

National Environmental Science Program

Climate Systems Hub research plan 2022



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Contents

Introduction.....	1
The National Environmental Science Program	1
Department role	1
Hub role	1
Purpose of research plan	2
Research	4
Research priorities.....	4
Expected outcomes and outputs.....	8
Hub outcomes and outputs.....	8
Collaboration and partnerships	15
Knowledge brokering, communications and data management	21
Annexure 1: NESP project assessment criteria.....	25

Introduction

The National Environmental Science Program

The National Environmental Science Program (NESP) is a long-term commitment by the Australian Government to environment and climate research. The program:

- provides evidence for the design, delivery and on-ground outcomes for environmental programs
- helps decision-makers, including from Indigenous communities, build resilience
- supports positive environmental, social and economic outcomes.

The first phase of the NESP invested over **\$145 million** (2014–15 to 2020–21) into 6 research hubs and emerging priority research projects. The second phase is investing **\$149 million** (2020–21 to 2026–27) into 4 new research hubs. These hubs are:

- Resilient Landscapes Hub
- Marine and Coastal Hub
- Climate Systems Hub
- Sustainable Communities and Waste Hub.

The NESP is administered by the Department of Agriculture, Water and the Environment (the department). More information on the NESP is available at awe.gov.au/science-research/nesp

Department role

The 4 NESP hubs have been formed to conduct applied research within their specific themes. Each activity year the department will work with the minister, the hubs and other key stakeholders to identify and refine research priorities and develop projects that align with these priorities.

This annual review and evaluation of research outputs and impact provides the flexibility needed for the hubs to engage in new themes of research in an adaptive manner, and ensures that the focus is on the delivery of relevant and practical research. Hubs are responsible for co-design of the research projects in consultation with research-users and in partnership with relevant Indigenous communities. Hubs are also responsible for monitoring and evaluating the research project outcomes during the life of the hub.

The research prioritisation is a rolling process and will be informed by key milestones in each activity year, such as the annual progress report and submission of the next research plan.

Hub role

The Climate Systems Hub begins on the foundation of the many successes of the NESP Phase 1 Earth Systems and Climate Change (ESCC) Hub.

The Climate Systems Hub is tasked with undertaking research and activities that target 4 research scope areas:

- progress the development of national climate services capabilities and systems
- contribute to the development of the next generation of climate projections
- lead the further development of Australia's global climate model, ACCESS
- advance understanding of Australia's climate systems and processes.

In addition to delivering these research outcomes the hub will:

- deliver to the outcomes of 4 cross-cutting initiative research portfolios through co-design and integration of these outcomes in research activities
- invest in and strengthen Indigenous partnerships
- utilise data management for optimal delivery of decision support tools
- communicate research outcomes to end-users across government, industry and communities.

These activities will be delivered in support of practical management outcomes required to address the nation's climate change challenges. We will also work to build collaborative linkages with the other three NESP hubs to deliver these practical outcomes.

The Climate Systems Hub operates on the principals of co-design, incorporating a diverse inclusion of stakeholder and next-user opinions and needs. We will continue to invest in co-design, co-production and co-delivery of outputs with our stakeholders. Ultimately the Climate Systems Hub strives to constructively contribute to the overall success of all 4 hubs and cross-cutting initiatives comprising delivery of the NESP Phase 2 program.

Purpose of research plan

This research plan was developed by the Climate Systems Hub, in consultation with the department and other key stakeholders.

The purpose of the research plan is to outline:

- the research priorities the hub is funded to investigate, including those related to the cross-cutting initiative the hub is funded to lead
- the research projects that will address these priorities
- how the research projects will be co-designed and delivered to research end-users
- how the outputs of the research will be communicated with key stakeholders
- how hubs will work collaboratively within and across hubs.

This research plan also provides summary information on the management and governance of the hub, including the broad funding profile, key staff and research organisations, and the risks that need to be monitored to ensure success.

Initiatives

In addition to its hub-level research projects, each hub is also responsible for delivering a cross-cutting initiative and contributing research to other initiatives where appropriate. The initiatives involve cross-hub collaboration and may include multiple projects to deliver management options, data and information for the themes listed below. The 4 initiatives are:

Table 1: NESP Cross-Hub Initiatives

Cross-hub Initiative	Lead Hub
Protected place management	Marine and Coastal
Threatened and migratory species and threatened ecological communities	Resilient Landscapes
Waste impact management	Sustainable Communities and Waste
Climate adaptation	Climate Systems

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.

Research

Research priorities

The Climate Systems Hub is committed to a body of activity that includes short- and long-term research projects, initiatives and emerging priorities.

Broadly, the research priorities of the Climate Systems Hub are:

- to maintain our world-class capability in multidisciplinary Earth system science and modelling
- to advance understanding of Australia's climate variability, extremes and associated drivers, including the fundamental drivers of bushfires, drought and rainfall in the Australian region
- to develop applied decision-making tools and information to inform policy and programs to prepare Australia to manage emerging risks and opportunities.

Within these priorities we aim to support cross-hub initiative outcomes and work to:

- develop evidence to support decision-making and the development of adaptation measures for air quality, pollution and waste management in support of the Waste Impact Management Initiative
- develop evidence to support decision-making and the development of adaptation measures for protected places management, including National Parks, National and World Heritage sites and Ramsar listed wetlands in support of the Protected Place Management Initiative
- develop evidence to support decision-making and the development of adaptation measures for threatened species (including migratory species), and threatened ecosystems management in support of the Threatened and Migratory Species and Ecological Communities Initiative.

To deliver the Climate Adaptation Initiative, individual hubs will deliver to the following research priorities:

- evaluating best practice adaptation (Climate Systems Hub)
- identifying climate change vulnerability and approaches to adaptation planning and actions for conservation management (Resilient Landscapes Hub, Marine and Coastal Hub, Climate Systems Hub)
- developing effective adaptation options and methods of planning for threatened species and protected places under climate change (Resilient Landscapes Hub, Marine and Coastal Hub, Climate Systems Hub)
- understanding the drivers and impacts of climate change on urban population and infrastructure and the role of green infrastructure in building adaptive capacity (Sustainable Communities and Waste Hub).

Hub research projects

In RP2022, we introduce our strategic approach to the research program which has been designed to frame our research program through the life of the hub.

Through co-design and analysis of stakeholder needs, we adopted 5 overarching themes to contain and focus the scope of our research priorities. The themes also allow us to scaffold our knowledge brokering, communications, data management and Indigenous partnerships strategies. They have been designed to:

- develop clearer pathways to impact
- provide clear entry points to our program for stakeholders
- build strong linkages with the outcomes of the other NESP hubs and initiatives.

RP2022 presents 11 new projects (Table 2). They reflect the breadth of expertise supported by the hub and the range of user needs initially determined through stakeholder engagement. They set our broader strategic vision for ongoing research within the hub and represent a starting point. They have been designed to commence with focused stakeholder engagement and the development of enduring partnerships, to shape and co-design the direction of the projects. The projects in this year's plan represent a balance between specificity for RP2022 investment, and direction to scope outcomes in the following year research plans. Further refinement of projects through the annual research planning process of NESP, facilitated through ongoing co-design, will increase specificity of aims, outcomes, and outputs in subsequent research plans. Projects highlighted green in Table 2 are well-developed and were submitted as tranche 1 of RP2022 (March 2022), while projects highlighted orange required further development and were submitted as the tranche 2 RP2022 submission (May 2022).

The 11 RP2022 Climate Systems Hub projects aim to provide an interconnected research portfolio that builds on research from RP2021 projects and strengthens synergies across the hub and the NESP program. At the heart of the NESP program is conservation, protection and sustainable management of Australia's natural areas. It connects us to goals of sustainable communities and care of Country. We do this through the lens of climate change science. In particular, through understanding and explaining climate processes, but also supporting adaptation. The five themes reflect this approach. We consider the domain of natural systems across land, ocean and coast; the domain of people and how they live safely and sustainably and the foundations of the climate science from modelled physical understanding to ensuring the best available knowledge is applied to decision making. In this context we have domain focused projects (CS2.1: *Enabling best practice adaptation*; CS2.3: *Understanding and Connecting Parallel Climate Knowledge of Western Systems and Ancient Lore* and CS2.4: *Indigenous-led climate change knowledge and response: Indigenous perspectives on risk*; CS2.7: *Climate-effective management for threatened species and protected places*; CS2.10: *Oceans and coasts; connecting climate variability and extremes across scales*) that build clear connections to different sectors, policy domains and cross-hub efforts.

There is also complementarity in investigation of common phenomena or challenges across projects. Our Indigenous partnership projects (CS2.3: *Understanding and Connecting Parallel Climate Knowledge of Western Systems and Ancient Lore* and CS2.4: *Indigenous-led climate change knowledge and response: Indigenous perspectives on risk*) provide pathways for two-way knowledge transfer between Indigenous knowledge and western science in the climate change and adaptation domains. The projects recognise that multiple sets of knowledge and understanding will need to be applied to common climate risks, and support Indigenous communities to determine how that should proceed – rather than vice-versa as is often the case.

Similarly, there are multiple approaches and methods to better understand and apply knowledge around climate variability and extremes – the climate risk front-of-mind in all domains. Three projects specifically tackle this challenge at a range of scales and investigate questions through different lenses (CS2.5: *Regional climate change guidance for local action*; CS2.6: *Extreme events explained*; CS2.8: *Extreme climate: dry, wet, hot-and-dry*). High resolution hazard data and approaches developed in CS2.5 give local insights into what we can expect from extremes for key locations. Project CS2.8 considers extremes at longer time-scales to better understand seasonal and annual extreme events. Finally, CS2.6 provides context to help understand why an event occurred and better understand the implications of projected future risk profiles of extreme events. Together, these projects provide climate change communication tools and detailed understanding of the strengths and weaknesses of current projections information, as well as the development of new approaches to continue to build confidence in the pathway of our future climate, including developing 'storylines' of future scenarios.

Underpinning the hub's research program is the investment, development and improvement of Australia's climate science knowledge, tools and capability. All projects contribute in some way to this outcome (for example CS2.5, 2.6 and 2.8 contribute to fundamental climate science of extremes and

variability, and CS2.10 builds connections between the ocean drivers of extremes and variability), but two projects in particular deliver critical intellectual and modelling infrastructure that Australia's climate science community relies on. CS2.9: *Transition to Net Zero - emissions pathways and managing carbon* invests in the ongoing evidence base and model improvement of representing carbon emissions. Quantifying emissions is understood for its critical role in policy responses, but it is also a fundamental input to determining plausible future climate scenarios. The second foundational effort supports Australia's national weather and climate model: ACCESS (CS2.11: *Towards the next generation Earth System Model*). This is Australia's contribution to the international climate modelling effort and is the pathway to improve modelling for Australia and its surrounding regions.

Completing the portfolio, our communications and synthesis project (CS2.2: *Synthesis, communication, and data: Tailored information for stakeholders*) will ensure fit-for-purpose products are provided to a high standard and research user needs during RP2022 and into the future. This work represents where the 'rubber hits the road' for Australia's climate science. It will scope and direct a whole-of-hub effort to deliver our research into the hands of those who need it.

Overall, outputs from the Climate Systems Hub will support NESP research users directly (for example, via CS2.1, CS2.2, CS2.3, CS2.7, CS2.9 and CS2.10), and developments under projects (such as CS2.5, CS2.6, CS2.8, CS2.10, CS2.11) will improve our datasets, models, methods and understanding. It is anticipated that some hub approaches will also be picked up by Australian Climate Service for further operationalisation.

Cross-hub initiative projects

Research projects falling under the cross-hub initiatives are also identified in research projects list. Some projects will be initiative-specific, and some hub research projects will contribute partly to an initiative.

Engagement with the NESP initiatives is on-going, with other hubs still working on scoping their programs. We expect projects to build and expand those linkages over the next 6 months and identify more specific outputs to support the cross-hub initiative program in RP2023.

Table 2: Climate Systems Hub projects in the context of pathway-to-impact via the 5 hub themes. Projects highlighted green are well developed and submitted for first tranche of RP2022 (March 2022). Projects highlighted orange required more time to be finalised and were submitted in the second tranche of RP2022 (May 2022).

Hub Theme	Project no. & duration	Project	Research priority
Accessible and Usable	CS2.1 (2.5yrs)	Enabling best practice adaptation	Support the Climate Adaptation Initiative
	CS2.2 (6mths)	Synthesis, communication, and data: Tailored information for stakeholders	Applied decision support tools and information
People and Country	CS2.3 (1.5yrs)	Understanding and Connecting Parallel Climate Knowledge of Western Systems and Ancient Lore	Applied decision support tools and information
	CS2.4 (1.5yrs)	Indigenous-led climate change knowledge and response: Indigenous perspectives on risk	Applied decision support tools and information
	CS2.5 (2.5yrs)	Regional climate change guidance for local action	Advance understanding of Australia's climate variability, extremes and associated drivers
	CS2.6 (2.5yrs)	Extreme Events Explained	Advance understanding of Australia's climate variability, extremes and associated drivers
Land and Terrestrial Ecosystems	CS2.7 (2.5yrs)	Climate-effective management for threatened species and protected places	Support Cross Hub Initiative program
	CS2.8 (2.5yrs)	Extreme climate: dry, wet, hot-and-dry	Advance understanding of Australia's climate variability, extremes and associated drivers
Ocean and Coast	CS2.10 (2.5yrs)	Oceans and coasts; connecting climate variability and extremes across scales	Advance understanding of Australia's climate variability, extremes and associated drivers
Monitoring and Modelling	CS2.9 (2.5yrs)	Transition to Net Zero - emissions pathways and managing carbon	Applied decision support tools and information
	CS2.11 (2.5yrs)	Towards the next generation Earth System Model	Maintain world-class capability in multidisciplinary Earth system science and modelling

Expected outcomes and outputs

The expected outcomes of NESP are to produce research that:

- enhances our understanding of Australia's environment and climate
- is communicated clearly to relevant stakeholders and the public
- is discoverable and accessible
- informs decision-making and addresses environmental priorities.

Research under NESP is expected to inform the department's policy and program delivery. More broadly, it will engage and inform key stakeholders with an interest in the outputs of environmental and climate science research, including state and local governments, business and industry, community groups, Indigenous land managers, Indigenous communities, and education institutions.

Hub outcomes and outputs

The Climate Systems Hub has identified 6 hub level outcomes in support of the NESP program goal. These outcomes are to:

- increase understanding and improve modelling of climate systems, across all timescales and relevant spatial scales, to improve decision-making and planning
- inform best practice climate adaptation and risk assessments
- provide fit-for-purpose climate science for decision-making and planning
- provide fit-for-purpose tools and information to support conservation, protection and sustainable management of biodiversity, ecosystems, environment and heritage are accessed and used
- enable decision-makers and planners in government, industry and community to have increased capacity to use climate and adaptation information, including data rich information, to assess climate risk and undertake adaptation planning
- bring greater connection between climate science communities and Indigenous communities to support increased capacity of Indigenous communities to respond to climate change impacts
- cultivate a next generation of environmental, climate and adaptation scientists that have capability to deliver advancements in environmental research to undertake adaptation planning.

To deliver to these outcomes through an integrated research portfolio, we developed 5 key overarching themes. These are described in detail in Table 3. The themes provide a planning-to-delivery framework that offers:

- strategic direction for the annual research planning process
- focus to the research scope
- a tool to guide stakeholder engagement
- a grouping of projects to deliver a clear impact pathway
- clarity to linkages to other NESP hubs and initiatives.

Table 2: Climate Systems Hub partner contributions and capabilities.

Hub Theme	Description
Accessible and Usable	Access to relevant and usable information is important to all aspects of decision-making. Maximising the impact of the hub's science by synthesising the best available information, including tailored communication products, in the way that is most beneficial for our stakeholders' decision-making needs. Data is delivered according to the Findable, Accessible, Interoperable, and Reusable, or FAIR, principles. Building on the co-design process, this includes co-developing applied decision-support tools to help them undertake vulnerability assessments, adaptation planning as well as providing guidance on how to use information and any limitations of different approaches.
People and Country	"Country" is an Australian Indigenous term that speaks to First Nations peoples' ongoing connection to their traditional lands and water, and their land management practices of Country. The term Country extends to all people who live, work, conduct business, learn and play on Country. All aspects of our lives will be impacted by climate change – thus, this theme explores the human impacts of climate change. Working in partnership with communities and local government, the hub will look at building solution-focused narratives. These include understanding local climate risks and impacts, including regional climate information, as well as understanding urban heat effects, bushfire risks, coastal hazards, and air quality risks.
Land and Terrestrial Ecosystems	Support for understanding how climate change will impact Australia's landscapes and terrestrial and freshwater habitats. Information needed for adaptation planning includes understanding climate processes and the impact of climate change on land management, consistent approaches for undertaking vulnerability assessments, and information to help identify adaptation options.
Ocean and Coast	Support for understanding how climate change will impact Australia's coastal and marine environments. These impacts range from sea level rise and coastal hazard, heatwave impacts on marine ecosystems to impacts on fisheries. The ocean plays an important role in driving changes in climate processes – thus, the hub will also explore the linkages between ocean, atmosphere and coastal processes.
Monitoring and Modelling	Monitoring the observed climate system and maintaining a state-of-science modelling capability is fundamental to maintaining the currency of Australia's climate science excellence. Building and enhancing the fundamental tools of Earth system modelling is key to understanding changes in the earth system. This includes developing Australia's leading climate tools, including the ACCESS model, and evaluating modelling methods and outputs. This work can be used to inform policy directions, understand current carbon budgets, and the outcomes of meeting carbon targets through tailored modelling experiments.

Hub outputs reflect cross-hub delivery to identified outcomes and thematic outputs (Figure 1).

Key hub level outputs for the program include:

- guidance, framework and case studies to support best practice adaptation for conservation management and Indigenous communities (CS2.1, 2.3, 2.4, 2.7)
- synthesis and communication materials delivered through an accessible gateway (all projects, co-ordinated through CS2.2)
- spatial layers (data or maps) of climate information - for example, sea level change, marine heatwave hazards, net carbon sinks, drought (CS2.2, 2.5, 2.7, 2.8, 2.9, 2.10)
- scenarios/projections of future climate scenarios – for example, pathways to net zero, fine scale regional projections (CS2.11, 2.5)
- increased understanding of climate processes and drivers – for example, flash drought, natural variability (CS2.6, 2.8)

- implementation and delivery of an Early Career Program to support the next generation of environmental, climate and adaptation scientists.

In RP2022, we present a revised program logic to summarise our research strategy (Figure 1). It also forms the building block of the hub's monitoring and evaluation strategy. We are using a log-frame approach to understand assumptions of meeting hub outcomes, and to develop a set of questions to ask and indicators to demonstrate progress toward each outcome.

NESP goals	Conserve, protect and sustainably manage Australia’s biodiversity, ecosystems, environment and heritage through research, information management, supporting natural resource management, establishing & managing Commonwealth protected areas, and reducing and regulating the use of pollutants and hazardous substances, and coordination of climate change adaptation strategy and climate change science activities.					
NESP Outcomes	Credible peer reviewed, timely research that is used by decision-makers to answer questions and develop solutions to problems.	Research findings and practical guidance for decision-makers, stored in a manner that is discoverable and accessible, and where appropriate integrated into end-users’ databases and decision support tools.			Enhanced environmental science and research capability amongst researchers, end-users, and Indigenous Australians.	
Cross-hub Initiative outcomes	<p>Threatened and migratory species and threatened ecological communities</p> <p>Policy, investment and on-ground action to halt the loss of and recover Australia’s threatened and migratory species and</p> <p>threatened ecological communities is better informed by scientific and Indigenous knowledges as a result of this initiative.</p>	<p>Protected place management</p> <p>Management of Australia’s protected places is supported by building capacity of Indigenous communities and organisations to determine, lead and disseminate indigenous knowledge and science to support protected place management.</p> <p>Adaptive management of protected places supported by building the evidence base.</p> <p>Governance of Australia’s protected places improved by identifying effective interventions.</p>	<p>Waste impact management</p> <p>Policy, investment and on-ground action to halt the loss of and recover Australia’s threatened and migratory species and</p> <p>threatened ecological communities is better informed by scientific and Indigenous knowledges as a result of this initiative.</p>	<p>Climate adaptation</p> <p>Adaptation focused research and outputs are produced across the NESP Hubs</p> <p>Strong end-user capacity, uptake and application of evidence-based adaptation information</p> <p>Decision support tools are delivered that enable application of climate change adaptation on the ground</p> <p>Adaptation decision-makers and researchers are supported to shared learnings and build relationships</p>		
Hub Outcomes	Increased understanding and improved modelling of climate systems across all timescales and relevant spatial scales to improve decision making and planning	Best practice climate adaptation and risk assessments are informed by fit-for-purpose climate science for	Fit-for-purpose tools and information to support conservation, protection and sustainable management of	Decision makers and planners in government, industry and community have increased capacity to use climate and adaptation	Greater connection between climate science communities and Indigenous communities to support increased capacity of	Next generation of environmental, climate and adaptation scientists have capability to deliver advancements in environmental research

		decision making and planning	biodiversity, ecosystems, environment and heritage are accessed and used	information, including data rich information, to assess climate risk and undertake adaptation planning	Indigenous communities to respond to climate change impacts	undertake adaptation planning
Hub themes	Modelling and monitoring	Accessible and useable		Oceans and coasts	Land and terrestrial ecosystems	People and Country
Outputs	<p>Guidance, framework and case studies to support best practice adaptation for conservation management and Indigenous communities (CS2.1, 2.3, 2.4, 2.7)</p> <p>Synthesis and communication materials delivered through an accessible gateway (all projects, coordinated through CS2.2)</p> <p>Spatial layers (data or maps) of climate information (CS2.2, 2.5, 2.7, 2.8, 2.9, 2.10)</p> <p>Scenarios/projections of future climate scenarios (CS2.11, 2.5)</p> <p>Communicating understanding of climate processes and drivers (CS2.6, 2.8)</p>					
Activities	Foster the community of practice	Synthesise and communicate climate adaptation research and information		Support for adaptation planning and decision-making	Integrated adaptation research	Indigenous First People's Platform on climate change
	Communications	Data wrangling		Implement Early Career Program	Knowledge brokering	National Gathering
	Program management					Monitoring and evaluation

Figure 1: Climate Systems Hub program logic provides indicative hub outcomes and outputs. We anticipate that a revised program logic will be completed during RP2022, co-developed through stakeholder engagement.

The program logic will be revisited each year to test whether it remains fit-for-purpose. To achieve this iterative, co-design approach, a component of 2022 project effort will be spent strengthening collaborative partnerships, understanding research gaps and needs, refining the strategic vision of the program, and prioritising research projects and outputs.

Pathway to impact

The program structure is intended to build clear pathways to impact through the themes. The pathway-to-impact is illustrated in Figure 2. It shows the parallel nature in the value chain across the whole of NESP program, through the linkages of the three central hub themes (People and Country, Land and Terrestrial Ecosystems, and Ocean and Coasts) with the other NESP hubs and initiatives (Sustainable Communities and Waste, Resilient Landscapes, Marine and Coastal), respectively.

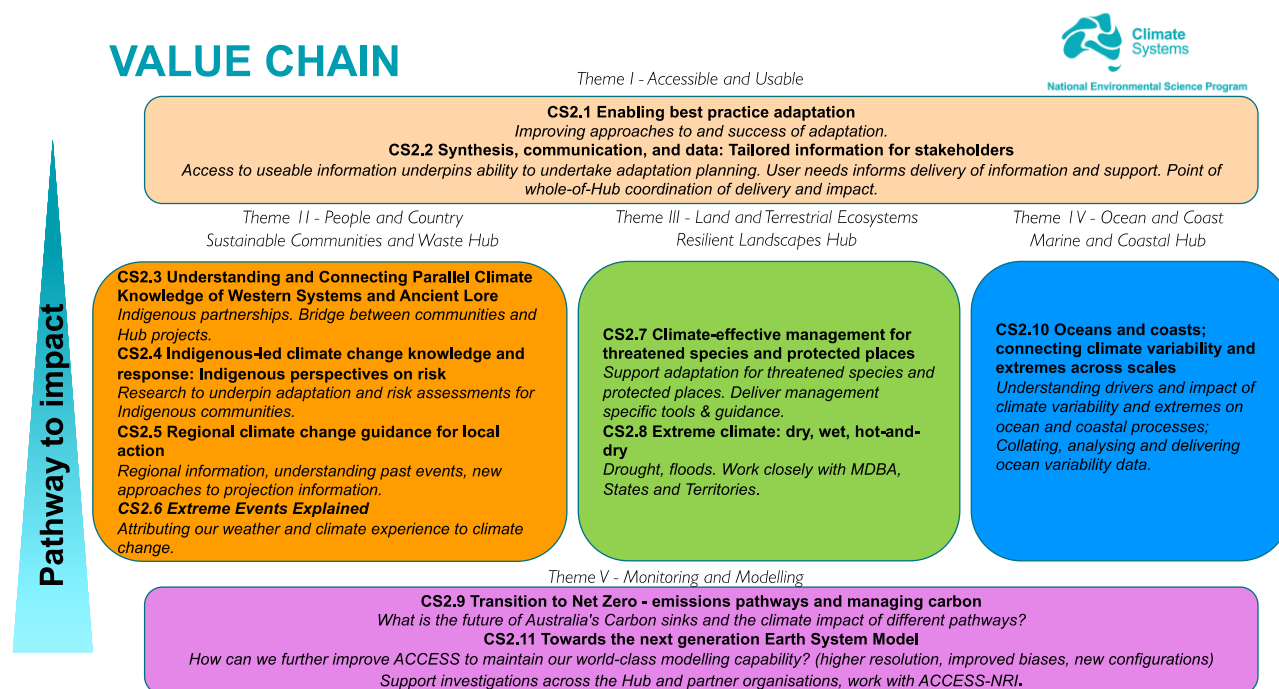


Figure 2. Schematic of project portfolio alignment with the 5 overarching hub themes and the corresponding alignment with other NESP hubs and their associated cross-hub initiatives.

This research plan connects our deep understanding of physical processes behind large-scale climate drivers to questions of how they will change in response to human caused warming. Knowing how key variables like rainfall and temperature will fluctuate and change in various regions is the basis of policy planning and decision-making. Current projections and information provide a range of future scenarios with attached uncertainty that can be difficult to plan to. In some regions, for example, plausible scenarios of rainfall change include both drier or wetter conditions. While we can respond to climate change with current projections, an increased precision of projections will help iteratively refine adaptation responses and improve efficiencies in actions. Ultimately, we aim to contribute to a society, nation, and world which is prepared for the climate “code red for humanity” (U.N. Secretary-General António Guterres, 2021).

Key project level outcomes for RP2022 include:

- a well-defined understanding of key end-user knowledge needs obtained through knowledge brokering and co-design activities
- increased collaboration and cooperation across climate science, adaptation science efforts, social science and ecological science to build knowledge and solutions more effectively for environmental management and decision-making
- effective engagement with stakeholders and partner networks building on those established in NESP phase 1 and RP2021 to ensure that the Climate Systems Hub produces fit-for-purpose research and outputs
- synthesised and accessible climate science research to support decision-making and build capacity

- continuing investment in foundational science capability.

The key project level outputs for RP2022 include:

- finalised knowledge brokering, communication, data management, and Indigenous partnerships strategies
- implementing the hub's co-design framework to guide engagement, research prioritisation, and co-design throughout the life of the hub
- a monitoring and evaluation framework and implementation plan
- a co-developed research program that targets user needs, builds cross-hub collaboration, and supports end-user needs to manage their climate risks
- refinement of priority projects, project teams and stakeholder partners for the next RP2023 that address the key strategic outcomes of the Climate Systems Hub
- submission of draft RP2023
- a suite of reports, communication outputs, and draft journal papers that capture new insights arising from project work and the continued analysis of NESP phase 1 research.

We aim to achieve Specific, Measurable, Attainable, Relevant, and Time-Bound (SMART) activities across the hub.

Collaboration and partnerships

NESP encourages a collaborative, multi-disciplinary 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 the Australian community, including Indigenous communities, to achieve positive environmental, social and economic outcomes.

We are building collaborative partnerships with all hubs and cross-hub initiatives to address complex, cross-disciplinary challenges and provide practical solutions. Participation in the Cross-Hub Committee and Cross-Hub Initiative Forum will be important avenues for identifying cross-hub opportunities for multi-disciplinary research of particular benefit to stakeholders. Likewise, the Indigenous Facilitation Network supported by the department will provide opportunities for contribution and cross-hub collaboration on projects specifically supporting Indigenous-led and informed activities, under the guidance of the hub's Indigenous partnerships strategy.

The Climate Systems Hub comprises 8 partners, whose role, expertise and alignment to the hub are shown in Table 4. The Cross Jurisdictional Community of Practice for Climate Science (CJ CoP CS) bring highly relevant experience in climate science expertise, knowledge brokering, and climate change adaptation. Their role in the hub is focused on linking scientists with technical end-users, policy and decision-makers to deliver applied science outcomes at the community level across all regions of the nation. The other 7 partners are well known to DAWE through their role in the predecessor NESP Earth Systems and Climate Change (ESCC) Hub. The participation of these partners ensures the hub's prominence as the central go-to place for expertise in Australian climate science. The CSIRO and BoM maintain continuity over a long history as national agencies central to our climate science and delivery. The 5 participating universities enhance the depth of research capability within the hub and engage a new generation of scientists, through the hub Early Career Program, imperative for climate science targeted to user needs. Together, these 8 partners comprise the expertise, capability and capacity to deliver hub and NESP outcomes.

Table 4: Climate Systems Hub partner contributions and capabilities.

Hub Partner	Role, expertise and alignment
CSIRO	<p>We solve the greatest challenges through innovative science and technology. We are Australia's innovation catalyst, collaborating to boost Australia's innovation performance.</p> <p>The Climate Systems Hub is led through the CSIRO Oceans and Atmosphere Climate Science Centre which provides foundational science capability across a range of hub research (CS2.8, CS2.9, CS2.10, CS2.11). The Oceans and Atmosphere Coast and Oceans Program brings further expertise underpinning our linkages with the NESP Resilient Landscapes and Marine and Coasts Hubs through project CS2.7. CSIRO Land and Water contributes capability to underpin the social-science aspects of our Indigenous partnerships project CS2.4.</p>
Bureau of Meteorology	<p>The Bureau of Meteorology's mission is to provide trusted, reliable and responsive weather, water, climate and ocean services for Australia – all day, every day. Research in the Bureau is advancing the science behind the Bureau's environmental forecasts, warnings and services, and our Indigenous engagement team are actively building the inclusion of traditional knowledge in all that we do.</p> <p>The Bureau of Meteorology is a major partner in the Climate Systems Hub, drawing on expertise from across the enterprise, particularly Research. Data wrangling is provided for Project 2.2, Indigenous engagement expertise in Project 2.3, fundamental climate research in Projects 2.5, 2.6 and 2.8 and climate modelling expertise in 2.11. Across all these projects our staff maintain strong stakeholder relationships and contribute to co-design towards successful delivery and meaningful outcomes. While contributing to</p>

	NESP phase 2, the Bureau through its core services to the public, emergency services etc. and programs like the Australian Climate Service is also a consumer (users) of NESP phase 2 outputs.
Australian National University	The ANU is Australia's most research-intensive university, and in the 2021 QS University Rankings was ranked 1st in Australia and 21st in the world for Earth and Marine Sciences. ANU was also rated 'well above world standard' for Earth Sciences and for Environmental Sciences in the 2018 Excellence in Research for Australia exercise. The ANU brings a wealth of expertise in climate change processes, impacts, adaptation and mitigation to the NESP2 Climate Systems Hub. It will contribute to our Indigenous project (CS2.3) as well as contributing climate projections expertise to CS2.5, land based carbon sequestration work to CS2.9, and marine heatwave work to CS2.10. These include expertise within the Research School of Earth Sciences, the Fenner School of Environment and Society and the Research School of Biology, including through the Institute for Climate, Energy and Disaster Solutions, the Centre of Excellence for Climate Extremes, and the Institute for Water Futures.
Monash University	Monash was ranked 75th globally (Times Higher Education World University Rankings, 2020) and fourth in Australia (Excellence in Research for Australia (ERA), 2018), Monash University has one of the strongest research and teaching programs in the Country, which is globally competitive. The University boasts a world-leading capability in climate science research, which remains a strategic priority under our Focus Area of Sustainability in the 2020 Research Agenda. Monash was rated as the top Australian universities in the 2018, ERA Engagement and Impact Assessment, for example, and translating our work to the community is a critical mission at the University. In this regard, the University has rapidly developed critical mass and capacity for climate science communications excellence through the Monash University Climate Change Communications Research Hub (MCCCRH). Through the MCCCRH the University has positioned itself as a leader in climate science communication, developing numerous strong working relationships with most major Australian media outlets, NGOs and government bodies. These networks, and the tools that the MCCCRH has created for climate communication, places the University in a unique position to provide strong communications support for stakeholders in the NESP2. Monash will also contribute climate extremes research to project CS2.8.
University of Melbourne	The University of Melbourne has collaborated with the partners in this proposed hub over many years to produce advances in climate science and deliver them to stakeholders. This has occurred through major programs such as the Australian Research Council (ARC) Centre of Excellence for Climate Extremes (CLEX) and the earlier ARC Centre of Excellence for Climate System Science. The University of Melbourne was also a partner in the NESP Earth Systems and Climate Change Hub. The School of Geography, Earth and Atmospheric Sciences includes a research team focused on understanding climate change and variability, with expertise in climate projections and adaptation research. They will make climate projections research contributions to project CS2.5 and contributions to the Climate Adaptation Initiative through project CS2.1.
University of New South Wales	Established in 1949, UNSW Sydney is one of Australia's leading research and teaching universities, renowned for the quality of its graduates and its commitment to new and creative approaches to education and research. UNSW Sydney is one of the founding members of the Group of Eight, a coalition of Australian research-intensive universities, and of Universitas 21, a global network of research universities. In the 2020 QS World University Rankings, UNSW Sydney was ranked as 44th globally. The Climate System Hub is closely aligned with our research strengths in 'Water, Climate, Environment and Sustainability'. UNSW Sydney leads the CLEX and hosts the Climate Change Research Centre (CCRC), demonstrating considerable expertise in climate science. Our experience and expertise help provide better understanding of our past, present and future climate to improve climate modelling and information delivery to inform adaptation planning for resilient regional and urban communities. UNSW will make climate projections and extremes research contributions through projects CS2.5, CS2.6, and CS2.8, and an Indigenous research contribution in project CS2.3. Furthermore, UNSW Sydney research strengths in predictive modelling, machine learning and data science align well with the NESP phase 2 priority areas.

<p>University of Tasmania</p>	<p>UTAS has a mission to be a place-based, globally connected University, with a clear ambition to develop and provide sustainable solutions across its diverse portfolios. While UTAS has diverse and multi-faceted research strengths, the University is also world leading in several areas, including marine and climate, with the Institute for Marine and Antarctic Studies being a Flagship of the University. UTAS are making ocean research contributions to project CS2.10 and contributing to Climate Adaptation Initiative work through project CS2.1. The 2019 QS World University rankings show that UTAS is among the best in the world (top 100) for Earth and Marine Sciences. The Academic Ranking of World Universities (ARWU) places UTAS in the top 2% of universities world-wide. In the most recent Excellence in Research Assessment (ERA), UTAS received numerous rankings of 5 – well above world standard. These comprise key disciplines and themes relevant to the Climate Systems Hub, including two-digit Fields of Research: Earth Sciences; Environmental Sciences; Biological Sciences; and including four-digit Fields of Research: Oceanography; and Fisheries Sciences.</p>
<p>The Cross Jurisdictional Community of Practice for Climate Science (CJ CoP CS)</p>	<p>The Cross Jurisdictional Community of Practice for Climate Science (CJ CoP CS) was established in March 2019 to encourage and enhance climate science for stakeholder needs and policy and decision-makers. The CJ CoP CS will support the Climate Systems Hub through an interjurisdictional knowledge brokering team working directly with technical end-users, policy and decision makers to ensure the development of fit-for-purpose climate science information and a consistent/comparable approach to application and communication of information. Knowledge brokering enables connection to a broad network of end-users across the nation to translate research into informed action.</p> <p>Supported by the NSW Department of Planning, Industry and Environment (DPIE), the CJ CoP CS represents all the state and territory governments, as well as the Commonwealth government.</p>

Strategic direction and endorsement of hub activities is provided through the Hub Steering Committee, while day-to-day planning and activity is managed by the hub Program Management Team (Figure 3). NESP programmatic cohesion is facilitated by the Cross Hub Committee with oversight of the NESP Program Board.

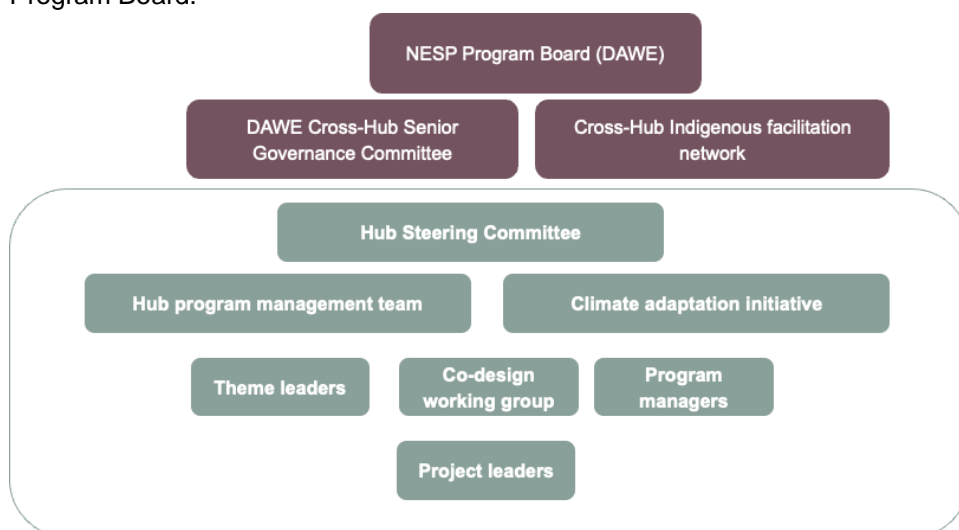


Figure 3: Hub governance structure.

Indigenous partnerships

Our engagements encompass principles of Free, Prior and Informed Consent (FPIC). We value engagement that is respectful to cultural protocols of the community and their Country. A First Nations reference group, comprising the Indigenous facilitator, knowledge broker, researchers and others when required, will continue principles of Indigenous-led and co-designed protocols, in accordance with the hub’s Indigenous partnerships strategy. They will provide high-level guidance and advice to the Climate Systems Hub on opportunities for collaboration and co-

design protocols as required but will not review specific projects prior to submission. They will help ensure our research accords to co-design respecting cultural protocols and safety. There are many peoples and many cultures. We respect the provision and ownership of traditional knowledge. Ensuring cultural safety for all, hub partners will undertake cross-cultural awareness and training.

The establishment of a National First Peoples Platform on Climate Change (NFPPCC) is a significant extension to the Indigenous Partnership seeded in the former hub. Supporting the NFPPCC Indigenous-led decision-making processes, relevant members of the hub will provide a secretariat function to ensure key performance indicators are met through co-design phases for the delivery of projects. Primary milestones of the NFPPCC are, but not limited to the National First Peoples Gathering on Climate Change, and support to Regional Gatherings of same. A Terms of Reference governing NFPPCC – including its function, roles, responsibilities, key timelines, and scheduled events - is a primary document guiding the NFPPCC and the hub in its activities.

Further, the hub is currently developing an engagement framework that encompasses the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) and ensures that two complex knowledge systems – western science and ancient traditional culture - come together to provide all communities with knowledge to protect Country in the face of climate change. Our engagements embrace the research principles established by the Australian Institute of Aboriginal and Torres Strait Islander Studies' Guidelines for Ethical Research in Australian Indigenous Studies. We deliver Indigenous-led research and processes that build traditional knowledge into our research outputs.

Indigenous Cultural Intellectual Property (ICIP) will be identified as early as possible in the hub's work and where appropriate, in individual projects. ICIP will be managed in accordance with the hub's Indigenous partnership and data management strategies. The practical details will be given attention from the outset of the hub's co-design phase, and will accord with the NESP Indigenous Partnership Principles. Capacity building of Indigenous partners is also considered through the understanding of their legal rights pertaining to ethics and data sovereignty. In RP2022 we plan to extend the number of hub researchers, commencing with project leaders, who engage in True Tracks training around ICIP, and more broadly role out Your Mob Learning Indigenous Cultural Awareness Training across all hub researchers.

Category 1 Approach - Consult and Collaborate

Potential Traditional Owner participants are identified through several ways, such as:

- a direct approach from a member of a Traditional Owner group via conferences and workshops
- networking within First Nations communication methods
- networking within stakeholder interactions
- existing Traditional Owner relationships and their partners.

Pre-discussions with the Indigenous facilitator and knowledge broker, then initial discussions with the Traditional Owner group governance process identifying their major concerns (often, rapid changes to their environment impacting their Indigenous cultural heritage). These discussions should include the following actions and priorities:

- consult with the Traditional Owner group to co-design agenda
- open a framework of inclusiveness and Indigenous-led priorities - important from commencement
- consideration that Traditional Owners need to be empowered and feel empowered as they have cultural authority and agency of their respective Country.

Communication via email and phone calls, made to convey:

- acknowledgement of discussions
- an opportunity to meet with key members/representatives of the Traditional Owner group via their respective governance processes
- the role of NESP phase 2 – Climate Systems Hub, including key milestones of NESP phase 2
- outline the role of the Indigenous facilitator.
- outline the role of the knowledge broker
- explain co-design principles
- explain Indigenous-led.

Given Indigenous perspectives encompassing their value and knowledge systems, Traditional Owners have progressively over millennia responded to a process of adaptation. It is crucial from the outset in the field of climate science, or the changing climate observed by Traditional Owners impacting Land and Sea Country, that discussions of adaptation is likely to occur. It is therefore prudent to include the Climate Adaptation Initiative lead (pending capacity) to participate and learn with Traditional Owners, Indigenous facilitator and knowledge broker towards a co-design and multi-disciplinary approach in the research design and planning. Further capabilities are identified through these initial discussions.

Identified cross-hub collaborations through the Indigenous Facilitation Network are kept abreast in terms of potential Indigenous researchers and core capabilities. Indigenous consultation and engagement are embedded in the learnings of the National First Peoples Gathering on Climate Change and are consistent with the 3-Category Approach.

Category 2 – Partnership development

Category 2 is based on the efficacy of the approach and engagement executed in Category 1.

Category 3 – Communicate outcomes

Throughout the development and implementation of the research, all key decisions and strategies are to be outlined in an appropriate communicate method to Traditional Owners and relevant stakeholders directly and to the public indirectly (websites – Traditional Owner, local stakeholders and partners, Climate Systems Hub comms, DAWE, newsletters, etc.). All desktop studies are outlined to respective Traditional Owner groups.

Indigenous Partnerships table of stakeholders

The Climate Systems Hub Indigenous partnerships strategy may from time to time consult on the following list of stakeholders (Table 5) relevant to cultural authority, protocols and processes, policy, and general matters.

Table 5: Climate Systems Hub Indigenous partnerships stakeholders.

Hub	Primary	Secondary
<ul style="list-style-type: none"> • Climate Science Partners • NESP Indigenous Facilitation Network 	<ul style="list-style-type: none"> • Australian National University – First Nations Portfolio • National First Peoples Platform on Climate Change • Ipima Ikaya Aboriginal Corporation, Registered Native Title Body Corporate • Indigenous Land and Sea Corporation • Great Barrier Reef Foundation – Traditional Owner Partnership • Yorta Yorta Nation Aboriginal Corporation • Indigenous Desert Alliance • Koinmerburra Aboriginal Corporation • Torres Strait Island Regional Authority • Gur A Baradharaw Kod (GBK) Torres Strait Sea and Land Council, Torres Strait Islander Corporation • South East Tasmanian Aboriginal Corporation • Tiwi Resources • Central Land Council • Traditional Owner groups corporations • Registered Native Title Bodies Corporate • Prescribed Body Corporate • Aboriginal Land Councils • Indigenous corporations • Departmental policymakers • Indigenous Advisory Committee • Identified policymakers in other federal and state government departments. 	<ul style="list-style-type: none"> • Peak Indigenous bodies • general public • environment non-government organisations

Knowledge brokering, communications and data management

NESP expects that each hub will engage and communicate research outcomes with research-users and the wider public to facilitate uptake and adoption. As part of this, the program is committed to promoting open access to public sector and publicly funded information, including optimising the use and reuse of data. NESP expects that each hub will implement its data management plan to provide timely, open-access to the data products and research outputs.

To be truly effective, large scientific projects should undertake a deep exploration of both end-user needs and the existing complementary research ecosystem. To facilitate this, the hub is committed to ongoing co-design through the life of the program (see Table 6). This effort will be led by the knowledge brokering team, to:

- i) ensure meaningful, continued, and embedded co-design between researchers, practitioners, data-users, and decision-makers,
- ii) establish collaborative partnerships, and
- iii) ensure that hub-led science directly informs decisions, policies, and adaptation responses.

Specifically, the hub knowledge broker and team will identify relevant stakeholders (and their roles), work to establish targeted engagement with relevant end-users (for example, researchers working with state and territory-embedded professionals to tailor outputs and products suited to specific user groups and decision-makers), and support hub projects in their co-design of detailed project plans that include outputs tailored to end-user needs as required.

The DAWE and other levels of government (including our partner states/territories through the Cross Jurisdictional Community of Practice for Climate Science - CJ CoP CS) are a gateway for support, advice on end-user needs, and networking on end-user engagement, knowledge exchange, and hub project co-design. These institutes with their broader visions and mandates provide essential advice on connections to larger risk and resilience initiatives. The hub will work with DAWE and other end-users through governance arrangements and throughout project life. They are a part of project design, planning, production, testing and delivery. Thus, DAWE and other end-users will also be the greatest advocates of the hub, and a pathway to broader communication and uptake of hub science and outputs.

Our knowledge brokering incorporates a 4-stage approach to research co-design shown in Table 6.

Table 6: Climate Systems Hub 4-stage approach to research co-design throughout life of program.

Stage	Intent
Explore	Map the broad picture of stakeholder and research landscape.
Analyse	Develop a strategic plan for the hub including key focus areas.
Co-plan	Deeper engagement, scoping, identify topics and projects within themes.
Co-design	Engage policymakers, other NESP hubs, end-users, next-users to design and refine projects for future research plans.

Table 7: Summary of the Climate Systems Hub primary knowledge brokering (KB), communications (C), and data management (DM) aims and objectives.

Aim	KB	C	DM
Guide the development of strategic, proactive and understandable communications, informed by knowledge brokering activities with key stakeholders, including key end-users, next-users and decision-makers.	Y	Y	
Increase awareness of available data and support to our stakeholders in finding the best available information and maintain engagement with these stakeholders through outreach activities. This will allow the hub to share its research with the broader community through the delivery of hub projects and communication activities	Y	Y	Y
Facilitate the development and management of productive stakeholder relationships, including collaborative partnerships, where appropriate, in the delivery of hub research projects and activities.	Y		
Facilitate: (i) implementation of the hub MERI plan (ii) adoption of key hub outputs by next/end-users (iii) management of attendant hub operational risks, and (iv) realisation of agreed strategic hub research outcomes and impacts (for example, path-to-impact), including successfully meeting with stakeholders and where appropriate adding value to stakeholder expectations.	Y		
Ensure that the planning and prioritisation of the publication of research outputs (including annual reporting) is in collaboration with the department and the making of all research outputs, and existing material incorporated in the research outputs, are made publicly available through the hub's website. In the case of scientific publications, the hub will make reasonable efforts to either publish via Creative Commons or make scientific publications publicly accessible within 12 months of publication.		Y	

All hub outputs should aim to increase awareness and understanding of hub projects and outputs. This should come from strategic, proactive, and understandable communications developed through co-design to meet the information needs of end-users. The nature of these communications should be built from co-design, user feedback, engagement data, and best practices to ensure that information is accessible and usable. As such, input from the hub knowledge broker and the knowledge brokering team is important in determining the language and nature of all communications. As is feedback provided by DAWE through the product submission process. Once finalised, all communications should aim to be publicly accessible, and where appropriate, stored on [the hub website](#). The external hub newsletters *Climate Systems Hub News and Adaptation Updates*, as well as hub social media, and when appropriate media connections brokered through the Monash Climate Change Communication Research Hub, should all be utilised in driving engagement with these products. Further information around hub audiences and communication aims can be found in the hubs

Communication strategy, all products should have language and content aimed at specific audience or stakeholders needs.

The [NESP data and information guidelines](#) and Climate Systems Hub Data Management Strategy details the fundamental approach to data management to ensure all hub outputs are open access and freely available, and they meet the FAIR data principles (Findable, Accessible, Interoperable, and Reusable). Each project will develop a data management plan that ensures consideration has been given to how the data associated with the project will be managed and that appropriate resources are devoted to data management, including a data custodian for each data product. The project's data custodians and the research project lead will work with the hub's data wrangler to ensure that project data is identified and treated in accordance with the hub's data management strategy. The data management plan is a living document, to be revised and updated as the hub evolves, and outputs are identified through co-design and generated by hub projects.

While it is acknowledged that projects may not know all the details at the outset, how and where all the project outputs will be made freely and openly available needs to be considered. The project data management plan will serve as a record of all datasets and other information used as inputs and outputs across the hub, including any models and code/software. Specific approaches for managing each of the different types of data and information are outlined in the hub's Data Management Strategy.

Risk mitigation

Within complex programs there are associated risks that have a bearing on its overall impact and performance to deliver projected outcomes and outputs.

To keep these risks in check, the development of strategies and the alignment to actionable treatment to mitigate these risks is high on the agenda of the Climate Systems Hub.

To achieve hub success close monitoring, measurement and assessment will be performed throughout the hub life. A monitoring and evaluation plan is under preparation.

Some key risks that have been registered and monitored are the following:

- COVID-19 - Delays to project and research facilitation activity milestones
- signed partner contract agreements not in place prior to commencement of project(s)
- failure to meet stakeholder needs, project milestones and deliverables
- limited engagement with stakeholders/Indigenous communities
- limited access to infrastructure (High Performance Computing and High-Performance Data) and tools.

Climate Systems Hub research plan 2022

For any given calendar year, the hub funding for applied science, decision tools and practical management options must total at least 70% of the funding. The balance of the funding can be allocated between knowledge capture (10–20%), communication (5–10%), and administration (5–10%). 10% of the hub's NESP funding being spent per calendar year (regardless of the expenditure category) must be set aside for emerging priorities. Below is the Climate Systems Hub allocation of funds to these categories.

Item	Percentage
Applied science, decision tools and practical management options	70%
Knowledge capture	12.9%
Communication	5.1%
Administration	8.9%

Under the terms of the funding agreement, the funds paid by the department under the NESP must be matched by recipient and other contributions, to a minimum total of 100% contribution for the life of the program.

Annexure 1: NESP project assessment criteria

1. Identified research priority

- Does the project plan incorporate one or more of the research needs identified by the department for the hub?
- How well does the project align with the NESP research scope overview and research priorities identified for the hub?
 - Does the research approach clearly address one or more of the research priorities (for example, rather than the plan just saying it does)?
 - How strong/direct is the link between the research proposal and the priorities identified? Is there a large proportion of the research that doesn't clearly address a priority?
- Does the research clearly support policy development, environmental management, regulation and investment?
- Is there a clear management action or policy development that could be taken as a consequence of the delivery of this project?
- Does the project plan refer to responsibilities, policies or programs to which the research will be directly relevant?
 - Does the project plan identify one or more departmental contacts, and were they consulted in the development of the draft? Were their suggestions taken on board?
- At a hub level how much funding is proposed for projects addressing the same research priority? Is the distribution of funds across priorities appropriate?

2. Outcomes and outputs

- Are the outcomes clearly articulated in the project plan and are they directed towards end-user needs/ practical management?
- Is there is a path to adoption for the research outcomes? Does this include direct links to line areas and the responsibilities of the department?
- Are the outputs of the project clearly described, with at least some tailored to support management/policy actions (for example, to assist uptake of the research by the department and other end-users)?
- If outputs are to be co-designed with stakeholders to directly meet their needs, is this clearly stated?

3. Project design

- Is the project well designed?
- Do you have any suggestions that would increase the value of the project?
- Is there is a clear link between the research and practical and tangible environmental outcomes (direct links or secondary links with a clear path to outcomes)?
- Could the research question or approach be refined to better suit research needs or the needs of other end-users? Are specific research questions clearly articulated, or is there a clear approach to doing so?
- Does the project leverage other programs or investments?
- Does the proposal refer to current and previous work (for example, previous Australian Government programs, state and territory government research), and clearly build on the outcomes of that work rather than duplicating it?
- Is there a process proposed that will review existing understanding to help identify gaps and specific research questions? Will this scanning or synthesis process consider relevant research beyond that done by the hub partners?
- Does the project intend to have ongoing co-design and implementation with research end-users?

4. Indigenous inclusion

- Do the projects have appropriate Indigenous consultation and engagement?
- Is there evidence that the Indigenous Partnership Principles will be applied?

5. Data management and accessibility

- Are the NESP Data Management and Information Guidelines being followed?
- Do the project proposals list a repository or repositories for data, and indicate timing for publishing of the data? Note: Timing of publication should be not more than 1 year after the end of the project.
- Have metadata standards been indicated? For example, ISO 19115-1, OGC or ISA 19139 MCP
- If an exception is stated for sensitive data, cultural data or species data, does it align with the NESP Data Management and information Guidelines.
- Has the hub indicated that publications will not be made open access? Note: All publications are to be open access at either the point of publication or at a specified future date.
- Has a data contact been specified for each project?

6. Knowledge brokering and communications

- Do the project proposals describe the approach to knowledge brokering and communications?
- Have specific communications and knowledge brokering actions and activities been included in the project proposals? For example:
 - how end-users will be engaged from the outset of the project
 - identified pathways to adoption by end-users
 - target audiences and stakeholders.
- Does the proposal align with the hub's knowledge brokering and communications strategy?
- Do the project proposals include a commitment to developing activities in an appropriate timeframe?

7. Time and budget

- What are the risks associated with delivering the project on time and within budget?
- Are the management actions proposed to address these risks appropriate?
- Does the project approach represent the best and most efficient way of addressing the research need?
- What is the scale and scope of the research needed to deliver the research outcomes? Is it commensurate with the budget and time and resources allocated to the project?

8. Project personnel

- Does the project team provide evidence that they have a history of delivering research that is useful and used by managers and policymakers?
- Is there evidence that their project meets the objectives of the program and requirements of the Funding Agreement?
- Has the project team demonstrated previous engagement with the department and other stakeholders in developing and delivering research?
- Is there any feedback from departmental staff involved in previous work delivered by this research group?
 - If this feedback consolidates any concerns with the current project proposal, consider deferring or providing specific feedback.

Recommendation

Well supported and meets criteria	Modifications required	Not supported and/or does not meet criteria	Defer for resubmission
The proposed project performs strongly against the majority of criteria, and there are no 'red flags'. It is well supported by end users in the department.	The proposed project would perform strongly against the majority of criteria if identified modifications are made prior to final assessment. 'Red flags' are relatively easily resolved or clarified.	Considerable further work is required. 'Red flags' will be complex/time consuming to resolve. Project not well scoped/does not meet Department's needs.	Significant changes or significant additional information required. Project proposal to be further developed and resubmitted.