A PLAN FOR

FUTURE EARTH AUSTRALIA

Enabling Australia's social, economic and environmental future

futureearth
research for global sustainability

ACOLA
AUSTRALIAN COUNCIL OF LEARNED ACADEMIES

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Summary

Future Earth and *Future Earth Australia*

Two hundred and fifty years ago, at the start of the industrial revolution, a big shift in the rate of social change began. The era marked the end of several millennia of slow change in the world's demography and economies, and in humanity's impact on the planet. By 1950, two centuries of rapid growth and increasing impact had brought us to the threshold of what has been called 'the great acceleration', a sharp rise in rates of growth of population, global wealth, and the impact of our species on the planet's biophysical life support systems.

The great acceleration has led to enormous improvements in personal wealth and quality of life, first in the developed nations but increasingly in the rest of the world too. The world economy is now fully globalised. For the first time, governments are working together to address physical and social problems on a regional and global scale, recognising that the Earth has entered the Anthropocene epoch in which human actions constitute a force potent enough to affect the natural workings of the planet. Under UN initiatives like the Millennium Development Goals and the Sustainable Development Goals, the challenges of poverty, disease, food security and premature mortality are being tackled on a global scale and with sustainable long-term solutions as the target.

Just as we have now recognised the need to coordinate solutions to these problems globally, because of the fundamental interconnectedness of today's world, we have also recognised that long-term solutions require us to fuse the best of our skills in the natural and human sciences, the arts and civil society, and for action to occur locally. Five years ago, the International Council for Science (ICSU) acknowledged this by initiating *Future Earth*, a global initiative that built on existing programs in the biophysical and human sciences. It brings together many of the world's best researchers and thinkers to achieve long-term solutions to global challenges. *Future Earth* has already mobilised more than $2.5 billion of research funding internationally.

Announced in June 2012 at the UN Conference on Sustainable Development (Rio+20), *Future Earth* is an international research platform providing the knowledge and support to accelerate our transformation to a sustainable world. It has subsumed three existing international research organisations addressing global change: International Geosphere-Biosphere Programme (IGBP), International Human Dimensions Programme on Global Environmental change (IHDP), and Diversitas, and is supported by a fourth, World Climate Research Programme (WCRP). Over 10,000 scientists are working in *Future Earth* projects with increasing involvement from other fields of knowledge, especially the humanities, arts and traditional knowledge. A key aim of *Future Earth* is to achieve greater integration of these diverse forms of knowledge to address the most challenging problems facing humanity—securing a decent quality of life for all while maintaining the natural systems of the planet in good order for future generations.

Future Earth has five global administrative centres, located in Canada, France, Japan, Sweden and the United States, and a set of regional research hubs which cover the Middle East and North Africa, Latin America, Europe and Asia. The management and detailed strategic planning processes of *Future Earth* are still at an early stage of evolution, and its regional structures will become increasingly important in setting its priorities at the global level. Consequently, Australia has been encouraged to establish a national/regional hub, called *Future Earth Australia*, to coordinate contributions from this continent, to facilitate interactions with our regional neighbours, and to represent our region in the strategic planning and priority setting of *Future Earth* globally.

Direct involvement of *Future Earth Australia* in *Future Earth*'s global priority-setting will ensure the necessary recognition and focus on problems peculiar to our region; it will also allow the unprecedented capability being developed across *Future Earth* internationally to be harnessed to our region's needs. The process will mean involvement in projects initiated and led by *Future Earth Australia* and will facilitate the participation of Australian workers in *Future Earth* programs based overseas. Of course, any Australian influence on research directions and foci of *Future Earth* will be proportional to the strength and vibrancy of the Australian regional program.

Conversely, active involvement in the planning and activities of *Future Earth* internationally will be of huge benefit to promoting sustainability in Australia; by harnessing the power of *Future Earth*, an enterprise supported by multiple national governments, this will ultimately influence Australian government and business for the better.

Recognising that the current state of development of *Future Earth* offers a brief window of opportunity for Australia to be an early adopter and shaper of *Future Earth* activities, the Australian Council of Learned Academies (ACOLA) has funded the development of a strategic plan for *Future Earth Australia*. The strategic plan has been developed under the guidance of Fellows from each of the learned academies, and following consultation across Australia with academia, business, government, the arts and civil society. This extensive consultation has involved open forums in most capital cities, one-on-one interviews, and a national forum in Canberra in April 2016.

Vision and strategic objectives

The vision of *Future Earth Australia* is: *for Australia and its people to thrive in, and contribute to, a sustainable and equitable world.*

Future Earth Australia will achieve this by *coordinating, enabling, performing and promoting research and practice that spans social and biophysical sciences, the humanities and the arts, to address the sustainability challenges facing Australia, our regional neighbours and the rest of the world, in close collaboration with government, business and civil society groups*.

Initial portfolio of projects

Future Earth Australia intends to achieve its strategic objectives by coordinating, enabling, promoting and performing sustainability research and practice. The first three activities require the establishment of a *Future Earth Australia* project office (described below) while *performance* of research and practice is manifested in its projects. *Future Earth Australia*'s initial set of projects includes those *Future Earth* projects already involving Australian researchers. These are important because they provide direct links with *Future Earth*'s large portfolio of international activities. The others are projects that were proposed at the April 2016 national forum as strategic responses to the three themes and eight focal challenges of *Future Earth* listed in Section 3 below. These all have the features that consultation has determined should mark *Future Earth Australia* projects (see Appendix 3 for a summary of that consultation)—that is, they are cross-disciplinary and have been co-designed by, and will be co-produced and applied by, cross-sectoral teams.

Three existing projects under *Future Earth* are being led by Australian researchers:

1. The 'Global Carbon Budget' project of *Future Earth*'s Global Carbon Core Project is led by Dr Pep Canadell of CSIRO.
2. *Future Earth*'s 'Sustainable Water Futures' Core Project is led by Prof. Stuart Bunn of Griffith University.
3. The 'Planetary Boundaries of the Human–Earth System' project of *Future Earth*'s IHOPE Core Project is led by Prof. John Finnigan of CSIRO.

Four *Future Earth Australia* projects discussed at the national forum in April are already underway or about to start:

1. Water Futures: Lessons from Australia. This new project, under the Sustainable Water Futures Core Project of *Future Earth*, is led by Prof. Stuart Bunn of Griffith University.
2. New stories (and myths) to live by in the Anthropocene, led by Prof. Iain McCalman, University of Sydney.

3. A young person's business plan for the planet, led by Dr Graham Durant, Questacon.
4. Water Futures, an Asia–Pacific knowledge exchange and transdisciplinary laboratory focused on water futures, 23–25 February 2017 at the Arts Centre, Melbourne, led by Ms Angharad Wynne-Jones (Director, Tipping Point).

Thirteen more projects were proposed at the April forum and are now in different stages of planning, with at least two being ready to commence as soon as resources are identified. Details of all these projects can be found in Section 3 and in Appendix 1.

Business plan and value propositions

Future Earth Australia's business model, consisting of structure, governance and funding is designed to deliver value to its stakeholder groups. Hence *value propositions* for each group take primacy. Consultation with stakeholders, including potential partners, has defined the following value propositions:

- Governments: Non-partisan engagement with all sectors of society to define and understand the challenges to long-term sustainability of the Australian economy, society and environment.
- Business: Ability to engage with multiple holders of knowledge in trans-disciplinary forums to consider issues vital for business.
- Civil society (the public): The ability to have informed involvement in identifying issues of sustainability from various perspectives and to be involved in appropriate ways in the co-design, co-development and co-implementation of socially significant projects.
- Non-government organisations: The ability to become involved in partnerships with government and business that go beyond what is currently feasible.
- Knowledge generators (including researchers and practitioners across the sciences, humanities, and arts as well as those in business, government, NGOs and the public): *Future Earth Australia* will provide a hub for networking, coordinating, enabling, and promoting sustainability research beyond what has been possible to date.

Establishment of a Project Office

A Project Office will be required to coordinate *Future Earth Australia* activities and facilitate interactions between stakeholders and with international initiatives, to promote implementation and uptake of key research outputs, and to enable new co-designed sustainability projects that benefit Australia and the region. The *Future Earth Australia* Project Office will perform a set of functions including convening an annual *Future Earth Australia* workshop, supporting projects, linking, coordinating and facilitating activities and partnerships, and promoting *Future Earth Australia* to government, business and other stakeholders.

It is envisaged that a *Future Earth Australia* Project Office will be established as an independent (i.e., incorporated not-for-profit) or semi-independent entity (i.e., business unit or subsidiary of an existing organisation) with an annual operating budget of approximately $400,000 p.a. to support 2.5 FTE staff and a range of functions and activities (outlined below). It is intended that this operational funding will be sourced from:

- subscription fees from *Future Earth Australia* member organisations
- Federal and/or State and Territory government grants to support core activities

- grants and sponsorship for specific events and coordination activities
- possible philanthropic donations.

An establishment phase will be supported by the Australian Academy of Science (henceforth referred to Academy of Science). This establishment phase will run for an initial 12 months from 1 July 2016; after this time, if not established, the Academy of Science will make an assessment of its likely success in the near term, and on this basis may decide to continue to support the establishment process for a further 12 months. The establishment process will require a budget of $200,000 p.a. (not including costs of an annual *Future Earth Australia* symposium) and will operate under an interim governance structure.

Future Earth Australia establishment plan

With an initial budget of $200,000 provided by existing stakeholder organisations, the Academy of Science will work with key stakeholders from July 2016 to secure the full operating budget required to establish the *Future Earth Australia* Project Office as an independent or semi-independent entity. As part of this establishment process, the Academy will appoint a Steering Committee, reconstitute the existing *Future Earth Australia* Expert Working Group as an Expert Advisory Group, and employ a full-time program manager to coordinate this work under an interim governance structure, as shown in Figure i.

Governance roles and responsibilities

Under this interim structure, the Academy of Science will host the program during its establishment phase, and the Executive Committee of the Academy's Council (EXCOM) will provide high-level governance oversight.

The *Future Earth Australia* Steering Committee will comprise 7–10 members nominated by funders of the establishment phase plus independent members with collective skills in business, law and finance, and with standing and deep connections throughout the Australian and regional sustainability sector, spanning business, government, academia and the community. Its role will be to champion the cause of *Future Earth Australia* and to provide strategic advice to the Academy of Science on the establishment of an independent or semi-independent *Future Earth Australia* Project Office by June 2018.

Once *Future Earth Australia* is established on an independent or semi-independent basis, the Steering Committee may be reconstituted as a Board of Directors or other structure as appropriate.

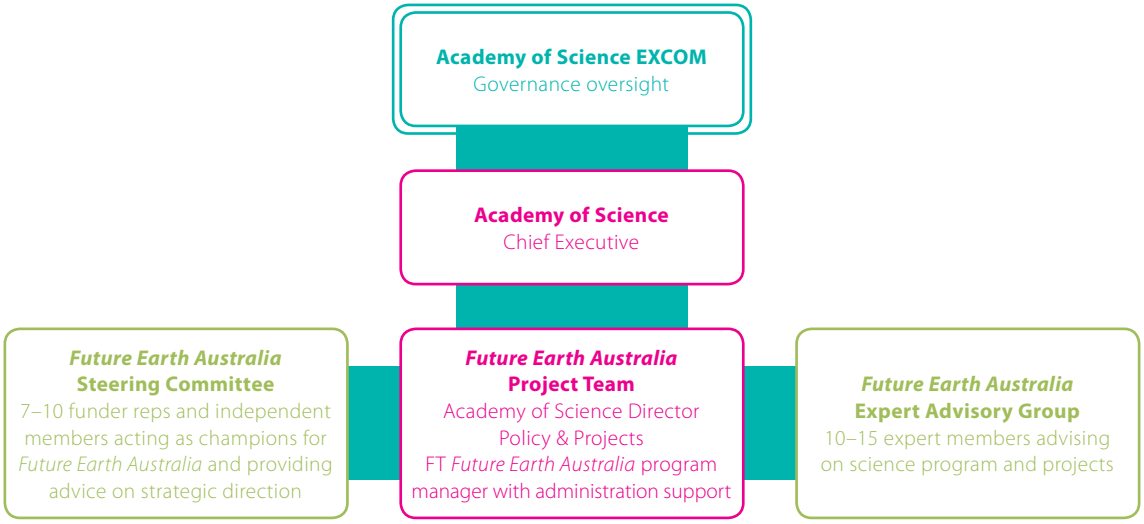


Figure i. Interim governance structure of *Future Earth Australia*

The *Future Earth Australia* Expert Advisory Group will comprise individuals with expertise in scientific, social and cultural aspects of sustainability, drawing in the first instance on those who served on the *Future Earth Australia* Expert Working Group during 2015–16. The *Future Earth Australia* Expert Advisory Group will identify key sustainability challenges, recommend *Future Earth* projects that address these, interact with *Future Earth Global*, and advise the Academy of Science on establishment and implementation of *Future Earth Australia* as required.

The *Future Earth Australia* Project Office will be hosted during the establishment phase by the Australian Academy of Science with a full-time program manager and some support in areas of communications, administration and finance, and oversight of the Academy's Director Science Policy and Projects.

Budget

A 2016–17 budget of $200,000 (excl GST) will be provided by existing stakeholder organisations by 30 June 2016.

If the Academy of Science decides to continue the establishment phase beyond 12 months, additional funding will be required, for which existing or new funders will be approached by the *Future Earth Australia* Steering Committee as required with support from the *Future Earth Australia* Expert Advisory Group.

An annual *Future Earth Australia* Symposium will be run by the *Future Earth Australia* Project Office under a separate budget, with the expectation that costs will be met from participant registrations and sponsorships.

Representation of *Future Earth Australia* at relevant *Future Earth* global meetings would be undertaken by members of the *Future Earth Australia* Expert Advisory Group or other key stakeholders with support from their own institutions or project funding.

Links with other key initiatives

While *Future Earth* was established to provide the integrated knowledge base to transition to a sustainable world, other initiatives, most notably the UN's Millennium Development Goals and now the UN's Sustainable Development Goals (SDGs), have been established as global targets. The Sustainable Development Solutions Network (SDSN) has been set up by the UN to bring the SDGs into effect. *Future Earth* and SDSN are complementary, and SDSN is a supporting agency of *Future Earth*. Similarly, SDSN Australia and *Future Earth Australia* will play complementary roles with representatives of SDSN Australia on *Future Earth Australia*'s Steering Committee.

Table i. Establishment timetable 2016–17

Quarter commencing	July	Oct	Jan	April
Future Earth Australia Steering Committee meetings	■	■	■	■
Future Earth Australia Expert Advisory Group meetings	■	■	■	■
Appoint *Future Earth Australia* Program Manager	■			
Refresh and upgrade *Future Earth Australia* website with collaboration tools	■	■		
Future Earth Australia stakeholder workshops		■	■	■
Coordinate and support new and existing *Future Earth Australia* project activity	■	■	■	→
Scope possible business models for ongoing operation		■	■	→
Establish/pilot a subscription/membership model for *Future Earth Australia*			■	→
Annual *Future Earth Australia* Symposium			■	
Discussion with funders and stakeholders re establishment	■	■	■	→
Assessment of establishment progress			■	■
Continuation decision by the Academy of Science EXCOM				■

Outline

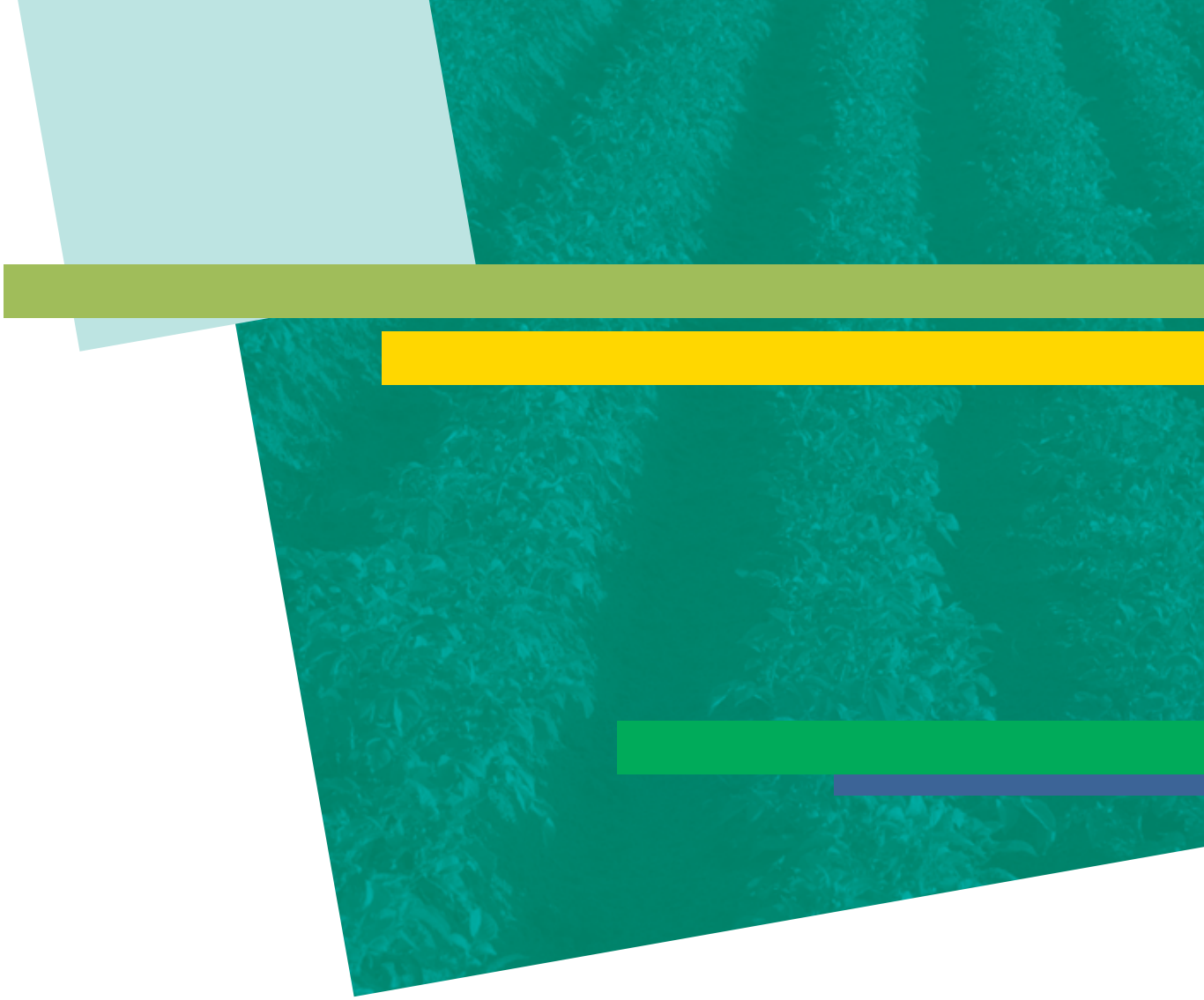
This document sets out a rationale for a new approach aimed at:

- addressing the big sustainability issues facing Australia and our region, and
- enhancing the ability of Australia to contribute to global solutions.

This rationale is based on consultation with a range of stakeholders around Australia representing government, business, academia and the arts, non-government organisations and civil society, including a national forum held in Canberra in April 2016.

In Section 1 (The current situation), we:

- review the environmental, social and economic challenges that Australia and the region we are part of face now and into the future;
- consider the institutional environment within which those seeking a sustainable future for Australia and our region must operate at the moment;
- explain why we think there is a need for a platform that enables groups and individuals across society to collectively make greater progress towards sustainable futures than has been possible to date, through co-design, co-development and co-implementation of knowledge of all types.



In Section 2 (Vision), we outline:

- a vision for '*Future Earth Australia*' (a temporary name that we hope will change to reflect a greater focus on Australasia and the Asia–Pacific as we demonstrate value to regional partners)
- a statement of intent (mission) for *Future Earth Australia*.

In Section 3 (Strategic Objectives and Initial Portfolio of Activities), we identify:

- strategic objectives
- priority actions
- a portfolio of initiatives currently under development.

Finally, in Section 4, we consider:

- the business model that *Future Earth Australia* will adopt, including value propositions for key stakeholders and a governance structure and operating process.

The current situation

1.1 Global and regional challenges and opportunities

In the twentieth century we saw a transition from an age of industrial power and global dominance by a few developed nations to a post-industrial age of information and global development. A decade and a half into the 21st century, geopolitical forces are realigning; the centre of gravity of economic activity is moving east. We are witnessing a rerun at a global scale of the great waves of change that transformed the western world through the industrial revolution. A demographic transition is leading to a stabilising, but hugely increased, world population. Massive urbanisation means that, by mid-century, four-fifths of the world will live in cities. Unprecedented connectivity in information, energy, and trade is driving unpredictable evolution of societal norms, institutions, and modes of governance. These changes are playing out against a backdrop of irreversible biogeochemical changes at a planetary scale, of which climate change is but the most prominent harbinger.

How will Australia fare in this new century? Where will Australia and the surrounding region be by 2025? We are a developed nation on the fringe of the great centres of population growth in Asia. Australians enjoy one of the highest per capita incomes and most enviable lifestyles in the world. How can we maintain these as markets, competition, and political alignments shift around us?

As our population heads towards 36 million in 2050, Sydney and Melbourne are growing by close to 100,000 each year, with Brisbane and Perth growing even faster, proportionately.

Australia is unique in several defining ways that mean that the answers to these questions must have a uniquely Australian character too.

Australia is one of the most urbanised of nations and has been so almost since settlement. Today more than 90% of us live in urban settings, with 70% concentrated in the coastal metropolises that rim our continent. As our population heads towards 36 million in 2050, Sydney and Melbourne are growing by close to 100,000 each year, with Brisbane and Perth growing even faster, proportionately. Within our cities and towns, a multicultural identity has emerged that bears little resemblance to the white pioneer Australia of the 1950s; indeed, this vibrant and constantly evolving national psyche is often at odds with the ruling assumptions and traditional alliances that still drive our politics.

Our rate of population growth, 1.5% p.a.,[1] more than half of which is driven by immigration, resembles that of a developing nation; therefore to maintain our current lifestyle, our economy must grow even faster. Yet farsighted planning for our economic future has not been evident in Australia in recent decades. Manufacturing has withered, and our dependence on services is not underpinned by a corresponding investment in education and research which is needed to sustain it. A significant dependence on mineral exports to maintain a healthy balance of payments has meant that Australia is reliant on the economic trajectories of China and India and vulnerable to a gathering global momentum for decarbonising the world economy. We risk falling prey to the curse of resources, as other countries have done before us.

1 Average over last century. See: Raupach M. R., McMichael A. J., Finnigan J. J., Manderson L. & Walker B. H. (Eds) (2012) *Negotiating Our Future: Living scenarios for Australia to 2050*. Volume 1. Australian Academy of Science, Canberra. <www.science.org.au/publications/negotiating-our-future-living-scenarios-australia-2050>

Last, but far from least, the biology, geology and location of our continent are truly unique. Situated in the great southern oceans, we inhabit an ancient worn regolith with fragile soils. The most densely settled southeastern part of the continent has low and intermittent rainfall. Our flora and fauna, both terrestrial and marine, devolve from a Gondwanaland origin and, until European settlement, represented millions of years of adaptation to our isolated landmass. However, in the last two centuries we have altered this ecosystem drastically and irreversibly. With the awareness of denizens of the 21st century, we love our landscapes, plants and animals and must nurture them for their own sake as well as for the vital life-support system that both our terrestrial and marine estates provide.

> *The challenge of sustainable development for Australia, which Future Earth must confront, is how we maintain an equitable and desirable lifestyle through creating new economic opportunities within the bounds set by these geopolitical, social, economic and biophysical parameters.*

There already exists a substantial body of innovative research and cross-society dialogue to address many components of the challenges and opportunities outlined above. In addition, many community, business and government organisations are taking steps to respond. The Department of Industry, Innovation and Science's strategic plan, for example, envisions an 'agile economy, capitalising on Australia's commercial and scientific strengths' based in part on international engagement. The Business Council of Australia's global engagement policy focuses on 'engagement with the global economy, fostering openness and reciprocity on the part of our regional and global partners'. Other non-government organisations are pursuing better engagement across society and nations to address sometimes incompatible economic, social and environmental objectives.

The following section of this document explores how Australia might join in a global program to take this body of initiatives to a higher level, making an even bigger and more effective contribution to a sustainable future for Australia, its region and the world.

1.2 Future Earth

Future Earth is a major international research platform providing the knowledge and support to accelerate our transformation to a sustainable world.

Future Earth was established because of recognition among funding bodies and decision makers globally that there is a need for a new approach to research aimed at planetary sustainability—one that is more integrative, international and solutions-oriented, reaches across existing research programs and disciplines, and has input from governments, civil society, local knowledge, research funders and the private sector.

Future Earth brings together a 'federation' of projects and other initiatives related to global environmental change. It is sponsored by the Science and Technology Alliance for Global Sustainability (Appendix 1 and <www.futureearth.org/who-we-are>). Its governance embraces the concepts of co-design and co-production of science with relevant stakeholders across a wide range of sectors, and it has used this approach to identify a core set of focal challenges for sustainable futures globally (Appendix 1).

Future Earth presents an unprecedented opportunity for social and biophysical scientists to work closely with government,

industry and societal partners around the world to address the big challenges facing the world. Currently, *Future Earth* involves over 10,000 researchers worldwide across all disciplines as well as workers in the arts, humanities and civil society. It entrains approximately $2.5 billion in research funding. A window of opportunity for Australia to be both involved with and contribute to this international effort is open now, and it is imperative that we seize it as the potential benefits to Australia are enormous.

1.3 Australia's knowledge environment

The approach that *Future Earth* aspires to involves engaging all relevant stakeholders in co- identification of issues; co-design (and co-development) of approaches to knowledge generation to address those issues; and co-application of the knowledge and solutions generated. This is consistent with contemporary thinking in social science about the processes involved in collective social learning (Figure 1 and Figure 2).

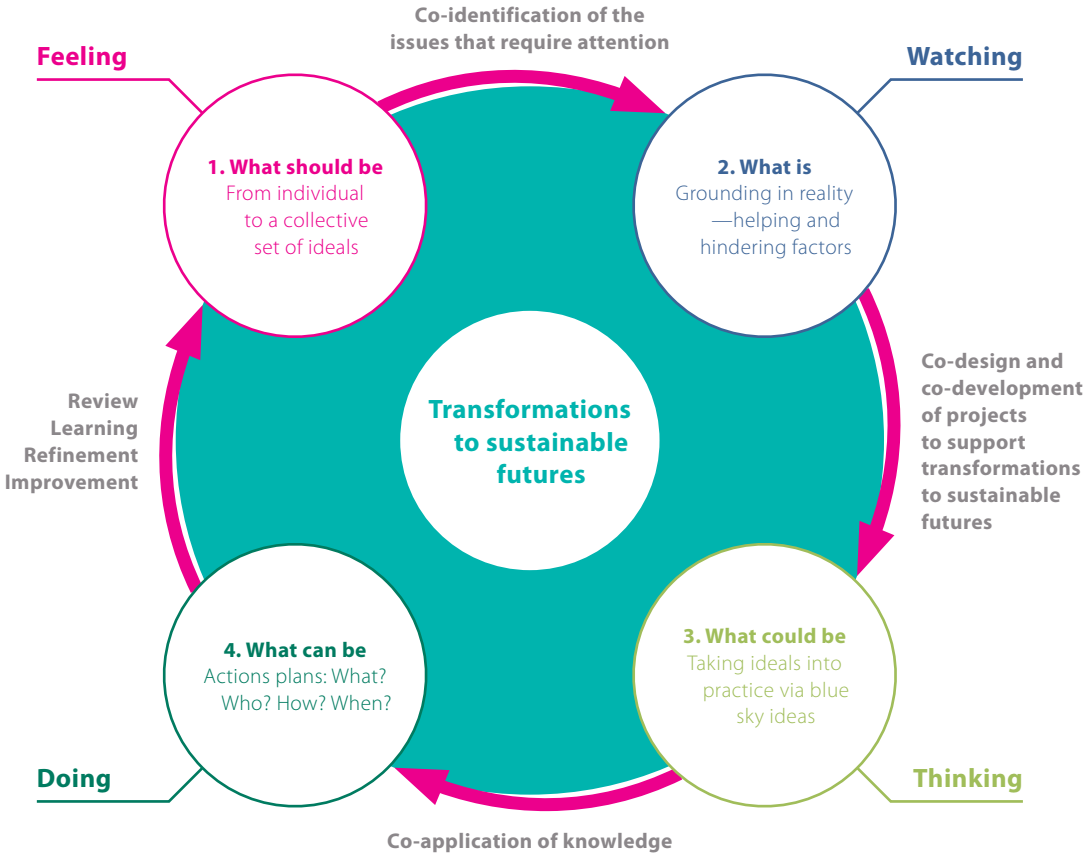


Figure 1. Modification of Brown and Lambert's depiction of collective social learning

The notes against the connecting arrows (colour) are our interpretation linking this scheme with the terminology used in this document (i.e., co-design, co-development, co-application, etc.).

Adapted from Brown, V. A. & Lambert, J. A. (2015). Transformational learning: Are we all playing the same 'game'? *Journal of Transformative Learning* 3(1): 35–41.

The consultation with stakeholders which was undertaken to support this plan for *Future Earth Australia* aimed in part to help us understand the dynamic interactions among individuals and groups who are trying to help Australia move towards sustainable futures. This consultation revealed that all the components of Figure 1 are in place in Australia, but it suggested that rewards and incentives do not always encourage effective functioning of the system (Figure 2).

Many individuals and groups in Australia are currently engaged in the generation of knowledge and its application to move Australia, the region and the globe towards sustainable futures. Despite this, the feedback from consultation workshops and interviews identified a number of aspects of Australia's knowledge generation and applications system that are not functioning optimally.

1.4 The case for creating *Future Earth Australia*

The analysis presented in the previous section suggests that for Australia to make its own progress towards a sustainable future and to contribute to a sustainable region there is a need to address several major limitations and blockages in current systems for generating, integrating and applying knowledge in all its forms.

Could existing involvement in *Future Earth* meet this need? Australia has representation on the Science Committee and the Asian regional hub of *Future Earth*, and Australians are involved in several major research initiatives supported by *Future Earth*. This involvement allows Australia to participate in the process of identifying priorities

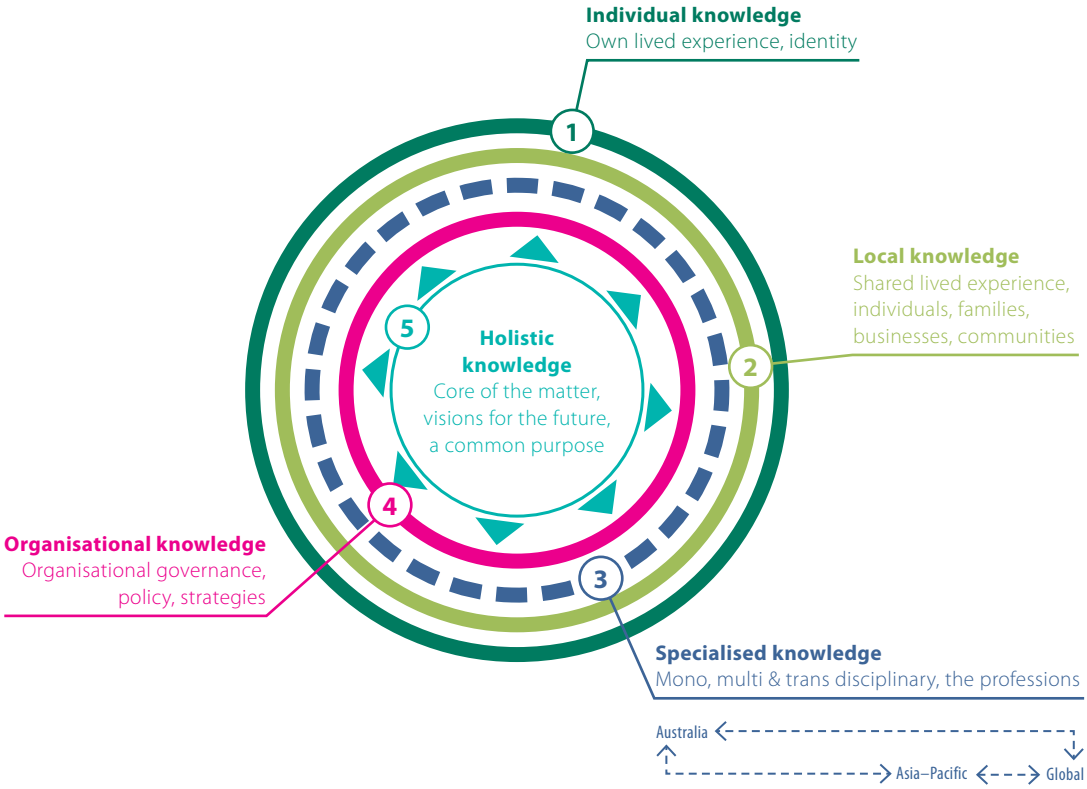


Figure 2. Brown and Lambert's typology of nested knowledge types

Integration of these layers of knowledge is required to achieve effective operation of the processes outlined in Figure 1.

From Brown, V. A. & Lambert, J. A. (2015). Transformational learning: Are we all playing the same 'game'? *Journal of Transformative Learning* 3(1): 35–41.

globally and enables Australian scientists to make limited contributions to international initiatives. However, Australia's relatively low financial contribution to international collaborative research does limit the extent of Australian involvement, let alone leadership. Therefore the types of involvement envisaged to date are not sufficient to address the barriers which prevent international producers and appliers of knowledge from focusing on the needs of Australia and its relationships with the surrounding region.

However, the management and detailed strategic planning processes of *Future Earth* are still at an early stage of evolution, and over the next 2–3 years its regional structures will become increasingly important in setting priorities at the global level. The way that regional structures will formally interact with the highest level management of *Future Earth* will be through the involvement of National Committees. The National Committee for *Future Earth* in Australia will be taken from the Steering Committee and Expert Advisory Group of *Future Earth Australia* (described in Section 4.2 below). The direct involvement of the leadership of *Future Earth Australia* in *Future Earth*'s global priority setting will ensure the necessary recognition and focus on the problems peculiar to our region; moreover, it will also ensure that capability developed by *Future Earth* can be harnessed via involvement in projects initiated and led by *Future Earth Australia*. Of course, any influence an Australian National Committee might exert would be greatly strengthened by the existence of an active focused research program, as envisaged in this plan. Australia's involvement in international sustainability science more generally would also be strengthened by enlisting the international credibility of *Future Earth* to promote Australia's contribution to global funding programs, such as the Belmont Forum.

The fact that the management and detailed strategic planning structures of *Future Earth* are still relatively fluid provides both an opportunity—and an imperative—for the establishment of *Future Earth Australia* so as to be an early member of an influential network of regional research hubs. Given this, the Australian Council of Learned Academies (ACOLA) considered that Australia would be in a better position to both contribute to (and benefit from) *Future Earth* if there were a body which focused specifically on identifying challenges and opportunities and bridging barriers to cross-societal cooperation within our country and region. Consequently, ACOLA has sponsored the development of this plan to explore and state the case for *Future Earth Australia*.

The value propositions articulated in Section 4 summarise the views (elicited by our national consultation process) about how different sectors across Australian society will benefit from the establishment of *Future Earth Australia*. Section 4.2 discusses the governance arrangements that we consider necessary to enable *Future Earth Australia* to add value to existing initiatives—by networking, coordinating, enabling, and promoting projects that will fill the gaps we have identified.

2.1 Guiding principles

It is proposed that *Future Earth Australia* should be a platform for supporting improved *networking and coordination* of existing activities across disciplines and sectors of society; for *enabling* the knowledge generation, synthesis and application that would not be possible or feasible otherwise; and for *promoting* the need for the practical application of such knowledge to those who are in a position to influence progress towards a sustainable future.

Many other principles have been proposed by stakeholders, including that *Future Earth Australia* should be responsive, honest, trustworthy, transparent and non-aligned politically, and should offer decision makers in business, government and communities a place to come to get high quality, objective and clearly communicated advice about issues relating to all facets of sustainability.

We propose that the vision for Future Earth Australia should be that: *Australia and its people thrive in, and contribute to, a sustainable and equitable world.*

2.2 Vision

The vision for *Future Earth* is:

for people to thrive in a sustainable and equitable world.

We propose that the vision for *Future Earth Australia* should be that:

Australia and its people thrive in, and contribute to, a sustainable and equitable world.

2.3 Mission/intent

The proposed mission/intent of *Future Earth Australia* is:

to coordinate, enable, promote and perform generation and application of knowledge—spanning social, biophysical and technological sciences, the humanities and the arts, local and other forms of knowledge—to address the sustainability challenges facing Australia, our regional neighbours and the rest of the world.

3 Strategic objectives and initial portfolio of activities

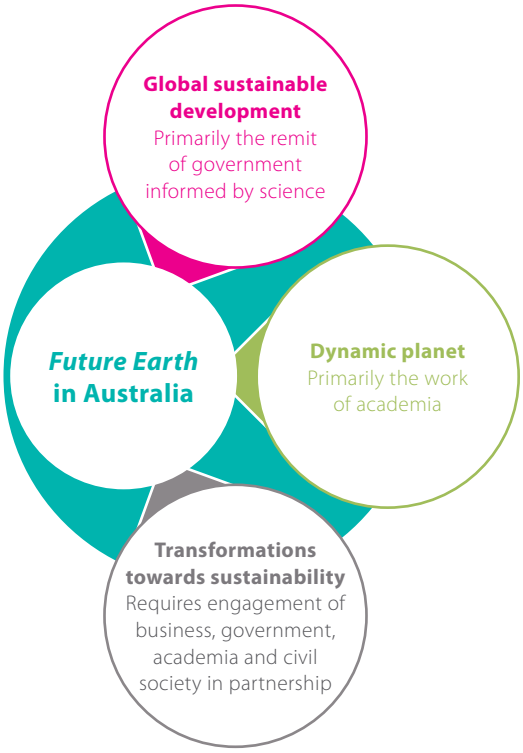
3.1 Strategic objectives

Consistent with *Future Earth* globally, projects undertaken by *Future Earth Australia* will reflect the following three themes:

1. Global sustainable development: how to sustainably raise all of humanity to a decent standard of living;
2. Dynamic planet: how does the human–Earth system (defined as the intersection of societal and biophysical processes) function?
3. Transformations towards sustainability: how do we get from where we are now to the objective of global sustainability?

Figure 3 shows the context of the themes.

Figure 3. The three themes that *Future Earth* will pursue in its activities



The following strategic objectives, to be achieved by 2025, involve the three themes indicated in Figure 3. They are based on the objectives of *Future Earth* globally and responses from stakeholders when asked what *Future Earth Australia* should try to achieve in the next 5–10 years (see Appendix 2).

Apart from the first, these objectives are taken largely from the global *Future Earth* initiative, with some minor changes, as they fit almost perfectly with what has come from the stakeholder workshops, web survey and interviews.

1. Inspire and create ground-breaking interdisciplinary projects relevant to the eight focal challenges identified by *Future Earth* globally (listed here in summary—see detailed versions at <www.futureearth.org/media/strategic-research-agenda-2014>) and other key challenges for Australia:
   - water, food, energy for all
   - decarbonise socioeconomic systems
   - safeguard natural assets
   - build healthy, resilient cities
   - sustainable rural futures
   - improve human health under global environmental change
   - sustainable consumption and production
   - social resilience to future threats.

2. Deliver products and services that stakeholders will need to meet future challenges, through:
    - open and inclusive platforms for observing and monitoring the status, trends and thresholds of the planet in a timely manner at different scales, including tracking fast-changing sentinel processes and systems
    - tailored metrics and evaluation tools for well-being and sustainable development
    - a new generation of integrated Earth system models to deepen our understanding of complex Earth systems and human dynamics across different disciplines, and to underpin systems-based policies and strategies for sustainable development
    - data, tools and resources (based on science but also considering other forms of knowledge) to support improved resilience of people, communities and economies, including disaster risk reduction
    - scenarios for transformative development pathways that enable global sustainability to help evaluate different strategies and options
    - critical contributions to key debates on global sustainability issues, including inputs to scientific assessments and decision-relevant syntheses
    - innovations in communicating, engaging and visualising global change and sustainability, fully exploiting the potential of new technologies and overcoming differential access to information across the world
3. Pioneer approaches to co-design, co-production and co-application of solutions-oriented knowledge and innovation for sustainable development in Australia, its region and globally, including:
    - conducting fundamental and applied research in ways that engage with diverse societal partners across all regions of the world to maximise impact and responsiveness to society's needs, and monitoring the effectiveness of these new approaches to research
    - establishing *Future Earth Australia* as a regionally and globally recognised model for engagement and collaboration in research for sustainable development
    - stimulating debate, illustrating good practice, and mobilising capacities for solutions-oriented knowledge, technology and innovation for sustainability
    - changing national and regional research funding practices to better support interdisciplinary and transdisciplinary generation and application of knowledge across and within regions
    - fostering collaboration among the research programs of national, regional and international agencies, to maximise resources (and its impact) for research which promotes sustainability
    - contributing to improved modes of sharing data about environmental change and progress towards sustainability in order to support policy and practice at different levels.

4. Enable and mobilise capacities to co-produce and co-apply knowledge across cultural and social differences, geographies and generations, including:
    - inspiring and supporting a new generation of scholars and practitioners doing integrated science for global sustainability
    - building a diverse and connected community of participants and organisations, including scientists, policy makers, civil society practitioners, private sector actors, and funders from all regions of the world
    - engaging influential stakeholders in Australia, our region and globally
    - mobilising capacities in Australia, our region and globally to cooperate on the generation of knowledge on sustainable development trajectories which connects local processes to regional and global ones, and promotes alternatives
    - creating a critical mass of knowledge generators, policy makers, business and civil society leaders who believe in and can serve as ambassadors for *Future Earth Australia*, including a body of *Future Earth Australia* Fellows.

3.2 Distinguishing features of *Future Earth Australia* projects

Appendix 2 includes a summary of the types of projects that stakeholders told us are needed in order for Australia to address the key challenges it faces, and also to contribute to the challenges facing the globe. Stakeholders told us that these projects cannot currently be achieved, but could be if *Future Earth Australia* were established and functioned as outlined in Sections 2 and 3. This feedback was used as one input to the April 2016 national forum.

Based on this input, projects that are initiated by or through *Future Earth Australia* will be distinguished by:

- strong synergy between knowledge of human needs and societal dynamics, as well as knowledge about all aspects of the biophysical world
- a systems approach
- significance for sustainability in Australia and/or its regional neighbours
- co-design, co-production and co-implementation by *Future Earth Australia*'s main stakeholder groups: government, business, civil society (general public and NGOs) and knowledge generators.

3.3 Criteria for success

Criteria for success relate to providing value to partners and stakeholders in line with the value propositions articulated in the business plan (articulated in Section 4) and to meeting our other strategic objectives by:

- creation of ground-breaking inter-disciplinary and trans-disciplinary projects that address the eight key challenges identified by *Future Earth*
- delivery of products and services that stakeholders need to meet these key challenges
- new approaches for co-design, co-production and co-implementation of solutions-oriented knowledge and innovation for sustainable development in Australia, its region and globally
- improved and mobilised capabilities for generation and synthesis of knowledge across cultures, sectors of society, and geographical areas.

Specific performance criteria related to these broad objectives are listed in the governance arrangements (Section 4.2).

3.4 Initial portfolio of projects

Two sets of projects are listed here. The first set (Table 1) comprises those projects already being prosecuted under the aegis of Core Projects of *Future Earth Global*. These projects are important because they establish direct links into *Future Earth Global* and its large portfolio of activities. The second set (Table 2) are projects proposed at, or following, the April 2016 national forum. These were responses to the framing and strategic priorities of *Future Earth* as set out in Section 3.1 above—that is, the three themes of dynamic planet, global sustainable development, and transformations towards sustainability, as well as the eight focal challenges (which for convenience are set out again here):

- water, food, energy for all
- decarbonise socioeconomic systems
- safeguard natural assets
- build healthy, resilient cities
- sustainable rural futures

Table 1. Existing projects under *Future Earth Global*

Future Earth Core Project	Location of Core Project office	Project name	Theme	Project leader
Global Carbon Project <www.futureearth.org/projects/gcp-global-carbon-project>	Tsukuba, Japan	Global carbon budget	Dynamic planet	Dr Pep Canadell, CSIRO, Canberra
IHOPE <www.futureearth.org/projects/ihope-integrated-history-and-future-people-earth>	Uppsala, Sweden	Planetary boundaries for the human–Earth system	Dynamic planet	Prof. John Finnigan, CSIRO, Canberra
Sustainable Water Futures	Griffith University Brisbane, Australia	A range of projects but see next section, project 4	Global sustainable development	Prof. Stuart Bunn, Griffith University Brisbane

- improve human health under global environmental change
- sustainable consumption and production
- social resilience to future threats.

All these projects address the themes and focal challenges in terms of sustainability questions relevant to Australia and our region.

Of the projects proposed at or following the April 2016 national forum (Table 2), some are already effectively underway, some are ready to start, but some require a significant amount of planning and identification of resources before they can commence. Succinct descriptions of each project are given in Appendix 1.

Four of these projects (4, 14, 15, 16) already have momentum and will go ahead. One (10) has strong institutional backing from *Future Earth Global* and will entrain some existing work; it therefore has a very high probability of commencing this calendar year. Project 9 is at an advanced stage of planning with strong stakeholder engagement and will commence when funding can be identified. The others are in various stages of planning and will need work to access funding.

To coordinate, enable, promote and perform generation and application of knowledge to address the sustainability challenges facing Australia, our regional neighbours and the rest of the world.

Table 2. Projects proposed at the national forum. The status of projects is indicated as UW (under way), R (ready to go), or FD (requires further planning and resources)

Project title	Lead researchers	Focal challenge	Theme
1. Can Australia implement the UN Sustainable Development Goals and if so, how? (FD)	David Griggs, Karen Hussey, Lesley Hughes, Barbara Norman	All	Transformations towards sustainability
2. How do we implement regulatory and legal policy to achieve the SDGs? (FD)	Celeste Young, Karen Evans, Kate Harris, Wayne Meyer, Nick Abel, Judith Preston, Brian Walker	Social resilience to future threats	Transformations towards sustainability
3. How to achieve the SDGs in a Northern Australia Development Agenda (FD)	Ross Smith, Margaret Findlater Smith, Lesley Hughes, Glenda Wardle, Bob Costanza, Dedee Woodside, Stuart Bunn, Anik Bhaduri, Liz O'Brien, Craig Moritz	All	Transformations towards sustainability
4. Water Futures: Lessons from Australia (UW)	Stuart Bunn, Ross Smith, Jason Evans, Anik Bhaduri, Lohi Matainaho (Chief Scientist Papua New Guinea), Jason Alexandra	Water	Global sustainable development
5. Demonstrate need for and benefit from the National Ecosystem Monitoring Program (FD)	Glenda Wardle	Safeguard natural assets	Global sustainable development
6. Healing the fractures: re-dreaming the Australian republic (FD)	Jason Alexandra and Barbara Norman	All	Transformations towards sustainability
7. Sustainability science to avoid survival science (FD)	Wayne Meyer	Sustainable rural futures	Global sustainable development
8. Deep and meaningful engagement and collaboration with indigenous communities to include their knowledge and perspectives in FE (FD)	Dedee Woodside, Craig Moritz	Social resilience	Global sustainable development
9. The city as a location for developing sustainability strategies through a trans-disciplinary approach (R)	Bob Webb, Chris Ryan, Xuemai Bai, Mark Stafford Smith	Healthy resilient cities	Transformations towards sustainability

Project title	Lead researchers	Focal challenge	Theme
10. Quantitative scenario analysis of the development of SE Asia/Oceania (R)	Mark Stafford Smith, John Finnigan, David Newth	All	Global sustainable development
11. Re-dreaming sustainable Australian landscapes (FD)	Wayne Meyer, Brian Walker, Nick Abel, Aysha Fleming	Sustainable rural futures; Safeguard natural assets	Global sustainable development
12. Synthesis and Innovation Centre (UW)	Bob Costanza and Beth Fulton	All	Transformations towards sustainability
13. Risk registry for Australia and recognising our coping strengths and weaknesses (FD)	Beth Fulton, Brian Walker	Safeguard natural assets, human health, social resilience to future threats	Global sustainable development
14. New stories (and myths) to live by in the Anthropocene (UW)	Iain McCalman, Emma Burns	All	Transformations towards sustainability
15. A young person's business plan for the planet (UW)	Graham Durant, Ian Chambers, Zoe Piper, Hans Bachor	All	Transformations towards sustainability
16 Water Futures, an Asia–Pacific knowledge exchange and transdisciplinary laboratory focused on water futures, 23–25 February 2017, Arts Centre, Melbourne (UW)	Angharad Wynne-Jones	Water, food and energy	Transformations towards sustainability
17. New myths to live by (FD)	Jason Alexandra and Barbara Norman	All	Transformations towards sustainability
18. Developing knowledge, capacity and processes to generate legitimate, novel pathways to realise relevant SDGs at appropriate scales (FD)	Russ Wise, Dedee Woodside, Zoe Piper, Alice D'Costa, Iain Walker, Peter Holt, Heinz Schandl	All	Transformations towards sustainability

4 Business plan

4.1 Stakeholders and the value they will gain (value propositions)

We have identified four broad groups of stakeholders: government, business, civil society (including non-government organisations), and knowledge generators. Many individuals and groups will be members of more than one of these categories. Members of all categories might become partners in *Future Earth Australia* as it evolves.

Future Earth Australia will provide a mechanism for **governments** to engage with other sectors to define and understand challenges to the long-term sustainability of the Australian economy, society and environment, and to develop appropriate policy. Among a wide range of interactions, this partnership could include:

- coordinating assessments of the triple-bottom-line sustainability of present policy settings in major areas of government responsibility
- evaluating the consequences for Australia's security of national, regional and global trends in factors like population change, climate and migration or food and energy security and sovereignty
- providing a non-partisan space to explore, develop and implement solutions along the lines of the UK government's Chatham House (see also project 12 in Section 3.4).

Future Earth Australia will provide a mechanism for governments to engage with other sectors to define and understand challenges to the long-term sustainability of the Australian economy, society and environment, and to develop appropriate policy.

Future Earth Australia will look to partner with business to address issues of sustainability on several levels. At the highest level it will work to identify problems and opportunities for whole sectors, addressing questions such as:

In the context of changes in Australasia and the world:

- What is the future for Australian agriculture?
- What does a sustainable Australian economy look like?
- What does climate change mean for Australian business?
- What is the role of mining in a sustainable future for Australia?
- What opportunities for Australian business are opened by these changes?

At the level of major industry players, it can tackle questions like:

- How do we sustain socio-economic structures or natural environments while establishing major capital developments in remote areas and in developing countries?
- What are the best mechanisms to facilitate sustainable socio-political change around major economic developments in regions of conflict?
- How can major industries be assisted with the reallocation of resources so they can capitalise on future opportunities?

And at the level of small and medium enterprises it can look at the implications of major social and economic processes, such as transformations of whole regions from reliance on old industries to new ones.

Examples might include:

- retooling of whole districts once a major industry exits (e.g., transforming North Adelaide from car manufacturing to a network of small engineering firms supplying the renewable energy or the high value horticulture industry)
- transformations of major industries in ways that provide new opportunities for SMEs (e.g., an increased focus in coal mine decommissioning or full landscape regeneration under global pressures to reduce greenhouse gas emissions)
- reimagining of cities (e.g., Newcastle and Wollongong) from centres of manufacturing (e.g., steel production) to centres of education and research.

Future Earth will offer a platform for civil society (the public) to have informed involvement in identifying issues of sustainability from their several perspectives, and to be involved in appropriate ways in the co-design, co-development and co-implementation of socially significant projects. Ways to do this include:

- social media-based platforms that can allow a wide range of otherwise silent voices to be heard on questions of sustainability at all space- and time-scales
- organising meetings, conferences and events in both capital and regional areas that could help spark a change of national consciousness about the opportunities and threats posed by global change to the long term sustainability for Australia
- ensuring the voices of the public are included in other activities proposed above.

Non-government organisations represent the points of view of many different parts of society. They are focused segments of civil society. Many NGOs are already concerned with sustainability as it is manifested in particular sectors. *Future Earth Australia* will offer NGOs partnerships that are similar to those with government and business and also include the knowledge sector.

Knowledge generators include researchers and practitioners across the sciences, humanities, and arts as well as those in business, government, NGOs and the public involved in acquiring, interpreting and applying knowledge. What *Future Earth Australia* offers this large and disparate group is:

- coordinating/facilitating dialogue with all parts of society to help define key issues and then ensuring the continued synthesis and networking needed to deliver successful outcomes
- enabling projects that would not otherwise be possible by bringing together the resources, partners and central organisation that small groups or individuals cannot command
- promotion of sustainability-focused research and activity to government and government-funded institutions (e.g., the Australian Research Council, The Arts Council) and to business organisations or others to achieve a critical momentum and single voice that cannot be achieved by groups acting alone
- capturing and coordinating knowledge, research and practice in which Australia leads the world, such as water and land management in arid climates, for application to achieve sustainability goals by government, business and NGOs.

4.2 Plan for the establishment of a Project Office

In order to deliver the strategic objectives set out in this plan, a project office will be required to coordinate *Future Earth Australia* activities, to facilitate interactions between stakeholders and with international initiatives, to promote implementation and uptake of key research outputs, and to enable new co-designed sustainability projects that benefit Australia and the region. The *Future Earth Australia* Project Office will support a range of projects as well as catalysing new research and deep social engagement around key priority areas. Specific functions delivered by the *Future Earth Australia* Project Office will include:

- convening an annual *Future Earth Australia* symposium
- hosting regular workshops for *Future Earth Australia* members and stakeholders around the country
- maintaining up-to-date contact and activity lists, with online access for members and other stakeholders
- promoting *Future Earth Australia* activities and opportunities to government, business and other stakeholders
- facilitating partnerships and funding opportunities for *Future Earth Australia* members and stakeholders
- linking Australian *Future Earth* activities and stakeholders with relevant global *Future Earth* activities
- coordinating *Future Earth Australia* memberships and subscriptions, and ensuring value for stakeholders
- preparing an annual report for stakeholders on *Future Earth Australia* activities.

In order to deliver these functions on a sustainable basis, the *Future Earth Australia* Project Office will need to be established as an independent (i.e., incorporated not-for-profit) or semi-independent entity (i.e., business unit or subsidiary of an existing organisation) with an annual operating budget of approximately $400,000 p.a. to support 2.5 FTE staff and a range of functions and activities as outlined. It is intended that this operational funding will be sourced from:

- subscription fees from *Future Earth Australia* member organisations
- Federal and/or State and Territory government grants to support core activities
- grants and sponsorship for specific events and coordination activities
- possible philanthropic donations.

As this quantum of funding is not yet available, an establishment phase will be supported by the Australian Academy of Science. This establishment phase will run for an initial 12 months from July 2016, after which, if not established, the Academy will make an assessment of the likelihood of success in the near term, and on this basis may decide to continue to support the establishment process for a further 12 months. The establishment process will require a budget of $200,000 p.a. (not including costs of an annual *Future Earth Australia* symposium) and will operate under an interim governance structure.

Future Earth Australia establishment plan

With an initial budget of $200,000 provided by existing stakeholder organisations, the Australian Academy of Science will work with key stakeholders from July 2016 to secure the full operating budget required to establish the *Future Earth Australia* Project Office as an independent or semi-independent entity. As part of this establishment process, the Academy will appoint a Steering Committee, reconstitute the existing *Future Earth Australia* Expert Working Group as an Expert Advisory Group, and employ a full-time program manager to coordinate this work under an interim governance structure, as was shown in Figure i (Summary).

Governance roles and responsibilities

Under this interim structure, the Australian Academy of Science will host the program during its establishment phase, and the Executive Committee of the Academy's Council (EXCOM) will provide high-level governance oversight.

- The ***Future Earth Australia*** **Steering Committee** will comprise 7–10 members nominated by funders of the establishment phase plus independent members with collective skills in business, law and finance, and with standing and deep connections throughout the Australian and regional sustainability sector, spanning business, government, academia and the community. Its role will be to champion the cause of *Future Earth Australia* and to provide strategic advice on the establishment of an independent or semi-independent *Future Earth Australia* Project Office by June 2018.

  It is anticipated that the *Future Earth Australia* Steering Committee would include representatives nominated by funders, plus independent members, and some representation from ACOLA if willing. Once *Future Earth Australia* is established on an independent or semi-independent basis, the Steering Committee may be reconstituted as a Board of Directors or other structure as appropriate.

- The ***Future Earth Australia*** **Expert Advisory Group** will comprise individuals with expertise in scientific, social and cultural aspects of sustainability, drawing in the first instance on those who served on the *Future Earth Australia* Expert Working Group during 2015–16. The *Future Earth Australia* Expert Advisory Group will identify key sustainability challenges, recommend *Future Earth* projects that address these, interact with *Future Earth* Global, and advise the Academy of Science on establishment and implementation of *Future Earth Australia* as required. The *Future Earth Australia* Expert Advisory Group will also assist the *Future Earth Australia* Project Office in coordinating *Future Earth Australia* projects and activities.

- The ***Future Earth Australia*** **Project Office** will be hosted during the establishment phase by the Australian Academy of Science with a full-time program manager, support in communications, administration and finance, and oversight of the Academy's Director Science Policy and Projects. The program manager would work closely with the chairs of the Steering Committee and the Expert Advisory Group in delivering the project.

Budget

- A 2016–17 budget of $200,000 (excl. GST) will be provided by existing stakeholder organisations by 30 June 2016.
- If Australian Academy of Science decides to continue the establishment phase beyond 12 months, additional funding will be required, for which existing or new funders will be approached by the *Future Earth Australia* Steering Committee as required. An establishment timeline for 2016–17 was shown in Table i (Summary).
- An annual *Future Earth Australia* Symposium will be run by the *Future Earth Australia* Project Office under a separate budget, with the expectation that costs will be met from participant registrations and sponsorships.
- It is expected that representation of *Future Earth Australia* at relevant *Future Earth* global meetings would be undertaken by members of the *Future Earth Australia* Expert Advisory Group or other key stakeholders with support from their own institutions or project funding.

Table 3. Provisional budget

Item	Cost (excl. GST)
Staffing (inc. salary on-costs)	
Director Science Policy & Projects	$15,740
Program Manager	$107,600
Committee expenses (travel and costs for Steering Committee and Expert Advisory Group meetings)	$12,000
Communications & marketing	
Publications (editing, design, printing, distribution)	$10,000
Website costs	$5,000
Media	$2,500
***Future Earth Australia* workshops and events** (venue, catering, speakers)	$12,500
Staff travel	$3,000
General expenses	$1,660
Academy of Science administration costs (inc. office costs, phone, IT, teleconferences, insurance, audit, etc.)	$30,000
Total	**$200,000**

Appendix 1
Brief descriptions of *Future Earth Australia* projects

Project title	Lead researchers	Focal challenge	Theme
1. Can Australia implement the UN Sustainable Development Goals and if so, how? (FD)	David Griggs, Karen Hussey, Lesley Hughes, Barbara Norman	All	Transformations towards sustainability

This two-year research program would produce the first comprehensive assessment of how Australia (governments, business, communities) can achieve the UN Sustainable Development Goals (SDGs) and what would be required in order to do so. The program would examine Australia's ability to measure the SDG targets, would make an assessment of Australia's current status with respect to the targets, and would identify the gaps. A co-ordinated multi-disciplinary program would be developed to close the gaps, including assessing the linkages between SDG targets and how to manage them, and considering the Australia-specific circumstances that would need to be taken into account. These would feed into a comprehensive underpinning of full implementation of the SDGs in Australia by providing the knowledge and collaborative frameworks to achieve the targets.

Project title	Lead researchers	Focal challenge	Theme
2. How do we implement regulatory and legal policy to achieve the SDGs? (FD)	Celeste Young, Karen Evans, Kate Harris, Wayne Meyer, Nick Abel, Judith Preston, Brian Walker	Social resilience to future threats	Transformations towards sustainability

This proposal aims to bring together diverse views and approaches to address the question: "how can we implement regulatory and legal policy frameworks to achieve the fundamental change required to meet Sustainable Development Goals?"

Four components are under development:

1. A case study of Local Government Areas, combined with a review of existing research, to identify optimal values, knowledge and regulatory frameworks to achieve sustainable development goals at a community level (including Indigenous perspectives and local learnings).
2. Explore how champions for change (leading thinkers, celebrities, politicians, etc.) can be enlisted to improve understanding among decision-makers of the need for fundamental change to achieve SDGs.
3. A symposium to explore international environmental best practice and its application within Australia to engage and work with policymakers and politicians at local, state, and federal levels to test and demonstrate viable regulatory, legal, and policy frameworks.
4. Investigate alternative metrics for measuring national wealth beyond Gross Domestic Product (drawing on advanced thinking in countries like Sweden, Bhutan, and others).

Project title	Lead researchers	Focal challenge	Theme
3. How to achieve the SDGs in a Northern Australia development agenda (FD)	Ross Smith, Margaret Findlater Smith, Lesley Hughes, Glenda Wardle, Bob Costanza, Dedee Woodside, Stuart Bunn, Anik Bhaduri, Liz O'Brien, Craig Moritz	All	Transformations towards sustainability

This project recognises that achieving sustainability in Northern Australia poses different challenges to those in the South. For example, there is a tendency to impose thinking that originates from urbanised centres on largely rural populations in the North. In addition, national level reporting on SDGs could overlook geographical areas with dispersed populations and regional issues spread across large landscapes. Therefore, this project seeks to define a Northern development agenda in relation to sustainability goals, initially by interpreting the Northern Development White Paper through an SDG lens and generate advice on additional and/or alternative approaches. This will be achieved through forums that involve all types of relevant knowledge, including that of academics, administrators, planners, and communities.

Project title	Lead researchers	Focal challenge	Theme
4. Water Futures: Lessons from Australia (UW)	Stuart Bunn, Ross Smith, Jason Evans, Anik Badhun, Lohi Matainaho (Chief Scientist Papua New Guinea), Jason Alexandra	Water	Global sustainable development

This project seeks to capture lessons from Australia's experience in water governance and reform over the past several decades. It proposes to do this by establishing stronger links between *Future Earth Australia* and *Future Earth* [global] in relation to water issues; to assemble a team representing key capabilities and expertise in relation to all issues associated with water governance and reform; co-design and co-develop proposals for Australian funding for international cooperation and partnerships; look for opportunities to collaborate with water industries to improve capacity and training in relevant areas; and develop a flexible framework that can be adopted and applied nationally and internationally, in multiple cultural contexts, and that can be a focus for continuous improvement, innovation, and learning.

Project title	Lead researchers	Focal challenge	Theme
5. Demonstrate need for and benefit from the National Ecosystem Monitoring Program (FD)	Glenda Wardle	Safeguard natural assets	Global sustainable development

This project proposes to establish a national, enduring ecosystem monitoring program. It will require a minimum of $500 million annually. It proposes to develop a case for such a program to be put to the federal Minister for the Environment, based on the argument that achieving sustainability across Australia requires sound information on the state of the environment and how it is changing. The case will be supported by analysis of best practice examples in Australia and internationally. The process would involve developing collaborations with key agencies capable of providing the infrastructure and expertise across Australia.

Project title	Lead researchers	Focal challenge	Theme
6. Healing the fractures: redreaming the Australian republic (FD)	Jason Alexandra and Barbara Norman	All	Transformations towards sustainability

This project asks: What kind of nation do Australians want or not want? What kind of futures do Australians want or not want? What institutions of governance are needed to achieve alternative futures? It seeks to address these questions by using discourse—national conversations—to address healing of past injustices to people and the environment. It will consider the reform of British property laws to suit Australian conditions and dynamics. Approaches will include: dialogue to initiate national conversations; competitions to redesign Australia's flag, symbols and institutions; and supporting cultural practitioners to reinterpret options for healing.

Project title	Lead researchers	Focal challenge	Theme
7. Sustainability science to avoid survival science (FD)	Wayne Meyer	Sustainable rural futures	Global sustainable development

This project aims to raise the profile of the need for sustainability science and to provide a forum to launch synthesis, analysis, implementation, and learning of sustainability solutions. The proposed process includes: a major national conference with a publication workshop; development of a white paper to be promoted within government; engagement with regional UNESCO and CGIAR in order that they display a Western Pacific Rim perspective.

Project title	Lead researchers	Focal challenge	Theme
8. Deep and meaningful engagement and collaboration with Indigenous communities to include their knowledge and perspectives in *Future Earth Australia* (FD)	Dedee Woodside, Craig Moritz	Social resilience	Global sustainable development

This project aims to work with *Future Earth Australia* to develop a communication strategy that embraces Indigenous cultures. It seeks active Indigenous representation in dialogue in *Future Earth Australia* on how to improve engagement. The principles from this engagement will be used to build *Future Earth Australia* activities and approaches. The project will allow the principles to expand by continuing engagement and ongoing refinement.

Project title	Lead researchers	Focal challenge	Theme
9. The city as a location for developing sustainability strategies through a trans-disciplinary approach (R)	Bob Webb, Chris Ryan, Xuemai Bai, Mark Stafford Smith	Healthy resilient cities	Transformations towards sustainability

This project would progress the "Sustainable Urbanisation Initiative" already under development across Australia and with links internationally. It would include: engagement with the private sector; influencing and reporting to emerging Commonwealth, State, and city agendas; reinforcing research networks, especially in the social sciences and humanities; building on existing urban initiatives; and building linkages to other allied initiatives such as the SDGs.

Project title	Lead researchers	Focal challenge	Theme
10. Quantitative scenario analysis of the development of SE Asia/ Oceania (FD)	Mark Stafford Smith, John Finnigan, David Newth	All	Global sustainable development

This project would draw on capability from the nations in our region who are partners in International Institute for Applied Systems Analysis (IIASA) to first develop a quantitative scenario methodology, and then to put into it national and regional level information. The goal is to produce a set of scenarios that are based on the best demographic, economic, and political information and projections using leading-edge models. Demographic and water future models would be sourced from IIASA, while economic modelling would be based on CSIRO's GIAM (global integrated assessment model), which in turn incorporates Intergovernmental Panel on Climate Change, Fifth Assessment Report (IPCC AR5) climate models.

Project title	Lead researchers	Focal challenge	Theme
11. Re-dreaming sustainable Australian landscapes (FD)	Wayne Meyer, Brian Walker, Nick Abel, Aysha Fleming	Sustainable rural futures Safeguard natural assets	Global sustainable development

This project proposes to take a holistic approach, combining sustainability science (interactions among environment, society, and the economy) to develop refined narratives about futures that are different from, and better than, the present. Australia has a special position in the world: a fabulous opportunity to plot a different course that does not have 'growth' as a mantra but 'quality'—quality of well-being, quality of resources, quality of opportunity, quality of surrounds. Narratives would consider the need for social/cultural change from a focus on 'me' to 'we'. The objective is to raise community and political awareness of thinking in a 100-year timeframe. This project would connect with other communication projects proposed in this portfolio.

Project title	Lead researchers	Focal challenge	Theme
12. Synthesis and Innovation Centre (R)	Bob Costanza and Beth Fulton	All	Transformations towards sustainability

A physical location that hosts workshops, conferences, and courses on issues of sustainability and its underpinning science. The Centre will produce a new integrated understanding of how natural and human systems co-evolve to facilitate the transition to a sustainable, equitable, and prosperous society for Australia and the world incorporating new collaborative, transdisciplinary approaches. This Centre will partner with the Australian Public Service and integrate participants from a broad range of disciplines with government, industry, civil society, and leading international initiatives to co-produce:

1. New integrated modelling and valuation capabilities to understand the complex interplay of socioeconomic/natural system dynamics and trade-offs;
2. New measures of well-being integrated with the models; and
3. Collaborative ways to create shared goals and achieve positive futures through integrated policy and investment decisions.

The Centre would seek support from the ANU and the Academy of Science plus corporate partners. It would learn from and collaborate with existing synthesis Centres such as National Centre for Ecological Analysis and Synthesis (NCEAS) and National Socio-Environmental Synthesis Centre (SESYNC) and could play the role of a non-partisan space for deliberations on policy by government and other bodies.

Project title	Lead researchers	Focal challenge	Theme
13. Risk registry for Australia and recognising our coping strengths and weaknesses (FD)	Beth Fulton, Brian Walker	Safeguard natural assets, human health Social resilience to future threats	Global sustainable development

This project seeks to list major types of risks, characterise the features needed to anticipate and deal with risks, and identify gaps and needs. It will bring systems thinking to bear in a series of case studies to consider interactions between social and biophysical aspects of risk.

Project title	Lead researchers	Focal challenge	Theme
14. New stories (and myths) to live by in the Anthropocene (UW)	Iain McCalman, Emma Burns	All	Transformations towards sustainability

This project aims to establish a virtual and physical meeting place to enable the telling of stories about humans as a force of nature in the past, present and future. It will do this using a wide range of processes including participation in cultural, music, dance and other festivals; targeted interviews; establishing a database of artists, scientists, and previous works illustrating and communicating humans as a force of nature; direct engagement with people locally; and, ultimately, creating a 'museum without borders'.

Project title	Lead researchers	Focal challenge	Theme
15. A Young Persons Plan for the Planet (UW)	Graham Durant, Ian Chambers, Zoe Piper, Hans Bachor	All	Transformations towards sustainability

This project is aimed at engaging young people directly in understanding and planning for sustainability. It is based on the book by Ian Chambers: *Plan for the Planet: A business plan for a sustainable world*. The project will commence with a schools' pilot project that is hoped will be launched at an event during National Science Week 2016 (13–21 August). The project will involve business and research mentors working with groups of senior school students to develop plans for local or regional challenges that relate to major global sustainability issues. We have already started to identify schools who want to take part in the pilot program.

The pilot will run with 20 schools, one from each of Australia's main bioregions and capital cities. The launch event this year is proposed as a Q&A-style forum for students on 'It is our Future Earth' and will probably be run at Questacon. The plan is to bring the groups together, virtually or physically, in the first part of 2017 to integrate plans and then present them to the Prime Minister during National Science Week 2017 as a *Young Australians' Plan for the Planet*. This will then kick-off a much larger project, which can be ongoing from 2018. The suggestion that the theme for the schools component of National Science Week be 'Future Earth' has been warmly welcomed.

The Principals have been working closely with the local United Nations Information Centre who have agreed to partner with them as they link the work to the SDGs. With the help of the UN they also propose rolling out the project into the Pacific Islands, again with a plan to link schools together in 2019, sharing perspectives and developing a regional *Young Persons Plan*. Linkage into UN business and youth groups is being proposed.

Other contacts have been made with the Office of the Chief Scientist to investigate links with STEM subjects and with an Indigenous economic development organisation and they are helping us scope out a *Young Indigenous Australians' Plan for the Planet*.

Questacon has provided some resources to help Ian Chambers develop the scope of the project and this is now underway.

Project title	Lead researchers	Focal challenge	Theme
16 Water Futures, an Asia–Pacific knowledge exchange and transdisciplinary laboratory (UW)	Angharad Wynne-Jones	Water, food and energy	Transformations towards sustainability

An Asia–Pacific knowledge exchange and transdisciplinary laboratory focused on water futures presented as part of AsiaTOPA, in partnership with Arts House, TippingPoint Australia, and *Future Earth Australia*, 23–25 February 2017, Arts Centre, Melbourne.

Water Futures is international, interdisciplinary and transdisciplinary event, with a public program of knowledge exchange and a laboratory for the creation of transdisciplinary projects. We are inviting 100 extraordinary people from across Australia and the Asia–Pacific (artists, scientists, Indigenous elders, economists, activists, politicians, diplomats and business people) to discuss, share and take action.

We will focus on water as a tangible and critical element of our existence and an indicator and teacher of the changes we need to make. We will inform each other of the challenges that we face, discuss, debate, prioritise and take action. We will share new understandings and knowledge, come to grips with potential conflict scenarios, understand the political, economic and environmental systems that create them, and develop projects that address critical issues.

Project title	Lead researchers	Focal challenge	Theme
17. New myths to live by (FD)	Jason Alexandra, Barbara Norman	All	Transformations towards sustainability

The creation of a set of new liberating stories that describe a sustainable future to replace doom and gloom prognostications—replacing negativity with positivity to drive attitudinal change. The project would engage with writers, artists and students to produce stories, videos and games as well as material for secondary school curricula. It would aim to encourage a set of new stories that would educate, propagate hope, and release a generational imagination to refine what the future could be like. Various writing and art competitions, for professionals through to school students, would unleash a huge array of stories.

Projects would link with museum and institutional exhibits such as those described in project 14 and secondary school projects such as described in project 15.

Project title	Lead researchers	Focal challenge	Theme
18. Developing knowledge, capacity and processes to generate legitimate, novel pathways to realise relevant SDGs at appropriate scales	Russ Wise, Dedee Woodside, Zoe Piper, Alice D'Costa, Iain Walker, Peter Holt, Heinz Schandl	All	Transformations towards sustainability

Issues addressed:

- The barriers to climate adaptation and sustainability that come from:
  - existing understandings and framings of 'change' and 'the future' which drive the nature of responses (e.g., if change and the future are understood and framed to be the same or similar to the past, then the responses will be business as usual)
  - the widespread observation that the present actions of individuals and communities are disconnected from visions for the future.
- The difficulties of and need for translating and interpreting the SDGs for stakeholders. It was discussed that numerous futuring and visualisation approaches, media and techniques (spanning IT to the humanities and arts) should be explored to assess which combinations of approaches are most effective in which situations for getting people engaged and willing to act.

Project 18 continued.

- The need for all stakeholders to better understand each other to inform the most effective ways of engagement and the knowledge and tools needed to operationalise the SDGs.
- Framing has to be done in a co-production way, using diverse forms of media to ensure the 'hearts', 'minds', and 'guts' of individuals and groups are appealed to in the processes of co-framing of the problems, challenges and solutions.
- The importance of language, and the need to understand and present information on SDGs and future risks/threats in relevant language and media (including arts and humanities), and the need to frame things positively and in solution-oriented ways instead of being problem-focused.
- The observation that the key communities that need to be, or should be, communicating with each other are not (e.g., business, research, and government). Seldom does one find representatives of all three at meetings or conventions each one hosts.
- The urgent need to develop and communicate the value propositions (e.g., return on investment) and practical guidance on the why, what, and how of each of the main actors taking on the SDGs.

Proposed approach:

Several activities were identified including:

1. Capture the notes from the session, circulate to the group for checking and supplementing, and submit to *Future Earth Australia*.
2. Analyse and characterise the different actors (business, community, research, and government) at different levels, who are interested and affected by the SDGs (and recent climate policy developments) and will increasingly be required to modify their practices.
    - A requirement of this step is that the criteria for characterising stakeholders have been identified so that they meaningfully inform what to do and how. Some of the criteria discussed in the session included: sector, level, culture, class, language, psychology, roles, ethnicity, influence, power, age, etc.
3. Undertake network analyses to understand relationships and to identify 'change agents' (early adopters and influencers) to target. An aspect of this could involve undertaking a mapping exercise of the different initiatives already out there (e.g., conscious capitalism, shared-value leadership forum) in terms of whether they are waning or growing, what their goals are, what is working, and what is not.
4. Translate/interpret and bundle SDGs in ways relevant to particular stakeholders (informed by the diagnosis above)
    - This involves co-developing understanding of the implications (trade-offs) of the relevant (bundles of) SDGs for particular stakeholders associated with a particular issue or decision-making process, and how, in the context of global change, the various stakeholders can adapt their processes to contribute to the SDGs. Important aspects to this will be:
        - developing effective futuring/visioning approaches that integrate diverse knowledge about the future, uncertain effects of global changes on stakeholders, and how these might play out in terms of their effects on various SDGs
        - backcasting from future possible outcomes to the present to reveal key preconditions, decision tipping points, and decision triggers that inform adaptation and sustainable pathways.
5. Develop monitoring, evaluation, and learning (MEL) tools and processes to assess the effectiveness of adaptations/interventions to contribute to realising bundles of SDGs while minimising negative trade-offs.
6. Use diverse media to raise awareness and to pressure individuals and organisations about the relevance and benefits of the SDGs to them.
7. Target efforts to build collective leadership in mainstreaming the SDGs into business, government, and research practices.

Appendix 2
Details about *Future Earth*

Why was *Future Earth* established?

The need for a coordinated scientific and societal response to global environmental change was highlighted at the 2012 'Planet under Pressure' conference. The conference declaration called for a new approach to research that is more integrative, international and solutions-oriented, reaches across existing research programmes and disciplines, and has input from governments, civil society, local knowledge, research funders and the private sector. This call was echoed in the *Rio+20* declaration and the United Nations Secretary-General's Global Sustainability Panel report, with the latter calling for a major global scientific initiative to strengthen the interface between policy and science. *Future Earth* is a response to these statements and calls <www.futureearth.org/history>.

What *Future Earth* is and who sponsors it

Future Earth was announced in June 2012 at the UN Conference on Sustainable Development (Rio+20). It is a major international research platform providing the knowledge and support to accelerate our transformations to a sustainable world. It is sponsored by the Science and Technology Alliance for Global Sustainability comprising the International Council for Science (ICSU), the International Social Science Council (ISSC), the Belmont Forum of funding agencies, the Sustainable Development Solutions Network (SDSN), the United Nations Educational, Scientific, and Cultural Organization (UNESCO), the United Nations Environment Programme (UNEP), the United Nations University (UNU), and the World Meteorological Organization <www.futureearth.org/who-we-are>.

Governance of *Future Earth*

Future Earth is at its core a 'federation' of projects and other initiatives related to Global Environmental Change. These projects were originally launched under the umbrella of four global environmental change programmes, DIVERSITAS, the International Geosphere-Biosphere Programme (IGBP), the International Human Dimensions Programme (IHDP) and the World Climate Research Programme (WCRP). Some further projects arose out of the <www.futureearth.org/projects>. *Future Earth* also co-ordinates a number of Fast-Track Initiatives and Cluster activities to encourage collaboration across disciplinary backgrounds on some of today's most pressing global environmental challenges <www.futureearth.org/initiatives>.

The governance structure of *Future Earth* embraces the concepts of co-design and co-production of science with relevant stakeholders across a wide range of sectors. It is led by a Governing Council and supported by two advisory bodies: a Science Committee and an Engagement Committee. These bodies are appointed by and report to the members of the Science and Technology Alliance for Global Sustainability, which acts as the Governing Council <www.futureearth.org/structure-and-governance>.

Regional connections

The Secretariat comprises five global hubs which function as a single entity, located in Canada (Montreal), France (Paris), Japan (Tokyo), Sweden (Stockholm) and the United States (Colorado).These offices are complemented by a set of regional hubs which today cover the Middle East and North Africa, Latin America, Europe and Asia. These regional structures are also being developed to ensure broader geographical representation and global diversity in the running of *Future Earth* <www.futureearth.org/secretariat>.

Mode of operation

Box 1 shows how *Future Earth* will operate.

Box 1. How will *Future Earth [Global]* work?

(From the *Future Earth* [*Global*] vision statement <www.futureearth.org/sites/default/files/files/Future-Earth_10-year-vision_web.pdf>)

By 2025 *Future Earth* will have pioneered approaches to co-design and co-produce solutions-oriented science, knowledge and innovation for global sustainable development

Key approaches for focus are:

1. Conducting fundamental and applied research in ways that engage with diverse societal partners across all regions of the world to maximise impact and responsiveness to society's needs, and monitoring the effectiveness of these new approaches to research.
2. Establishing *Future Ear*th as a globally recognised model for engagement and collaboration in research for global sustainable development, effective in all world regions.
3. Stimulating debate, illustrating good practice and mobilising capacities for solutions-oriented science, technology and innovation for sustainability.
4. Changing international research funding practices to better support interdisciplinary and transdisciplinary research and engagement across and within regions.
5. Fostering collaboration among national and international agencies' research programmes, to maximise resources for and impacts of research towards sustainability.
6. Contributing to improved modes of sharing data about environmental change and progress towards sustainability in order to support policy and practice at different levels.

Strategic Research Agenda

The Strategic Research Agenda 2014 for *Future Earth* <www.futureearth.org/sites/default/files/strategic_research_agenda_2014.pdf> advocates not just a set of research priorities, but also a novel way of doing science. This approach, detailed in the *Future Earth 2025 Vision* document <www.futureearth.org/media/future-earth-2025-vision>, includes a strong emphasis on full integration among scientific disciplines, on engagement with societal partners in co-designing and co-producing knowledge, on international collaboration, on producing knowledge that is valuable to decision-makers, and on generating the solutions that society needs.

At the heart of this strategic research agenda are 8 key focal challenges (Box 2).

These focal challenges will generate 7 focal outputs (Box 3).

Box 2. The 8 key challenges identified by *Future Earth* globally

1. Deliver water, energy, and food for all, and manage the synergies and trade-offs among them, by understanding how these interactions are shaped by environmental, economic, social and political changes.
2. Decarbonise socio-economic systems to stabilise the climate by promoting the technological, economic, social, political and behavioural changes enabling transformations, while building knowledge about the impacts of climate change and adaptation responses for people and ecosystems.
3. Safeguard the terrestrial, freshwater and marine natural assets underpinning human well-being by understanding relationships between biodiversity, ecosystem functioning and services, and developing effective valuation and governance approaches.
4. Build healthy, resilient and productive cities by identifying and shaping innovations that combine better urban environments and lives with declining resource footprints, and provide efficient services and infrastructures that are robust to disasters.
5. Promote sustainable rural futures to feed rising and more affluent populations amidst changes in biodiversity, resources and climate by analysing alternative land uses, food systems and ecosystem options, and identifying institutional and governance needs.
6. Improve human health by elucidating, and finding responses to, the complex interactions amongst environmental change, pollution, pathogens, disease vectors, ecosystem services, and people's livelihoods, nutrition and well-being.
7. Encourage sustainable consumption and production patterns that are equitable by understanding the social and environmental impacts of consumption of all resources, opportunities for decoupling resource use from growth in well-being, and options for sustainable development pathways and related changes in human behaviour.
8. Increase social resilience to future threats by building adaptive governance systems, developing early warning of global and connected thresholds and risks, and testing effective, accountable and transparent institutions that promote transformations to sustainability.

Box 3. Key focal outputs identified by *Future Earth [Global]*

By 2025 *Future Earth* will have delivered products and services that our societal partners need to meet these challenges. Key focal outputs are:

1. Open and inclusive platforms for observing and monitoring the status, trends and thresholds of the planet in a timely manner at different scales, including tracking fast-changing sentinel processes and systems.
2. Tailored metrics and evaluation tools for well-being and sustainable development.
3. A new generation of integrated Earth system models to deepen our understanding of complex Earth systems and human dynamics across different disciplines, and to underpin systems-based policies and strategies for sustainable development.
4. Science-based data, tools and resources to support improved resilience of people, communities and economies, including disaster risk reduction.
5. Scenarios for transformative development pathways that enable global sustainability, to help evaluate different strategies and options.
6. Critical contributions to key debates on global sustainability issues, including inputs to scientific assessments and decision-relevant syntheses.
7. Innovations in communicating, engaging and visualising global change and sustainability, fully exploiting the potential of new technologies and overcoming differential access to information across the world.

Appendix 3
Summary of feedback from stakeholder surveys and workshops on priorities for *Future Earth Australia*

Table 3. Priority research areas that stakeholders thought were vital for addressing the challenges and opportunities facing Australia in the next few decades and that require a body like *Future Earth Australia* to achieve

Research areas	Explanation
A renewable energy superpower	One very specific project that sits within the broader issue of future energy is the proposal to establish Australia as a world leader in generating and providing renewable energy. Such an objective cannot be achieved through science and engineering alone—it will require a society-wide understanding of the issues and engagement and commitment from all sectors.
Climate change	Climate change is being addressed in many ways already (e.g., understanding and modelling climate systems, considering adaptation pathways at all levels from policy to community action), but they are largely disconnected from one another. Issues like the plausible effects on economic and social wellbeing are not well understood or explained across society and understanding of the interactions among social, economic and ecological systems as climate changes is at an early stage. There is a need to bring the various scientific disciplines currently addressing climate change together with other forms of knowledge so that society can develop coherent strategies that are understood and have broad support. The political barriers to society-wide progress on climate change has been highlighted as being in need of urgent consideration by multiple disciplines working together.
Diseases in a social-economic-environmental context	There is considerable investment in anticipating, detecting and combating outbreaks of plant, animal and human diseases, but effective mitigation requires integration of specialist knowledge of diseases with understanding of how society, the economy and the environment might interact with the diseases themselves and/or actions taken to manage the risks.
Energy	Considering the options and implications of current energy sources (oil, gas, coal) and emerging alternatives drawing on and integrating the full range of knowledge within society.

Research areas	Explanation
Food, water, energy nexus	The term 'food-water-energy nexus' is seen everywhere at present and yet it is usually used to justify research] in one or two of these three elements. Australia has world-leading skills in each of the three parts of this nexus and also the ability to take a transdisciplinary approach to considering the interactions among food, energy and water and their implications for Australia's future in the region and globally. A major challenge is that biophysical and social sciences see this nexus very differently and rarely have the potential contributions from the humanities (e.g., historical and anthropological analyses) arts (e.g., how food, water and energy and their interactions are depicted in words and images and how that influences our perception of them) and other forms of knowledge (e.g., community-level differences in perceptions of how the nexus might be dealt with at local scales) been brought together. The IHOPE program of *Future Earth* globally is an example of a project tackling some of theses issue with inputs from the humanities but Australia can take this type of approach further and in so doing provide opportunities for greater wellbeing and economic opportunities for business.
Inequality	Understanding the drivers and implications of inequality and inequity in society in all their forms including the ways in which social, economic and ecological systems are influenced by and influence inequality and what these influences might mean for Australia's plausible futures
Northern Australia	Considering development of Northern Australia in a truly transdisciplinary way
Rehabilitation	Rehabilitation of ecosystems, including waterways, is currently mostly addressed by ecologists and/or engineers. There is a need to consider the roles of ecosystem rehabilitation in supporting all aspects of social and economic wellbeing as well as the ethical and moral dimensions of conservation.
Safe operating space	What counts as a safe operating space for humanity in Australia and how do we get there? While there is general agreement that we cannot identify a single state that might represent an ideal future for Australia, we can identify limits beyond which lie undesirable aspects of the future. Attempts to identify biophysical components of a safe operating space for humanity have made some progress but identifying social and economic components is at a very early stage and requires inputs from across society.
Sustainability	The word 'sustainability' is familiar to many Australians but what it means, or could mean, is poorly understood. Australia is currently playing a key role in exploring how the global Sustainable Development Goals might be achieved. There is potential to build on the SDGs as a nucleus to engage a wider range of people in exploring what Australians want for their future and the future of their descendants and what challenges might need to be addressed to achieve these futures. History demonstrates that the future is driven not just by factors that scientists can analyse and forecast but by intangible, unpredictable and often illogical expectations and actions of people individually and collectively. The concept of sustainability has emerged as a way of helping us explore how to keep options open so society can deal with shocks. A key component of being resilient is society-wide thinking about what the future might hold and how to prepare for it. This requires integration of knowledge across society as scales rarely, if ever, achieved in the past.

Research areas	Explanation
Sustainable agriculture	The has been a large amount of effort and world-leading research results in Australia in relation to making agriculture more productive. And yet many in regional communities complain that Australia as a nation does not have a well developed idea of what agriculture, and rural Australia generally, has to offer the nation's future. It can be argued convincingly that Australia's economic and social future, including how we deal with climate change and economic and political upheavals regionally and globally, will depend on strategic consideration of how agriculture is integrated with other industries and environmental management. Transdisciplinary projects involving the sciences, humanities, arts and other types of knowledge can facilitate this integration.
Sustainable cities/ urban resilience	Bringing together multiple types of knowledge to understand how cities have developed, how they might develop in future and what implications this might have for human and other life in and around cities. There is a huge body of work but it needs coordination and sharing of resources. Key topics include population size, make-up and distribution, planning infrastructure (water, education, health transport etc) in ways that avoid lock-in that might inhibit adaptation to future change.
Sea level rise	The implications of sea level rise for coastal ecosystems and communities and decision making around this
New options for Australia's economy	A range of projects was suggested by stakeholders with the common theme of critically and objectively questioning the basis for current policies of economic growth and asking whether there are alternatives that could yield better outcomes in terms of human wellbeing. Within these projects are question like how we decouple provision of goods and services from consumption of non-renewable resources and how we measure progress in ways that capture more of human wellbeing than the circulation of money. Some economists have made great progress in theory in this area but barriers to adoption by politicians and policy makers, which arguably require engagement of wider knowledge sets than ecology and economics and enable society as a whole to understand the underlying issues and develop narratives about the future that prepare us for both realities and possibilities.
Australia's natural variability	Although we've learned a lot, we don't understand well what counts for normal in Australia, and how far climate, water, plants, animals have bounced around within this normal range of variability
Better use of historical research	Drawing on the skills of historians to understand how change has occurred in the past to supplement science and other ways of considering future possibilities
Disruptive technologies	Various business groups are currently investing in ideas and technologies designed to shake up business thinking and generate new products and business opportunities. Rarely does this thinking about disruptive technologies include thinking about the environment or broader social issues. *Future Earth Australia* presents an opportunity to broaden the thinking about disruptive technologies to a society-wide focus.
Indigenous knowledge	Although there have been efforts to engage with the knowledge of Indigenous people in Australia, there is a need for much greater integration between Indigenous knowledge and other forms of knowledge across society. This includes facilitating better understanding of, and respect for, Indigenous ways of life. The integration of types of knowledge to improve Australia's ability to anticipate and prepare for multiple futures and steer towards desirable ones is a general challenge that needs much more attention.

Research areas	Explanation
Local knowledge	Scientists have generally struggled to integrate scientifically derived knowledge with local knowledge that people in communities have accumulated through experience over many years. However, local knowledge is often the most powerful force driving the decisions of communities and individuals. Effectively dealing with complex societal challenges and opportunities requires recognition of local knowledge and views about the world and mechanisms for encouraging dialogue between those with local knowledge and those with scientific and other forms of specialized knowledge.
Leverage	In an increasingly complex world, where should we invest efforts to encourage desirable futures to emerge? Both research and policy-making currently occur in silos that focus on parts of the coupled social, economic and ecological systems that determine how the future unfolds. Transdisciplinary approaches that go well beyond the biophysical and social sciences offer the chance to better understand how society, the economy and the environment interact and where influence can be applied to leverage change most effectively.
National foresight capacity	At all workshops, the issue of Australia's limited commitment to systematic thinking about medium and long term futures, despite the considerable skills in this area that exist within Australia. High quality foresight methods is a mechanisms for bringing all types of knowledge together to both increase understanding of alternative views and identify possibilities that would not have been identified by applying foresight methods *within* disciplines or *within* science, politics or policy-making alone.
New forms of governance	Many suggestions from stakeholders related to better understanding of how Australian society is organised and governed and what options exist for new and better governance processes where existing ones seem to be struggling. Achieving progress in this areas requires not only integration of a wide range of knowledge but also the understanding and cooperation of people across society. There are currently large gaps between academic consideration of governance possibilities and the public understanding needed to support experimentation with alternatives.
Noise as an integrating issue	Noise and its effects on society as a cross-cutting issue
The role of the arts	There is a lot of potential for involving the arts (visual, performing etc.) in helping people understand and deal with complex issues through giving them ways to see and experience the key dilemmas and options for addressing them. This a theme that potentially cuts across all transdisciplinary projects.
The role of the media	Another cross-cutting issue is the role of the media in helping Australians deal with diverse types of knowledge. It has been suggested that, apart from media involvement in the full range of transdisciplinary projects as a source of knowledge, there is a need for transdisciplinary consideration of the roles that the media might play in the future and the implications of different possibilities.
Understanding barriers to uptake of ideas	This is a truly transdisciplinary subject as the process that work against the development and uptake of ideas to address complex sustainability challenges and opportunities are themselves likely to be complex interactions of social, economic, environmental and other factors and require solutions that involve knowledge from all of these aspects of society.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