management agencies, researchers, Indigenous peoples and community groups, through its data management approach.

At the project level, data guidelines are being implemented through project-level research data plans. Completing the data-management plan template has been incorporated into a set of resources for researchers (which includes a handbook) which will form the basis of orientation sessions for project leaders to ensure that the hub delivers on its data strategy. Working with project teams, the hub's Data Wrangler will ensure data-product generation and delivery conforms to FAIR principles where applicable, including by hosting on national repositories for integration into existing systems and databases.

The hub has also been collaborating with data wranglers from other hubs, liaising with data-specific contacts in the partnerships team, and working with the Atlas of Living Australia (ALA; detailed below) to ensure that the hub's approach to data is optimal. This includes refining our internal process for project tracking, particularly around outputs, and ensuring that projects are using best-practice data management from their inception.

The HSC has also expressed an interest in having a greater focus on data by:

- including data management as an agenda item at its meetings
- coordinating data management across hubs
- understanding the wider data landscape, repositories and portals
- promoting consistent language with commonly understood meanings
- commissioning a paper to allow for consideration of key issues around how the hub will manage and implement its *Data management strategy*.

Hub-level risk management

All risks identified in the hub's risk management plan are being actively managed. There have been no additional risks included in the hub's risk management plan since the approval of RP2022.

Financial information

Annual financial reporting

Financial information for the Resilient Landscapes Hub is provided at Attachment C. Hubs require strong financial controls for project budgeting, planning and management purposes, including for managing arrangements with partner research organisations.

As advised by the department, it does not have a need, at this time, to receive detailed project-level financial reporting (i.e. actual expenditure by project) because this is provided in Attachment C to RP2023. Financial reporting against the 4 main expenditure categories – research (applied science, decision tools and practical management options), knowledge capture, communication and administration – are sufficient for the 2022 Annual Progress Report acquittal.

Attachments

- Attachment A – Resilient Landscapes Hub research projects and outputs
- Attachment B – Resilient Landscapes Hub impact stories
- Attachment C – Resilient Landscapes Hub financial information, asset schedule and audit report.