

National Environmental Science Programme

RESEARCH PRIORITIES FOR 2017

Context

The NESP Research Priorities (Priorities) are determined by the Minister for Environment and Energy and the Department of the Environment and Energy (Department) in consultation with the NESP Hubs and stakeholders. The Priorities aim to guide and contribute to the on-going dialogue between the hubs, the Department and other end-users to develop a program of research, described in hub annual research plans, which is targeted towards the needs of NESP stakeholders.

The Research Priorities for 2017 ('2017 Priorities') are the outcome of an engagement process across the hubs, the Department and other stakeholders in early 2017. The 2017 Priorities build on previous iterations (2015 and 2016), with amendments to clarify and emphasise new initiatives and management challenges, and removal of previous priorities that are no longer a focus.

Interpreting the 2017 Research Priorities

A set of priorities is presented for each hub, arranged under higher-level groups or themes. Some of these priorities are specific and some are more general in nature. The priorities in **bold** are 'focus priorities' for Research Plan version 4, based on stakeholder feedback that these are particularly important to their existing and future decision-making needs. Each hub will work with stakeholders to understand the nature and extent of effort required under Research Plan version 4 to respond to the set of priorities, taking into consideration research projects which are already underway.

The 2017 Priorities identify four 'cross-cutting issues' that are relevant across multiple hubs. Highlighting these issues supports their integration across the NESP. Responses to the cross-cutting issues will vary between hubs, and may benefit from collective consideration across the hubs.

CROSS-CUTTING ISSUES RELEVANT TO ALL HUBS

Research undertaken under all hub priorities should:

1. consider current and future climate risks in the research design, delivery and recommendations, as appropriate, as recommended by the State of the Environment Report 2016
2. consider the social and economic value of the environmental asset/s and research outcomes, as appropriate
3. where possible, and where other considerations are equal, be targeted at areas with high conservation value such as National and World Heritage places and Ramsar wetlands
4. be designed with consideration of how it may intersect and integrate with the priorities of other NESP hubs.

HUB RESEARCH PRIORITIES

[CLEAN AIR AND URBAN LANDSCAPES: RESEARCH PRIORITIES](#)

[EARTH SYSTEMS AND CLIMATE CHANGE: RESEARCH PRIORITIES](#)

[MARINE BIODIVERSITY: RESEARCH PRIORITIES](#)

[NORTHERN AUSTRALIA ENVIRONMENTAL RESOURCES: RESEARCH PRIORITIES](#)

[THREATENED SPECIES RECOVERY: RESEARCH PRIORITIES](#)

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Note: Numbering of priorities may not be consecutive - original priority numbering has been retained for continuity and easy reference.

CLEAN AIR AND URBAN LANDSCAPES: RESEARCH PRIORITIES

Increasing our understanding of the environmental and social impacts of air pollution in urban and peri-urban areas to inform management actions (Group A)

Contribute to the design of, and inform the development of, a programme for monitoring and reducing atmospheric particulate matter levels in Western Sydney (1).

Identify and prioritise significant sources of air pollution and their impact on the environment and public health to better target government investment (2).

Identify key sources of emissions of air pollutants, including sulphur dioxide and particulate matter, in Australian urban centres and the risks they pose to the environment and human health. This work should complement the current reviews of the National Environment Protection (Ambient Air Quality) Measure relating to a) PM standards and b) the standards for sulphur dioxide, nitrogen dioxide and ozone, as well as other efforts underway to reduce point source emissions of these pollutants (3).

Identify features of Australian urban landscapes that influence the impact of air pollution on humans and the environment (e.g. landform, local climatic conditions, urban design) (5).

Quantify the co-benefits for air quality, human health, biodiversity and the environment of measures to reduce greenhouse gas emissions in urban and peri-urban areas. Such measures could include active transport, improved public transport, increased energy efficiency of buildings and changes to the urban form (6).

Study the exposure and risks to the environment and human health of chemicals and persistent organic pollutants arising in everyday products, including chemicals newly listed under the Stockholm Convention, in the urban environment – from indoor and outdoor sources, flows and use through to disposal via current urban infrastructure such as sewers and landfills (8).

Identify and evaluate effective systems and tools for detecting and managing air pollution in urban areas, including a focus on monitoring, reporting and forecasting systems, strategic planning in infrastructure and urban development, and measures to reduce point source emissions (10).

Assess existing and identify new information systems and processes needed to achieve air quality objectives, identify trends and evaluate outcomes (11).

Support existing and emerging cross-government clean air initiatives such as the Clean Air Agreement (12).

Quantifying the benefits of urban greening for humans and other species in cities to inform Australian Government policy and programmes, and management actions by all levels of government, the community and industry (Group B)

Work with major cities to assess the effectiveness of various current and new approaches to managing urban ecosystems, such as greening plans, and how these can be incorporated into greening plans to maximise positive outcomes for biodiversity including threatened species, air and water quality, and human health. These outcomes could support the development of a framework for greening cities which would consider multiple benefits such as absorption of atmospheric pollutants, sequestration of carbon, mitigation of the urban heat-island effect, provision of habitat and landscape connectivity for biodiversity, strengthening of social capital, and the reconnection of humans with nature in urban areas (13).

Demonstrate the relative cost effectiveness of different approaches to planting and managing urban green spaces for air and water quality and human well-being. These approaches could include the choice of species to be planted, the location and configuration of plantings, irrigation of plantings with stormwater to improve survival and growth rates and reduce runoff to local streams, and preservation of upland drainage lines in new developments to provide green space and a range of environmental and health benefits for residents (14).

Prioritise climate adaptation measures for managing the impacts of climate change on environmental quality and human health in urban areas, such as expanding urban forests and improving the even distribution of tree cover across our major cities for equity of access (15).

EARTH SYSTEMS AND CLIMATE CHANGE: RESEARCH PRIORITIES

Building the utility of Earth Systems and Climate Change information (a)

Work with our Partners and NESP to establish and collaborate with the National Centre for Coasts and Climate as it undertakes climate change research and activities, including Blue Carbon research (a1).

Engage with stakeholders to ensure that the information is being provided in a manner which supports decision-making and is meeting the needs of end users including business, government and Indigenous people. This includes contributing Australian and Southern Hemisphere climate information, analysis and expertise to global initiatives such as the Intergovernmental Panel on Climate Change and climate modelling projects (e.g. Coupled Model Intercomparison Project) to ensure that Australia benefits from the international analysis efforts that shape global discussions on climate change (a2).

Collaborate across National Environmental Science Programme Hubs to ensure that Earth systems and climate change research informs the broader Programme. This would include provision of nationally consistent and targeted regional climate projections and information relevant to specific issues, such as threats to marine and terrestrial ecosystems and ocean acidification and the cumulative impacts of climate change and other environmental pressures (a3).

Develop and enhance Australia's national capability in Earth system and climate simulation through ongoing improvement of the Australian Climate Community Earth System Simulator (ACCESS) in the areas of accessibility and simulation performance (a4).

Improving our understanding of how the climate system may change in the future (b)

Investigate how human activities will continue to influence the carbon cycle and change the chemistry and physical state of our oceans, atmosphere and terrestrial systems (b1).

Improve understanding and simulation of Southern Hemisphere climate drivers¹ in our climate models (especially ACCESS) to increase our confidence in projections of likely future climate change at multi-annual to multi-decadal time scales. Improve our understanding of how climate variability (e.g. the El Niño-Southern Oscillation) and the frequency, intensity and extent of extreme events (e.g. tropical cyclones and droughts) may change in the future (b2).

Further develop our ability to simulate and provide regional information on future climate, from years to decades (b3).

Consider low likelihood but high impact consequences of climate change for Australia to improve risk management decisions (b4).

Use improved climate projections and understanding of the drivers of climate to inform understanding of climate and coastal interactions (b5).

Improving our understanding of past and current climate (c)

Use observations of greenhouse gases and the Australian regional carbon budget to track changes and improve our understanding of how the different components of the natural and human elements of the carbon cycle interact and influence each other (c1).

Identify how the different scale drivers¹ of the climate system interact in the Southern Hemisphere to generate our past and current climate (c2).

¹ The term "climate drivers" is used here to mean the main modes of variability and change, such as El Niño–Southern Oscillation and radiative forcing and its response

Improve analysis methods used for Australian climate change research, and examine the current and past patterns and trends in climate variability and extremes in the Southern Hemisphere, with an emphasis on the Australian region, including the ocean (c3).

Analyse robust observational records of our atmosphere, oceans, cryosphere and terrestrial systems to undertake 'detection and attribution' studies in order to identify and explain significant changes in our current climate (c4).

MARINE BIODIVERSITY: RESEARCH PRIORITIES

Noting the broad nature of these priorities, the following areas are of particular importance to the Department of the Environment and Energy:

- 1. Contribute to management and monitoring of the Commonwealth Marine Reserves.*
- 2. Matters of national environmental significance – areas of particular interest are listed species and communities, informing environmental assessments and domestic research which demonstrates that you do not need to kill whales in order to study them.*
- 3. Marine debris – supporting implementation of the Threat Abatement Plan.*

Maximising the efficacy of managing Australia's marine environment (1)

Identifying hot spots and management strategies for top order marine predators, including research to identify effective non-lethal measures to manage human-shark interactions (1.1).

Improve the management of marine and coastal biodiversity by evaluating and quantifying the results of management interventions (1.2).

Identify key social and economic values of the marine environment to build better stakeholder support and engagement in the management of marine and coastal environments (1.3).

Develop and trial decision making tools that will support policy makers and managers to identify options, and prioritise activities (1.4).

Identify and trial methods to restore degraded habitats such as oyster and mussel beds, seagrass, and intertidal habitats to underpin on-ground management actions (1.5).

Improving our understanding of pressures on the marine environment (2)

Define the impact of sewerage outfalls and stormwater runoff on Australia's marine environment to identify real actions to improve outcomes for marine water quality. This is to be informed on a national scale by the completion of a national ocean outfall database (2.1).

Identify past and current pressures on the marine environment, and understand their impact to better target policy and management actions. For example, identify the impact of cetacean ship strike (2.2).

Determine the causes of, and relationships between, pressures, including cumulative pressures, on the marine and coastal environment to inform government investment, regulation and best practice industry operations (2.3).

Improve prediction of likely future pressures and their potential impacts on marine and coastal biodiversity and economic and social values to enable the mitigation of avoidable impacts (2.4).

Improving our understanding of the marine environment including biophysical, economic and social aspects (3)

Determine and trial practical and repeatable methods for monitoring the status and trends of key coastal and marine species and environments (3.1).

Meaningful and accessible information on the status and trends of key social and economic values associated with the marine environment (3.2).

Better understand issues that are common to the fishing industry and the environment including identifying solutions of mutual benefit (3.3).

Improve our knowledge of key marine species and ecosystems to underpin their better management and protection (3.4).

Identify key opportunities to collaborate and build Indigenous participation and knowledge into the management and protection of marine species (3.5).

The role of citizen science in the management of marine biodiversity (3.6).

NORTHERN AUSTRALIA ENVIRONMENTAL RESOURCES: RESEARCH PRIORITIES

Effective management of northern Australia's environmental resources (A)

Identify lessons learned from the incorporation of Top End Indigenous fire knowledge into fire management, to inform the incorporation of Indigenous knowledge in fire management and carbon abatement planning nationally (A1).

Identify high-priority areas in northern Australia for threatened species and ecosystems to better target threat abatement and species recovery investments (A2).

The development and direct trial of practical techniques that underpin on-ground management for the recovery of identified threatened species, including Kakadu National Park and adjacent Indigenous Protected Areas (A3).

Develop and trial spatially explicit tools to guide planning and management decisions that support a mix of multiple uses and protected areas while maintaining environmental values (A4).

Identify evidence-based methods for the assessment of development impact on species and ecosystems which can be better integrated into planning processes and EPBC Act approvals (A5).

Develop management practices for rainforests which minimise the impact of extreme weather events (A6).

Identify management actions to address the management of waste and debris in remote locations. This includes the issue of ocean rubbish and debris washing up on Australia's northern coastline and the management of hard waste in remote locations such as Cape York (A7).

Understanding the pressures and impacts on environmental resources in northern Australia (B)

Identify biodiversity impacts from changed land and water use (e.g. agricultural, development and infrastructure) to support best practice land management (B1).

Demonstrate the benefits and constraints of landscape and river connectivity to better manage biodiversity outcomes (B2).

Determine the impacts, including cumulative impacts, of natural stressors and current management regimes on biodiversity loss and landscape degradation to underpin on-ground management actions (B3).

Identify critical knowledge gaps in the understanding of environmental resources in northern Australia to better prioritise government investment (B4).

Understanding and measuring the condition and trends of environmental, social and economic resources in northern Australia (C)

Develop methods, and techniques to reduce the cost of estimating changes in soil carbon over time (C1).

Participation of Indigenous people in environmental management across northern Australia, including Indigenous Protected Areas (C2).

Develop better capacity to predict ecosystem failure to improve planning and management practice (C3).

Determine the economic contribution of environmental resources across northern Australia in supporting effective policy and planning decisions (C4).

Demonstrate how to better measure environmental drivers, pressures, stressors and responses in northern Australia, taking into account remoteness and limited specialist skills base within the region, including approaches to environmental accounting (C5).

THREATENED SPECIES RECOVERY: RESEARCH PRIORITIES

Effective on-ground responses to reduce threats and promote recovery of threatened species (D1)

The development and direct trial of practical techniques for the recovery of identified threatened species to underpin on-ground management. Including the development and trial of practical actions for recovery of at least 10 of the highest priority threatened species and the trial of exclusion/enclosure methods (D1.1).

The development and direct trial of practical techniques for the restoration of degraded habitat and re-establishing natural succession processes (D1.2).

Demonstrate the costs/benefits and effectiveness of methods to mitigate the impact of invasive animals, plants and disease (D1.3).

Improved information on management techniques to recover threatened freshwater and estuarine species and ecosystems (D1.4).

Better understanding, measuring and reporting on the condition and trend of threatened species (D2)

Meaningful and accessible information on trends in threatened species, to inform the targeting of Government investment and build community awareness and support (D2.1).

Early warning tools for extinction risk and identification of the most at risk species (D2.2).

Better prediction of threatened species trajectories, for example using indicators, proxies, triggers and thresholds (D2.3).

Improved information on the distribution of threatened species and ecological communities to better pinpoint their location. Including the review of current species distribution models, and incorporating the capacity for species to adapt to climate change (D2.4).

Using social and economic opportunities for threatened species recovery (D3)

Identifying better ways to use offsets under the EPBC Act to conserve threatened species (D3.1).

Identifying better methods for communication and community buy-in to threatened species issues including threatened species listing, and initiatives to engage the community in the protection of our threatened species, including the development of flying fox management options in urban/township areas (D3.2).

Opportunities for mutual benefit to threatened species and business in a streamlined regulatory environment (D3.3).

Collaborations with, and participation of, Indigenous people in threatened species research and management (D3.4).

The role of citizen science in threatened species conservation and in building greater community support for threatened species management (D3.5).

TROPICAL WATER QUALITY: RESEARCH PRIORITIES

Improved understanding of the impacts, including cumulative impacts, and pressures on priority freshwater, coastal and marine ecosystems and species (Theme 1)

Further development of a systematic approach to Crown of Thorns (COTS) control. Identify and trial risk abatement, and prioritisation strategies in response to Crown of Thorns outbreaks, extreme events and biosecurity threats. Develop and implement a plan to reduce Crown of Thorn numbers by two million (1.1).

Develop practical improvements to land management practices that will influence behavioural change and improve outcomes for tropical water quality and ecosystem health (1.2).

Improve our knowledge of cumulative pressures on environmental and social values of the Great Barrier Reef to determine more effective management actions (1.4).

Evaluate the practicalities of restoring connectivity to freshwater, coastal and marine ecosystems and the resilience of dependent species (1.6).

Maximise the resilience of vulnerable species to the impacts of climate change and climate variability by reducing other pressures, including poor water quality (Theme 2)

Improve our understanding of the consequences of climate change for the health and resilience of vulnerable freshwater, coastal and marine species, and ecosystems (2.1).

Develop practical, cost-effective, climate change adaptation options that are accessible to the managers of coastal and marine ecosystems and their catchments (2.2).

Identify practical management actions capable of protecting and improving water quality on the Great Barrier Reef. Including evaluating actions with the potential to protect highest priority ecosystems and species or to reinstate severely impacted ecosystems and species (2.3).

Investigate the feasibility of water quality improvement where reduced nitrogen use on cane farms can be turned into a credit that can be traded (2.5).

Identify sustainable populations and the effectiveness of zoning on the health and resilience of target fish species and tropical ecosystem biodiversity (2.6).

Natural resource management improvements based on sound understanding of the status and long term trends of priority species and systems (Theme 3)

Identify and trial practical methods to improve reef resilience, such as the transplantation of coral and coral genetics (3.1).

Understand trends in Dugong and turtle populations, including breeding cycles and trends in seagrass and habitats. Develop better methods for the protection of important habitat for Dugong and turtles (3.2).

Combine existing indicators and monitoring programmes to develop a cost-effective integrated monitoring programme to support natural resource management, evaluate results and communicate trends (3.3).

Identify regionally-specific management interventions to achieve or maintain realistic desired states for tropical environmental, social, cultural and economic values (3.4).

Develop and implement better tools, including spatial information, to support the prioritisation of on-ground investments and interventions and assess their success (3.5).

Explore the opportunities for citizen science and Indigenous participation to improve tropical water quality awareness and outcomes (3.6).