

## Deep South Challenge status summary

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The Deep South Challenge (DSC) has built a Mission-centred research plan incorporating five research programmes: Engagement; Vision Mātauranga; Impacts & Implications; Processes & Observations; and Earth Systems Modelling & Prediction.

In addition to programme funding, the Deep South is conducting an open “Contestable Fund” process that invites ideas for focal area-based research aligned to any, or several, of the five programmes. Since the overall mission of the Challenge relies on synergies and success across all five programmes, proposals that span and connect more than one programme are actively encouraged.

This status update provides information designed to enable applicants better to understand the overall vision of the Challenge and its component programmes. This also reflects developments that have occurred subsequent to publication of the [Research and Business Plan](#), which was published in December 2014.

### Overall Vision/ Context

#### Mission Statement

The mission of The Deep South (Te Kōmata o Te Tonga) National Science Challenge is to enable New Zealanders to adapt, manage risk, and thrive in a changing climate.

Working with communities and industry we will bring together new research approaches to determine the impacts of a changing climate on our climate-sensitive economic sectors, infrastructure and natural resources to guide planning and policy.

This will be underpinned by improved knowledge and observations of climate processes in the Southern Ocean and Antarctica - our Deep South - and will include development of a world-class earth systems model to predict Aotearoa/New Zealand's climate.

#### Overarching vision

Increasing resilience to climate change requires reliable scientific information that responds to the decision-making needs of New Zealanders, made available and accessible through appropriate channels. Deep South research includes enhancing climate modelling capacity, improving predictions of future climate and its impacts and implications, and gaining new understanding of Antarctic and Southern Ocean processes. This is closely coupled with research and engagement that will build New Zealanders ability to understand and respond to these risks.

## Deep South Challenge Programmes

A brief description of each programme, including its goals, boundaries and current status, is provided below. While these are presented separately, proposals that strengthen the interplay and connections between these programmes are strongly encouraged to ensure delivery of the Mission as a whole.

### Engagement

The high-level goal of the DSC Engagement programme is to contribute to improving New Zealanders' ability and capacity to make decisions informed by DSC -related research. The Engagement programme aims to support and create avenues for information from the DSC to be useful, and used, in decision-making about climate change across New Zealand. It also seeks to build avenues that ensure that DSC research responds to the priorities of New Zealanders.

The Engagement programme has identified six objectives, expanded in the [Engagement Update](#) on the DSC website. These could be realised through a number of activities ranging from coproduction mechanisms that help identify New Zealander's decision-needs related to climate change and ensure these priorities inform DSC research, to more traditional communication and education about the physical science underpinning DSC-research, to two-way tailored engagement activities with specific communities and sectors. We strongly encourage proposals that complement existing or proposed DSC-research, are innovative and adventurous in their scope and goals, and which include ideas for evaluation. We also encourage proposals that partner with current activities and organisations, build on existing strengths and communities, and test or demonstrate new approaches and best practice in engagement. We welcome either standalone Engagement proposals or cross-programme proposals that include a strong Engagement component.

If you would like more details on the Engagement Strategy, or to discuss proposal ideas, please contact [DSC-Engagement@vuw.ac.nz](mailto:DSC-Engagement@vuw.ac.nz).

### Vision Mātauranga

The Deep South Vision Mātauranga science programme seeks to strengthen the capacity and capability of iwi/hapū/whānau and Māori business to respond to climate change risks and impacts. This programme will give effect to the [MBIE Vision Mātauranga objectives](#) through strategic planning and research.

Project proposals should be built around the four research themes identified in the Deep South Challenge Research and Business Plan. They should also aspire to strengthening connections between Māori and the science system as well as fostering greater understanding of how DSC research can contribute to the aspirations of iwi, hapū, whānau and Māori business and enterprise. As with Engagement, we encourage proposals that complement existing or proposed DSC-research, are innovative and adventurous in their scope and goals, and which include ideas for evaluation.

The four research themes are:

Theme 1: Understanding climate change - linkages, pressure points and potential responses

Theme 2: Exploring adaptation options for Māori communities

Theme 3: Assistance to Māori businesses to aid decision-making and long-term sustainability

Theme 4: Products, services and systems derived from mātauranga Māori\*

\* Includes: Te Reo Māori and Tikanga Māori

Finally, it is expected that Vision Mātauranga science projects will build upon research advances made to date and contribute practical and sustainable solutions for Māori and wider Aotearoa/New Zealand.

For further guidance, please contact the Science Leader Vision Mātauranga, Darren Ngaru King ([darren.king@niwa.co.nz](mailto:darren.king@niwa.co.nz)).

### Impacts and Implications

The goal of the Impacts & Implications programme is to advance New Zealand's capacity to understand, identify, and assess direct (and indirect) climate change impacts and implications arising at different scales at timescales ranging from a few years, to many decades, to even a century.

The Impacts & Implications Programme will be implemented via four research streams:

- 1) Targeted Impacts that will advance New Zealand's capacity to consider and evaluate key impacts of climate change, including strengthening links and interactions with the emerging New Zealand Earth Systems Model (see below)
- 2) Tailored Implications that will assist end-users, stakeholders, and communities build capacity to robustly consider climate change in various decision-making contexts and processes
- 3) Engagement Adaptive Capacity that will support the Engagement Programme by increasing access to and fostering collaborations with Impacts & Implications research and researchers
- 4) Vision Mātauranga Adaptive Capacity that will support the Vision Mātauranga Programme by increasing iwi/hapu access to and collaborations with Impacts & Implications research and researchers.

On the basis of previous scholarship and stakeholder feedback, the DSC has identified four direct climate change impacts which are priorities for the Impacts and Implications Programme: (1) extreme weather events; (2) droughts; (3) changes in climate distributions (such as days above a temperature threshold); (4) sea-level rise. Proposals focusing on other impacts are welcome, but will need to demonstrate co-funding opportunities or alignment with other NSCs, CRI core funding, or similar.

We welcome either standalone Impacts & Implications proposals or cross-programme proposals that include a strong Impacts & Implications component. For further guidance, please contact the Science Leader Impacts & Implications, Daniel Rutledge ([rutledged@landcareresearch.co.nz](mailto:rutledged@landcareresearch.co.nz)).

### Earth System Modeling and Prediction

Earth System Models (ESMs) are the tools that inform international assessments of climate such as the assessment reports published by the Intergovernmental Panel on Climate Change (IPCC). While major advances in climate modelling have been made, problems remain that reflect a lack of scientific understanding of salient southern high-latitude processes. It is the mission of the DSC to help fill these scientific gaps such that climate projections in future will be less subject to these problems. We will do so by developing, in collaboration with international partners, the New Zealand Earth System Model (NZESM).

Six core projects have been set up which define the backbone of core physical research to be undertaken under the DSC. With one exception, these projects combine modelling and observations (to be detailed below). They focus on heat transport in the Southern Ocean, Antarctic sea ice extent, clouds and aerosols in the Southern-Ocean region, initialized decadal prediction and extreme events, and on providing processed observational datasets ready for use in model validation. A sixth project is about handling versioning, managing code contributions from the other projects, and supporting users of the NZESM.

We welcome proposals from the NZ scientific community that aim to improve the formulation or behaviour of the NZESM or exploit the NZESM. Proposals on model development need to outline which aspect of the model is targeted, and how the improvement will be achieved. Projects need to complement but not duplicate the six existing projects in the ESMP/P&O domains. Proposals that also offer co-benefits in the other DSC programmes are encouraged. Access to the NZESM for accepted non-NIWA projects will be facilitated; this does not need to be discussed in the proposal.

For further guidance, please contact the Science Leader Earth System Modelling, Olaf Morgenstern ([olaf.morgenstern@niwa.co.nz](mailto:olaf.morgenstern@niwa.co.nz)).

### Processes and Observations

There are information deficits in our understanding of the physical and chemical processes in the atmosphere, ocean, and cryosphere in and over the Southern Ocean and Antarctica. The intention over the 10 years of the *Deep South* Challenge in the Processes and Observations programme is to address these deficiencies with targeted process and observation studies. Specifically the challenge will target those processes that once better understood will improve the skill of the New Zealand Earth System Model, and hence climate prediction for New Zealand.

Current and future work in this programme is expected to focus on the collection and analysis of new observations and/or the re-examination of old observations that will provide a better understanding of climate processes in the Deep South. Any observations collected are expected to be time limited, although enhancing their value through a contribution to long term monitoring is encouraged. It is expected observations will utilise the geographical and logistical assets that New Zealand has for studying the Deep South, and/or contribute to globally significant observation programmes.

For further guidance, please contact the Science Leader Processes & Observations, Mike Williams ([mike.williams@niwa.co.nz](mailto:mike.williams@niwa.co.nz)).