FUTURE EARTH AUSTRALIA

Enabling Australia's social, economic and environmental future

Towards a Plan for Future Earth Australia

Please note:

It is intended that this document will be the basis for a much shorter, sharper strategic plan developed after input from participants in the National Workshop in April 2016

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AUSTRALIAN COUNCIL OF LEARNED ACADEMIES

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research for global sustainability

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INTRODUCTION

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.

In Section 1 of this document, '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 currently operate
- 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 of this document, 'Vision', we outline:

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

In Section 3 of this document, 'Strategic objectives and example initiatives, we present our current thinking, based on extensive consultation within Australia, about:

- strategic objectives
- initial activities, including model initiatives.

Finally, in Section 4, 'Operational plan and business model', we consider:

- the type of business model that Future Earth Australia might adopt, including value propositions for key stakeholders and a governance structure and operating process (a more detailed business model and operational plan is being developed as a separate document).

This is a draft plan for comment. A final plan will be launched in April 2016.

1. 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. The world's population looks might stabilise in the next half century but will be much larger than it is currently. Massive urbanisation means that by mid-century, four-fifths of the world's people 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 the most prominent.

> ***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?***

Australia is unique in several defining ways; 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 past 36 million in 2050, Sydney and Melbourne are growing by close to 100,000 people 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 population growth rate of 1.5% pa[a], driven more than half by immigration, is that of a developing nation; 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 the corresponding investment in education and research that is needed to sustain it. 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

[a] 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. <http://www.science.org.au/publications/negotiating-our-future-living-scenarios-australia-2050>

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.

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 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 Australian Government's Department of Industry, Innovation and Science's strategic plan, for example, envisions an 'agile economy, capitalising on Australia's commercial and scientific strengths' and 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 initiative to take this body of initiatives to a higher level, making a greater 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 transformations 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 http://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. For Australia, there are opportunities to both benefit from and contribute to this international effort.

1.3 Australia's knowledge environment

Future Earth aspires to engage 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).

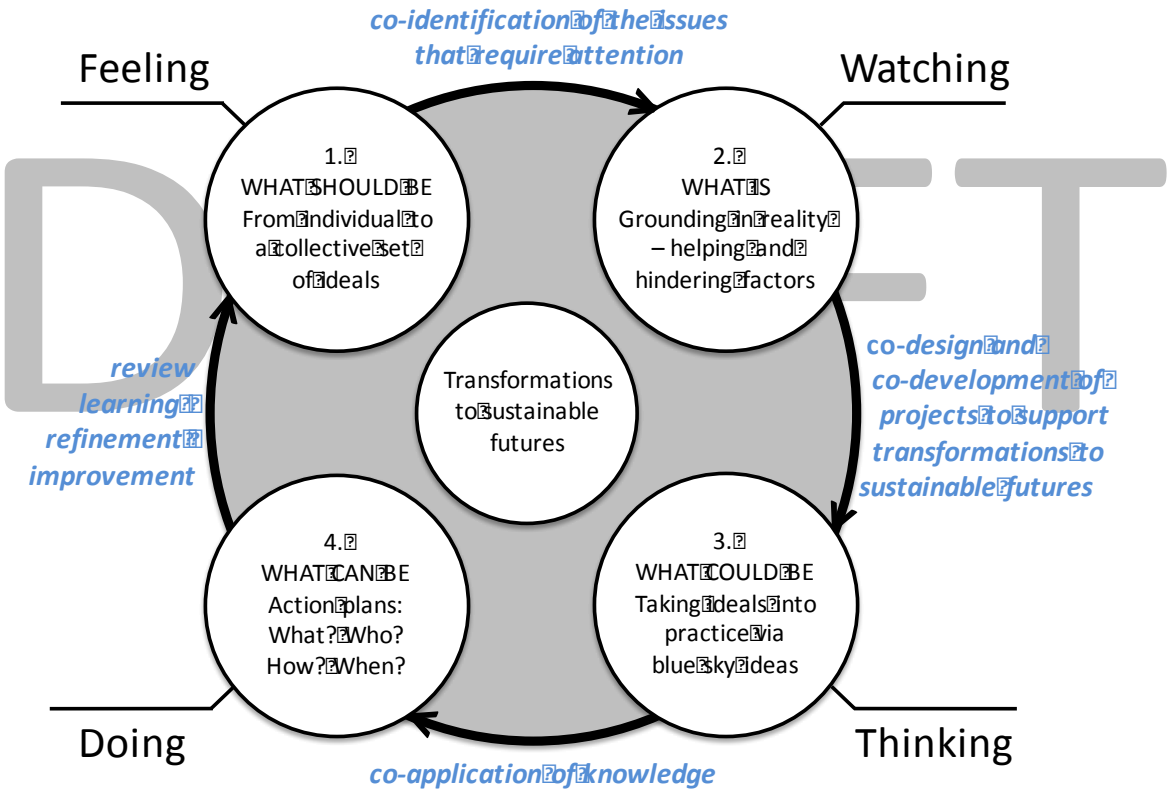

Figure 1: Modification of Brown and Lambert's[b] depiction of collective social learning. The notes against linking arrows, in italics, are our interpretation, linking this scheme with the terminology used in this document (i.e. co-design, co-development, co-application etc.).

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

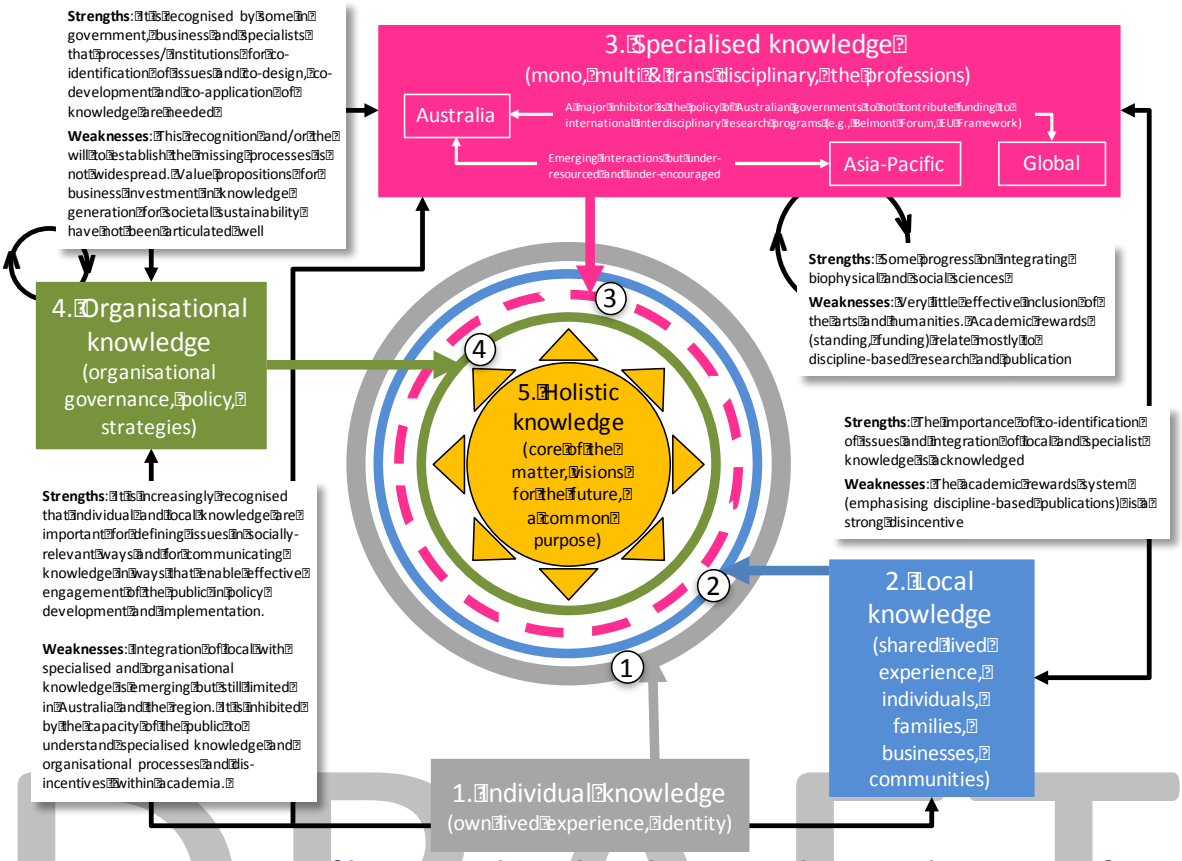

Figure 2: Summary of key strengths and weaknesses in the Australian system of knowledge generation and synthesis, mapped against Brown and Lambert's[c] typology of nested knowledge types. Integration of these layers of knowledge is required to achieve effective operation of the processes outlined in Figure 1.

The consultation with stakeholders undertaken to support this plan for Future Earth Australia aimed in part to help us understand the dynamic interactions among individuals and groups that are trying to help Australia move towards sustainable futures. This consultation revealed that all of the components of Figure 1 are in place in Australia, but suggests 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

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

need to address several major limitations and blockages to the current systems for generating, integrating and applying knowledge in all its forms.

Might 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 of the major research initiatives supported by Future Earth. This involvement allows Australia to participate in identifying priorities globally and enables Australian scientists to make limited contributions to international initiatives. However, Australia's limited financial contributions to international collaborative research limit the extent of Australian involvement, let alone leadership, and the types of involvement envisaged thus far will not address the barriers to focusing Australian producers and appliers of knowledge on the needs of Australia and its relationships with the surrounding region.

The Australian Council of Learned Academies (ACOLA) considered that Australia could be in a better to position to both contribute to and benefit from Future Earth if a body existed that 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 a plan to explore and state the case for Future Earth Australia.

The value propositions articulated in Section 4 of this document summarise our perceptions so far 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 are 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. VISION

2.1 Guiding principles

It is proposed that Future Earth Australia 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 source of high quality, objective and clearly communicated advice about issues relating to all facets of sustainability.

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 that spans social, biophysical and technological sciences, the humanities and the arts, and local and other forms of knowledge, to address the sustainability challenges facing Australia, our region and the world*.

3. STRATEGIC OBJECTIVES AND EXAMPLE INITIATIVES

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.

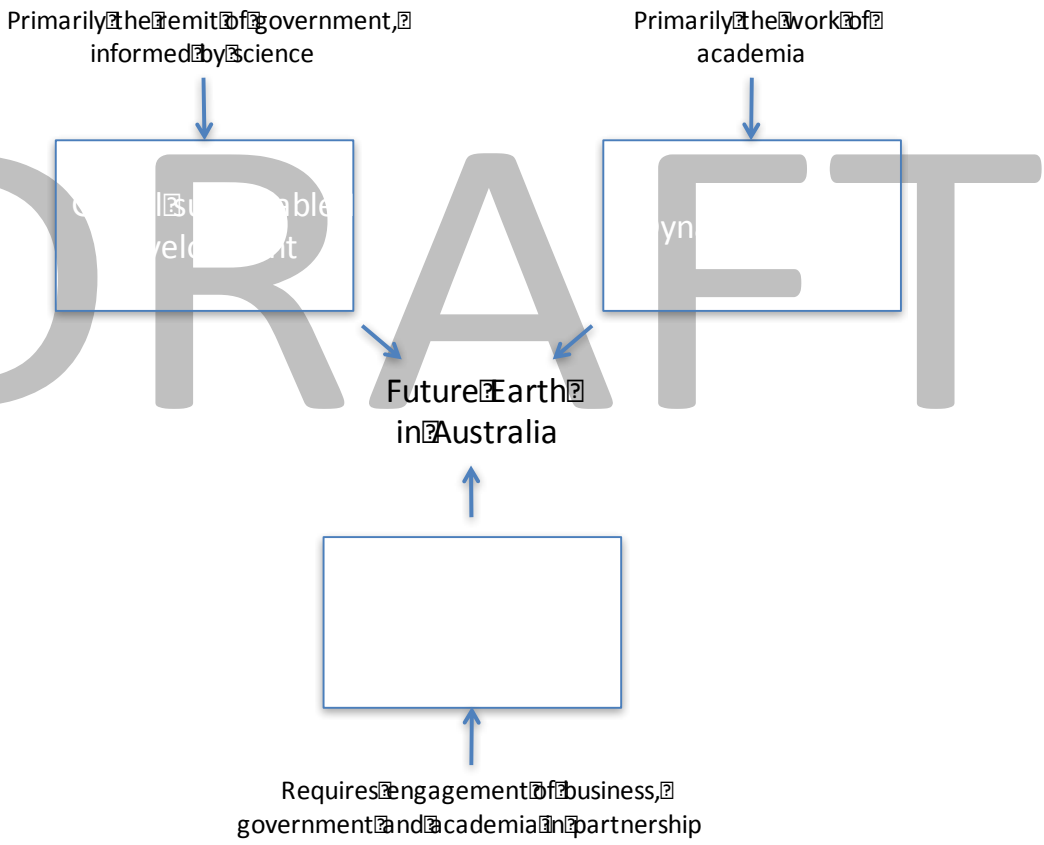

Figure 3: The three themes that Future Earth will pursue in its activities

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 http://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 national, regional and international agencies' research programs, to maximise resources for and impacts of research towards 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 generation of knowledge that connects local to regional and global processes and promotes alternatives for sustainable development trajectories
   - creating a critical mass of knowledge generators, policy makers, and 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

Projects that are initiated by or through Future Earth Australia will have the distinguishing features of:

- strong synergy between knowledge about human needs and societal dynamics, and knowledge about all aspects of the biophysical world
- a systems approach
- significance for sustainability in Australia and/or our region
- 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 (see Section 4), and to meeting our other strategic objectives, by:

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

Specific performance criteria related to these broad objectives will be developed once a governance arrangements are established.

3.4 Examples of themes

To recap messages given earlier in this plan, establishment of Future Earth is proposed because:

- a mechanism for bringing together the full range of knowledge needed to address the pressing challenges facing Australia, our region and the globe does not exist in Australia
- many components of a solution to these complex challenges exist but require support to enable them to connect and function in a transdisciplinary way.

Appendix 2 includes a summary of the types of projects that stakeholders told us are needed for Australia to address the unique challenges it faces and to contribute also to the broader 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. From this input, we have identified four major themes that will be the focus for dialogue and planning at the April 2016 forum mentioned in Section 4.4.

- **People in a sustainable society**
- **The economy and a sustainable society**
- **The environment and a sustainable society**
- **Links and feedbacks between people, the economy and the environment**

Table 1 shows how the priority project areas relate to the four themes listed above. As would be expected from transdisciplinary projects, most involve multiple themes.

Table 1: Priority project areas that emerged from the online survey and the stakeholder workshops (for explanations of the project areas see Appendix 2)

Project areas from survey and workshops	Forum theme			
	People	Economy	Environment	Links and feedbacks
A renewable energy superpower	x	x	x	
Climate change	x	x	x	
Diseases in a social-economic-environmental context	x	x	x	

Energy	x	x	x	
Food, water, energy nexus	x	x	x	
Inequality	x	x	x	
Northern Australia	x	x	x	
Rehabilitation	x	x	x	
Safe operating space	x	x	x	
Sustainability	x	x	x	
Sustainable agriculture	x	x	x	
Sustainable cities/ urban resilience	x	x	x	
Sea level rise	x	x	x	
New options for Australia's economy	x	**x**	x	
Australia's natural variability			x	
Disruptive technologies				x
New forms of governance				x
Better use of historical research				x
Indigenous knowledge				x
Local knowledge				
Leverage				x
National foresight capacity				x
Noise as an integrating issue				x
The role of the arts				x
The role of the media				x
Understanding barriers to uptake of ideas				x

To focus dialogue and planning at the forum and to show how Future Earth Australia, like Future Earth globally, has emerged from a number of existing initiatives already making progress towards transdisciplinary activities on some key challenges, we propose to showcase the following projects. We will seek support to build on them as ways to provide rapid returns on investment to partners who join Future Earth Australia.

- **Sustainable Urbanisation** led by the Australian National University (Bob Webb and Xuemei Bai), CSIRO (Mark Stafford Smith) and Monash University (Nigel Tapper and Dave Griggs). It is linked with the Future Earth Global Urban Knowledge Network through Professor Xuemei Bai (also a member of Future Earth's Research Committee). It has completed several rounds of consultation around Australia and has a portfolio of projects ready to implement if funding can be obtained.
- **The Sustainable Water Future Program**, led by Professor Stuart Bunn at Griffith University, is an existing core program of Future Earth and relocated its project office to Brisbane in 2015. It plans a forum in mid-2016, aiming to bring together Australian partners and build Australian research into the initiative. This initiative is keen to link with Future Earth Australia and is seeking greater investment from within Australia. It already has interest from several international governments.
- **Transdisciplinary centre**, proposed by Professor Robert Costanza at the Australian National University. The proposal is to bring together a wide range of scientific and other knowledge in a series of workshops and forums to generate novel ideas about achieving a sustainable future society and economy within a sustainable environment in Australia and our region.
- **System of Environmental Economic Accounts**. Australia continues to play a key role in developing and applying the new global standard System of Environmental Economic Accounts (current participants include the World Bank, United Nations, Australian Department of Foreign Affairs and Trade, Australian National University

and Australian Bureau of Statistics). There is substantial potential to build on this process to focus research and dialogue and to bring together an even broader range of knowledge to address economic, social and environmental challenges in an integrated way.

4. OPERATIONAL PLAN AND BUSINESS MODEL

4.1 Generating value for stakeholders

We have identified four broad categories 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 these 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 policies. 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.

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 opening up??

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. Example 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 on 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 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 geographic 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 of Australia
- ensuring the voices of the public are included in the 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. Future Earth Australia offers this large and disparate group:

- coordination—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
- connection—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—raising awareness of sustainability-focused research and activity in government and government-funded institutions (e.g. the Australian Research Council (ARC), the Australian Council for the Arts), and to business organisations or others, to achieve a critical momentum and single voice that cannot be achieved by groups acting alone
- elevation—capturing and coordinating knowledge, research and practice in which Australian 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 Organisation and governance

The proposed structure consists of:

- A **national steering committee** that oversees the operation and strategic decisions of Future Earth Australia. The steering committee will represent key stakeholder communities related to the economic, societal and environmental sustainability of Australia.
- Possible terms of reference of the steering committee are:

  1. To identify national research challenges affecting the sustainability of the Australian economy, society and environment.
  2. To select Future Earth Australia projects that address national research challenges.
  3. To provide initial support for the establishment of Future Earth Australia projects.
  4. To monitor progress of Future Earth Australia projects.
  5. To advocate sustainability research in Australia and collaboration with our region through Future Earth in Asia (e.g. by including Australia's representative on the Advisory Committee to Future Earth Asia on the board or national steering committee for Future Earth Australia).

- A **Future Earth Australia secretariat** will support the steering committee. It will manage the tasks involved in coordinating, enabling, promoting and performing activities.
  - The secretariat will consist of a manager and support staff.
  - It will be located in an appropriate institution such as a university.
- **Specific management committees** will be established for individual Future Earth Australia projects.

Two key challenges to be considered by the appointed board and national steering committee are:

- Should Future Earth Australia become incorporated to give it stronger ability to negotiate partnerships and collaborations?
- How can Future Earth Australia avoid the possible negative implications of governance by committees while benefiting from the strengths of broad participation?

4.3 Funding

Funding for Future Earth Australia core activities will include, but not be limited to, subscriptions from universities, research agencies and industry. Subscriptions will be sought through a strategy of simultaneously promoting the benefits to partners while improving our understanding of the needs of potential partners and refining the operations of Future Earth Australia to meet those needs consistent with our guiding principles (see Section 4.5). The core activities will include support for the initial development of specific Future Earth Australia projects. Funding for specific projects will generally be raised through each project management committee.

Matching funding will be sought from government on the basis of benefits for the public and to policy-making processes. An ARC Special Research Initiative (SRI) will be sought to promote enhanced links between Future Earth global core projects and national Future Earth Australia projects. An ARC Linkage Infrastructure Equipment Facilities (LIEF) grant will be sought to support Australian involvement in the international Belmont process.

4.4 Immediate objectives

Future Earth Australia's first, and pivotal, objective is to build demand and support for establishment and maintenance of Future Earth Australia. This will be done by:

- continuing the marketing and refinement of the strategic and business plans for Future Earth Australia among potential clients, partners and other participants during 2016
- Focusing on universities and government to secure $300,000–$400,000 annually for the first five years (2016–2021) to allow a secretariat to be established and maintained
- exploring models for establishing research funds that can be allocated by Future Earth Australia partners, and/or leveraging other funds through Future Earth Australia's role as a broker of new and ambitious projects and other activities, so that by early 2017 there is a clearly articulated and funded path towards achieving the strategic objectives.

In April 2016, Future Earth Australia will hold a two-day workshop at the Australian Academy of Science in Canberra at which the full range of stakeholders will be invited to co-identify, co-design and co-develop a small set of key projects.

4.5 Operating principles

A focus on enabling and promoting national collaboration

To be an enabling institution, Future Earth Australia must fill gaps and create new links in networks rather than duplicate what already exists. One key gauge of Future Earth Australia's success in achieving this objective will be its relationship with the UN Sustainable Development Solutions Network (http://unsdsn.org). SDSN is a member of Future Earth's Governing Council and has many objectives in common with Future Earth Australia. It is acknowledged by SDSN's leadership that it cannot achieve all that is required for transformations to sustainable futures in Australia and the region, and that there is value in an institution that complements the agenda of SDSN.

Achieving complementarity, not just with SDSN but with many other institutions and programs addressing sustainability issues in Australia, will require time and fine-tuning as Future Earth Australia goes through its establishment phase. In relation to SDSN, Future Earth Australia will initially cover similar ground but Future Earth Australia's activities will be concentrated towards the knowledge-generation end of the spectrum while SDSN will be more focused on application and implementation projects. At the same time, Future Earth Australia will maintain a strong interest in implementation activities involving arts and humanities (e.g. museums, galleries and performances) that promote public awareness of sustainability. As time goes on, it is anticipated that the relative spheres of activity of SDSN

in Australia and Future Earth Australia will become more clearly demarcated as is also expected to happen with SDSN and Future Earth.

Relationship with Future Earth globally and Future Earth in Asia
Future Earth Australia will coordinate and provide a central point of contact and reference to activities in Future Earth globally, especially where Future Earth's core global projects have Australian representation. To do this, we will develop a governance structure that gives all those currently involved in Future Earth, and those who seek to become involved, confidence that their interests are being met by Future Earth Australia. A key component of Future Earth Australia's governance, therefore, will be to establish formal links with Future Earth in Asia, which is the mechanism by which Future Earth globally coordinates its activities n the Asia–Pacific. We will do this by seeking the equivalent of a memorandum of understanding with Future Earth in Asia and by inviting Australia's representative on the Advisory Committee for Future Earth in Asia to sit on the board or steering committee of Future Earth Australia.

APPENDIX 1: 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 (http://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 (WMO) (http://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 programs: 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 (http://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 (http://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 (http://www.futureearth.org/structure-and-governance).

Regional connections

The Future Earth 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 (http://www.futureearth.org/secretariat).

Mode of operation

The Future Earth [global] vision statement outlines the following mode of operation.

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 Earth 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 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* (http://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. These focal challenges will generate 7 focal outputs:

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 2: SUMMARY OF FEEDBACK FROM STAKEHOLDER SURVEYS AND WORKSHOPS ON PRIORITIES FOR FUTURE EARTH AUSTRALIA

Appendix 2, Table 1: Priority research areas that stakeholders expressed as 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 from survey and workshops	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.
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 these 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 the 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.
Sustainable agriculture	There has been a large amount of effort and world-leading research 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. Within government, the agriculture and environment departments have not always shared common objectives. 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 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 challenges that needs much more attention.

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 specialised 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 the leverage change most effectively.
National foresight capacity	At all workshops, the issue was raised 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 are 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 of 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	Within almost all of the projects suggested is the question of how individuals and groups make decisions about dealing with change and how we can overcome barriers to acceptance of ideas that seem critical for adaptation. Several fields across psychology and economics address these questions but there is a need to connect this theory with the practical questions of managing change at societal scales in the face of increasing complexity and amounts of information and increasing sophistication of those who wish to shape public opinion to their own ends. In some ways, this is about overcoming undesirable resilience (perhaps better called resistance) that arises due to human thinking flaws that have evolved to protect our minds from information overload.