

Australian National Outlook and the future of regional NRM

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CSIRO Integration Science and Modelling

NATIONAL OUTLOOK 2015
www.csiro.au

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Prediction is difficult, especially the future*

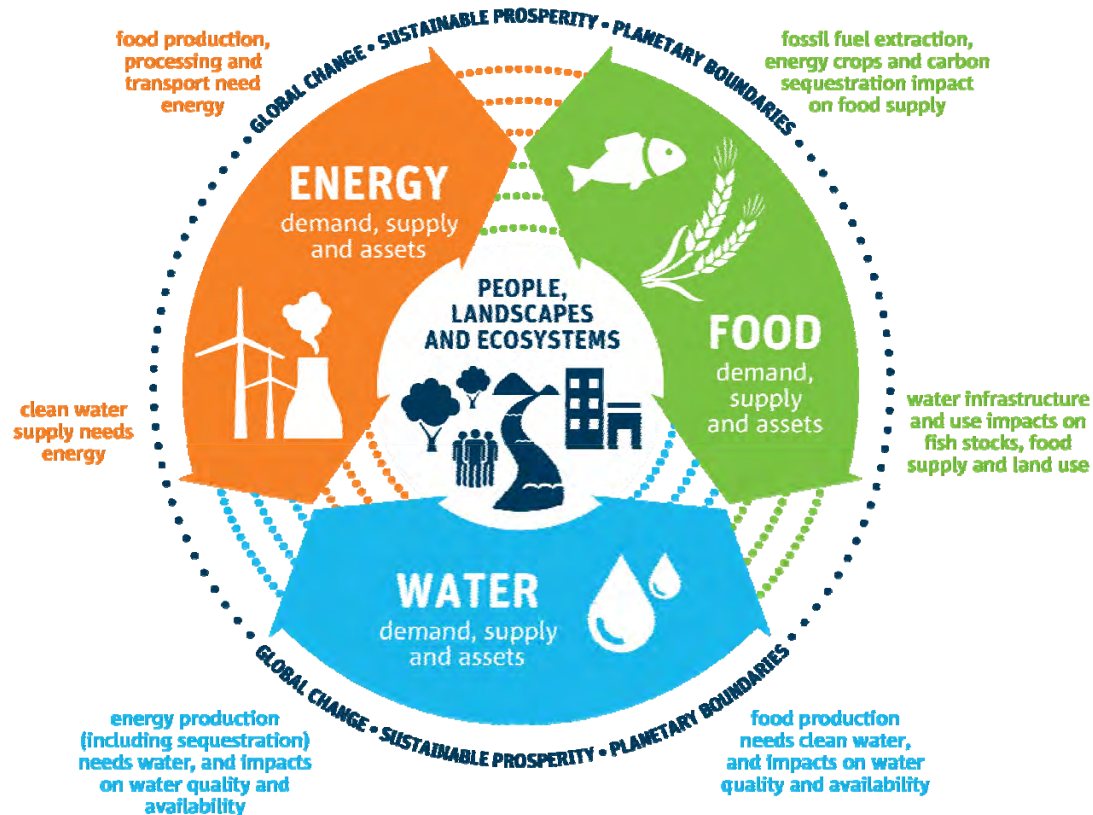


* Danish proverb / Neils Bohr, 1922 Nobel Prize in Physics

<http://snicket.wikia.com/wiki/File:Blindfolds.jpg>

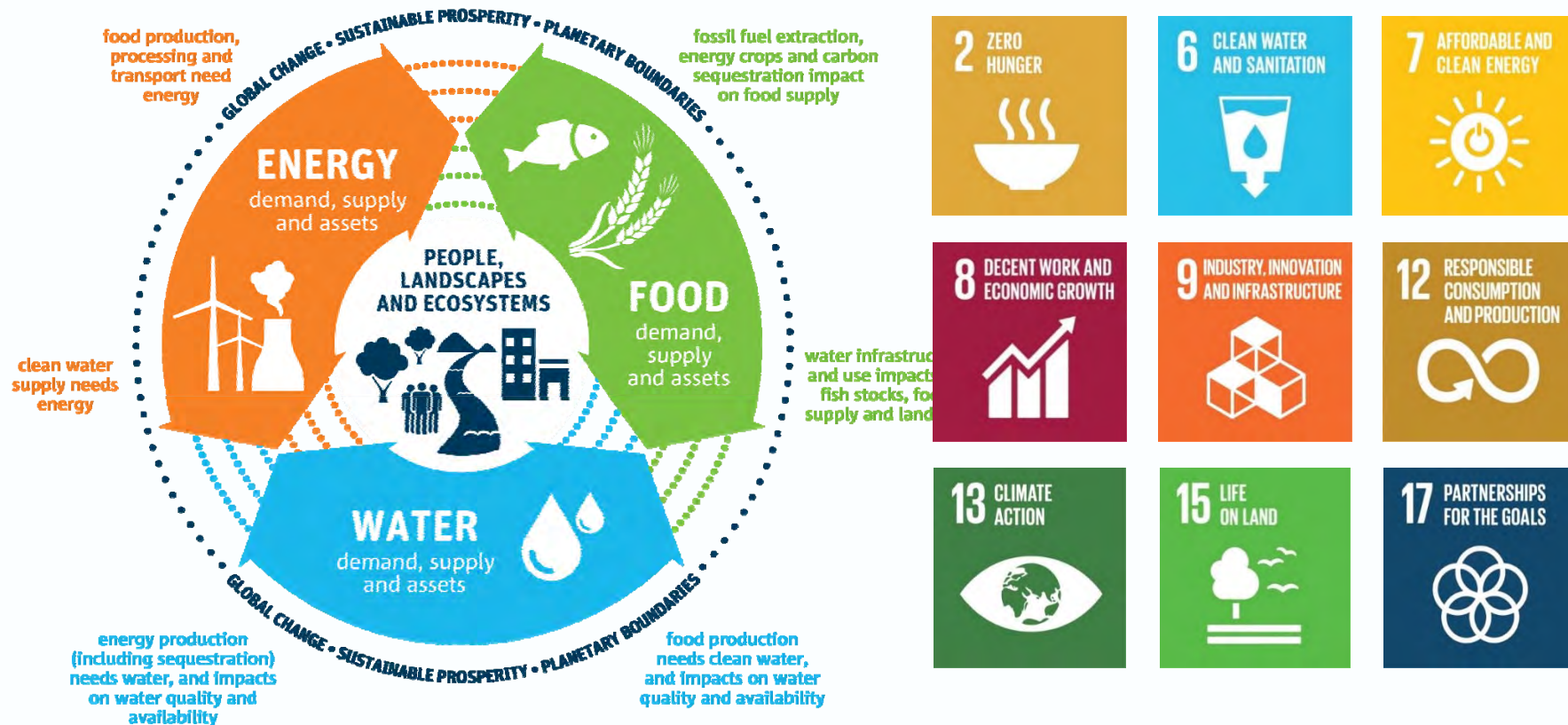
Integrated modelling explores possible futures, with a focus on material and energy intensive industries

Water-Energy-Food nexus



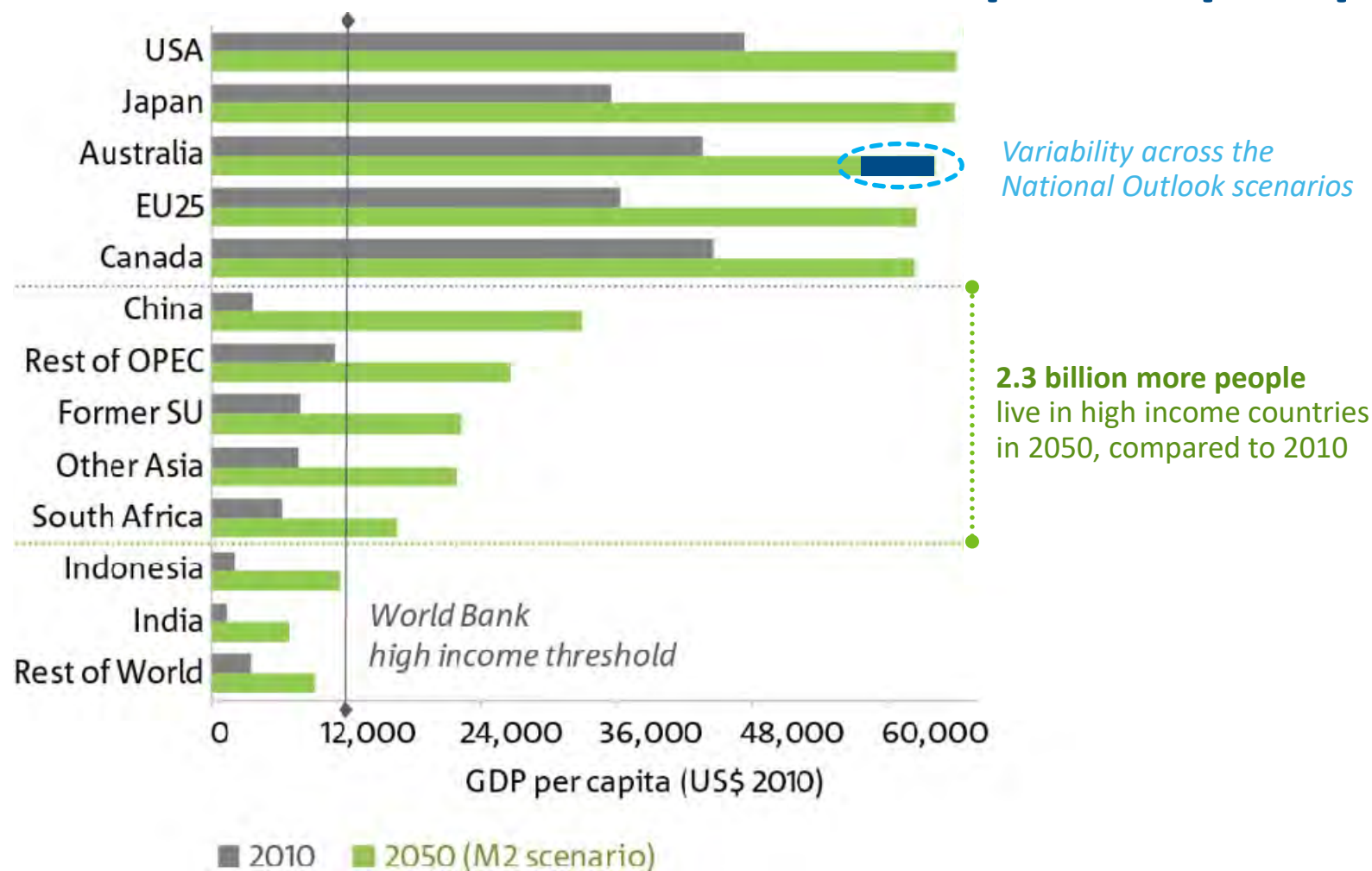
Integrated modelling explores possible futures, with a focus on material and energy intensive industries

Water-Energy-Food nexus



1

The global outlook is positive, but uncertain. Australia's choices will shape our prosperity.



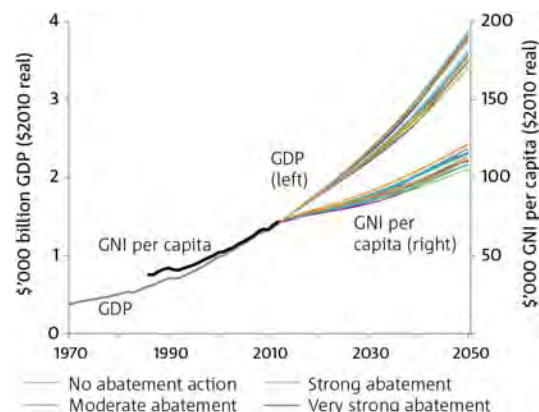
Source: Chart Overview A3 – Per Capita Income by World Regions, 2010 and 2050

www.csiro.au/nationaloutlook



2 Sustainability and economic growth can be partners, not competitors

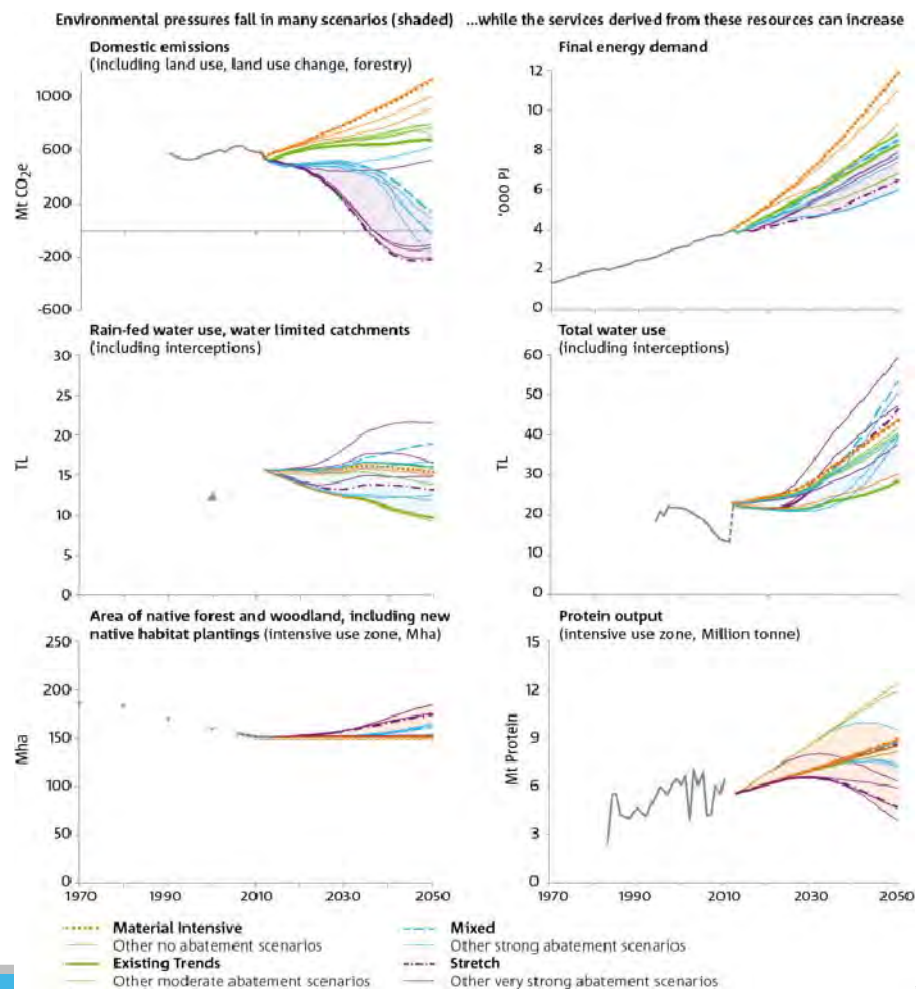
ECONOMIC ACTIVITY AND NATIONAL INCOME GROW STRONGLY ACROSS ALL SCENARIOS, 1970-2050



Integrated modelling finds Australia can enjoy strong economic growth, while reducing pressures on natural resources and ecosystems.

Only three of eighteen scenarios decouple all the pressures: greenhouse emissions, water stress, native habitat and biodiversity

ENERGY, WATER, AND AGRICULTURAL INPUT INCREASES, WHILE PRESURES DECLINE



3

Decisions we make as a society matter. Technology deployment and governance are crucial.

FIGURE 12 ENERGY EFFICIENCY CAN MAINTAIN AFFORDABILITY OF ELECTRICITY IN THE FACE OF HIGHER PRICES – BUT THE BIGGEST GAINS COME FROM REDUCING NETWORK AND DISTRIBUTION COSTS

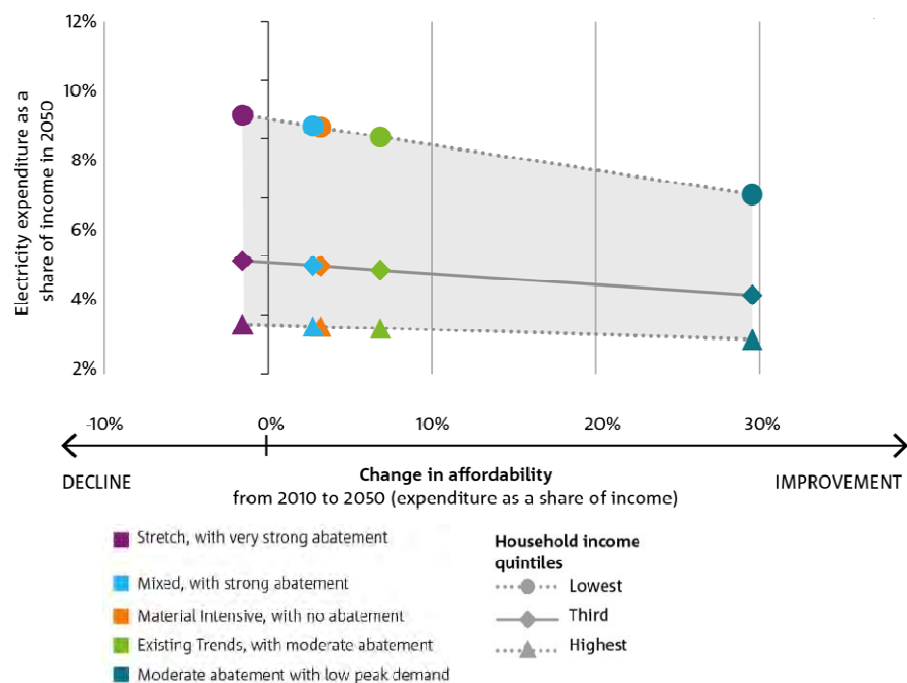
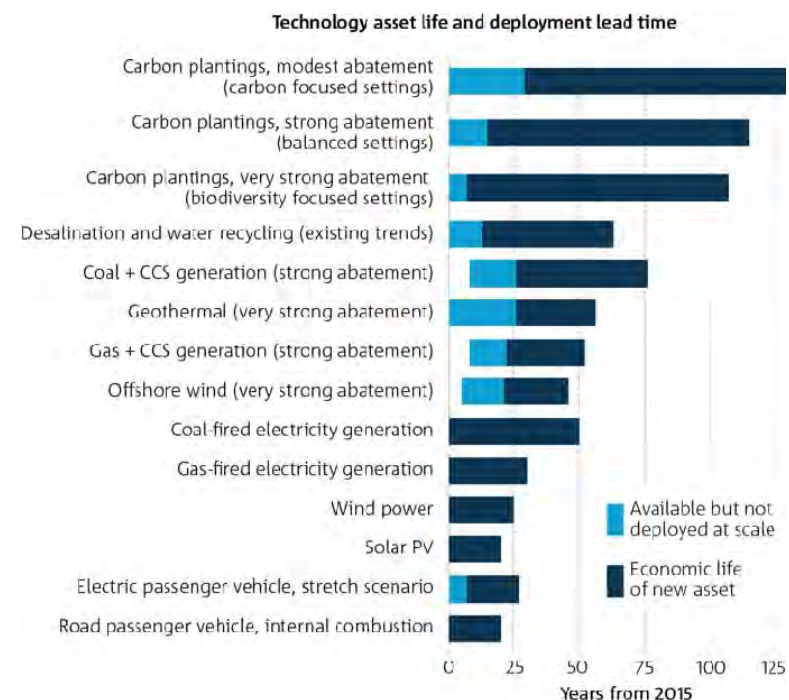


FIGURE 18 TRANSITION TIMEFRAMES ARE SHAPED BY INVESTMENT DECISION CONTEXT AND THE LIFE SYSCLE OF DIFFERENT ASSETS



... implying a need for informed and integrated
environmental, social, and economic governance and decision making

what might
shape
the
future
of our landscapes
and communities?

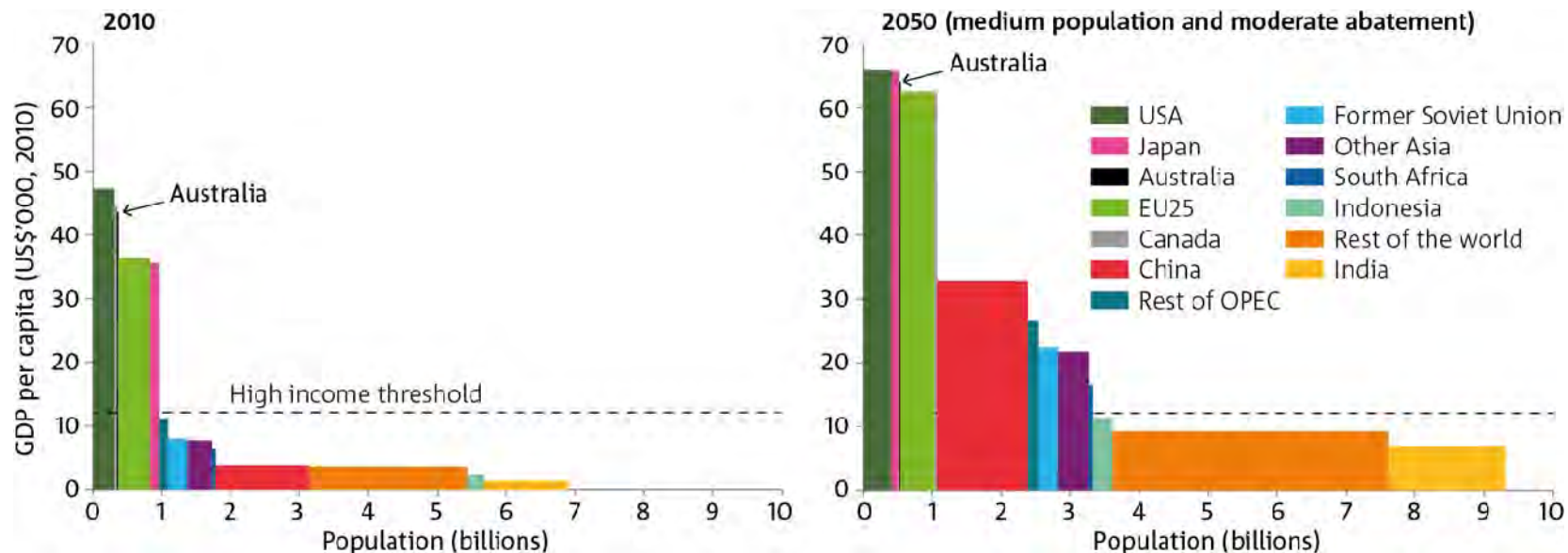




<http://www.sbs.com.au/news/article/2013/04/23/who-number-23-million-joining-snapshot-australia>

Global demand for our exports increases, driven by rising incomes, and the re-emergence of Asia

FIGURE 5 THREE BILLION PEOPLE LIVE IN HIGH INCOME NATIONS BY 2050, UP FROM ONE BILLION TODAY



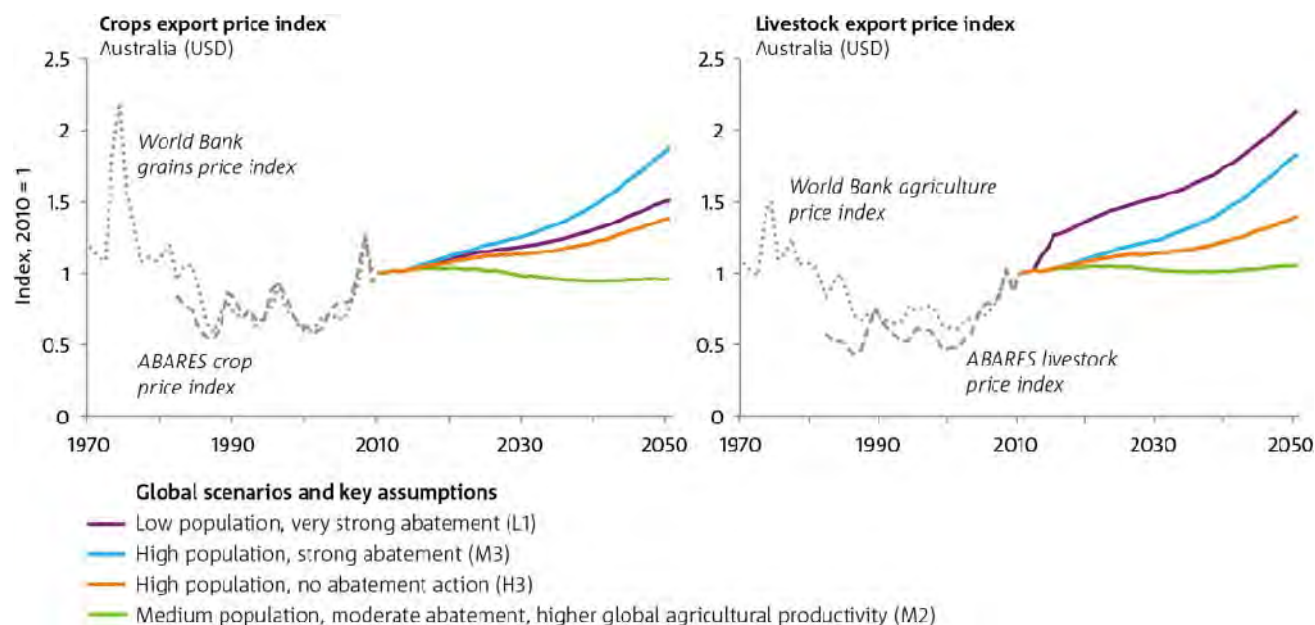
Sources: Hatfield-Dodds et al. (2013) *Australian National Outlook 2015: Economic activity, resource use, environmental performance and living standards, 1970-2050*.

By 2050 the world economy is projected to grow to be around three times larger than it is today, with average global income per person more than doubling from 2010 to 2050 across all scenarios.



Agricultural prices likely to trend upwards, reversing the long term trend

FIGURE 7 GLOBAL AGRICULTURAL PRICES COULD TREND UP, REVERSING THE LONG TERM TREND



Looking ahead, an upward trend in agricultural prices is likely as global supply falls behind the growth in global demand.

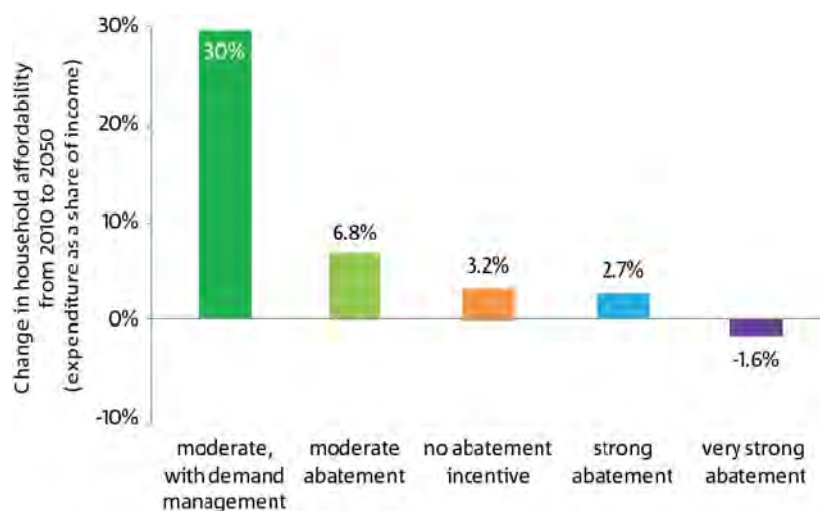
Source: Hatfield-Dodds et al. (2015) *Australian National Outlook 2015: Economic activity, resource use, environmental performance and living standards, 1970-2060*.



<http://www.edselby.com/convert-atheist/monkey/>

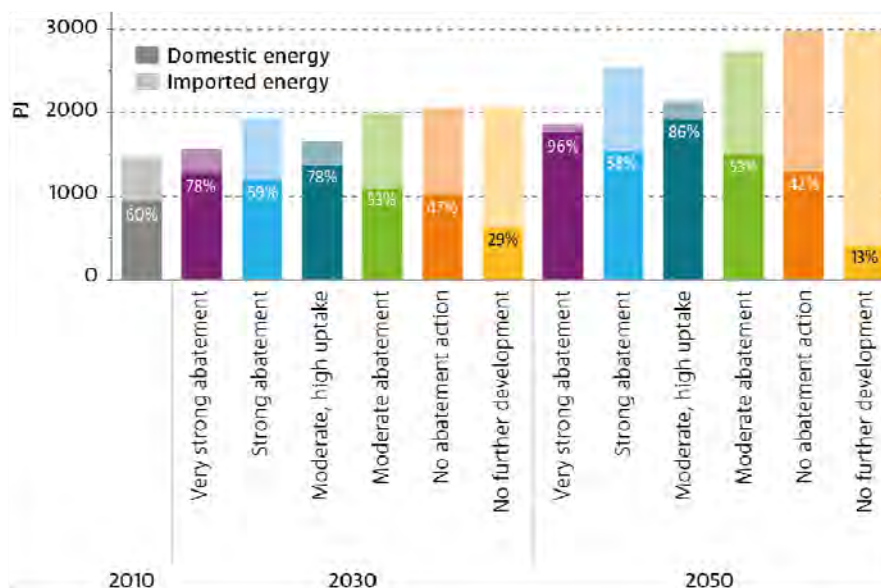
New technologies reshape markets and disrupt old certainties and advantages

D1. ENERGY EFFICIENCY CAN MAINTAIN AFFORDABILITY OF ELECTRICITY IN THE FACE OF HIGHER PRICES – BUT THE BIGGEST GAINS COME FROM REDUCING NETWORK AND DISTRIBUTION COSTS

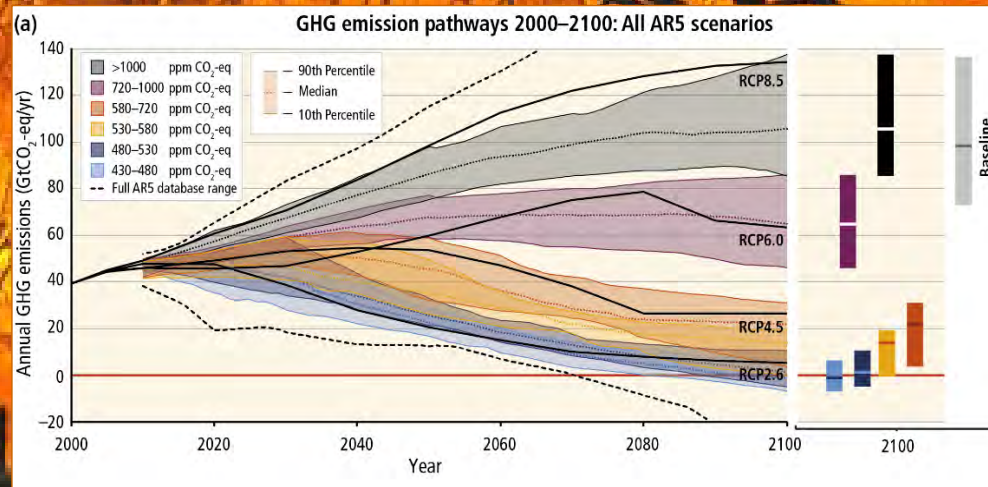
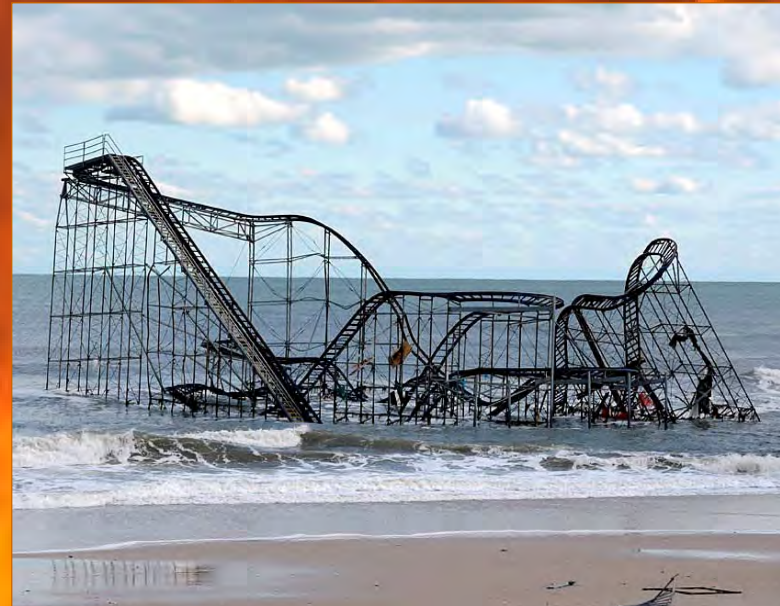
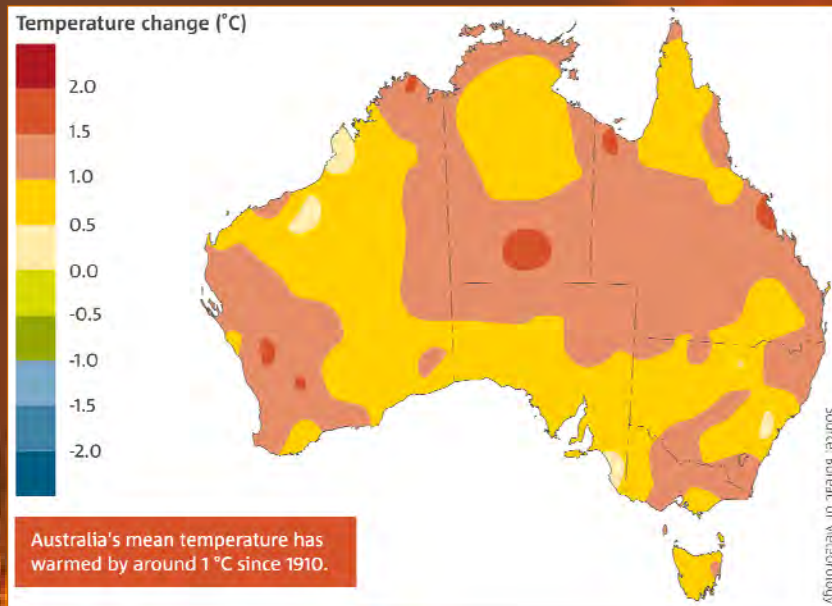


Source: CSIRO (2015) *Australian National Outlook 2015 – Chart Overview: Economic activity Living standards, resource use, environmental performance and living standards, 1970–2050*. CSIRO, Canberra.

FIGURE 13 ELECTRIC VEHICLES AND BIOFUELS COULD REVERSE DECLINE IN TRANSPORT ENERGY SELF-SUFFICIENCY



Source: Hatfield-Dodds et al (2015) *Australian National Outlook 2015: Economic activity Living standards, resource use, environmental performance and living standards, 1970–2050*. CSIRO, Canberra.



<http://www.bom.gov.au/state-of-the-climate/>
http://ar5-syr.ipcc.ch/ipcc/sites/default/files/AR5_SYR_Figure_SPM.11.png

<http://framework.latimes.com/2012/10/29/hurricane-sandy/#/18>
<http://www.washingtontimes.com/news/2014/nov/12/obama-climate-change-deal-with-china-a-stretch>
<http://www.rjmedia.com.au/upload/projects/24/Firestorm%20-%20burning%20tree.jpg>

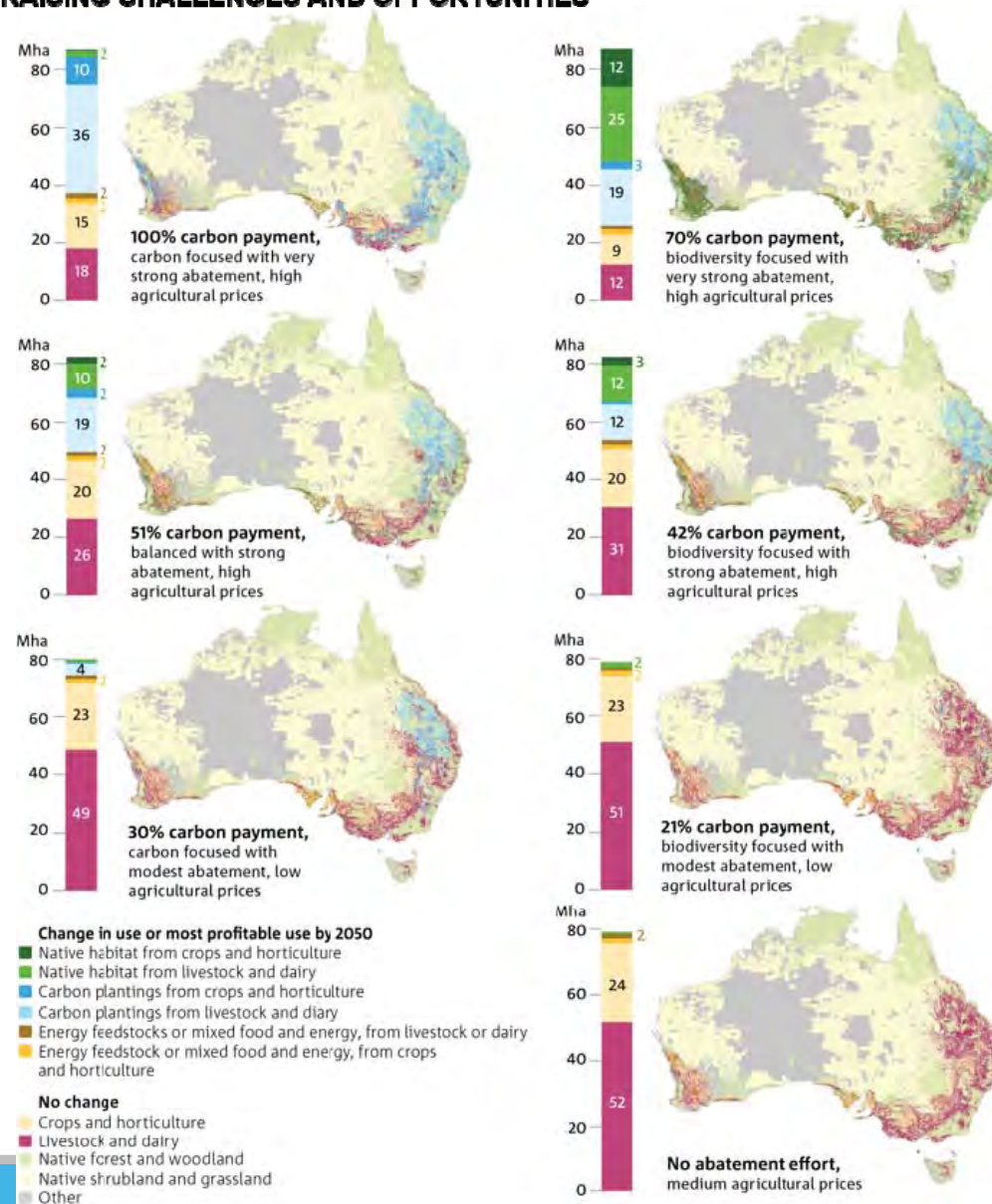


Carbon could outcompete food production across two thirds of agricultural land

Rural communities face challenges and opportunities.
We can transform and enrich our economy and regional communities if we manage these transitions well.

We find substantial land use change occurs once carbon payments reach \$40-60 per tonne.

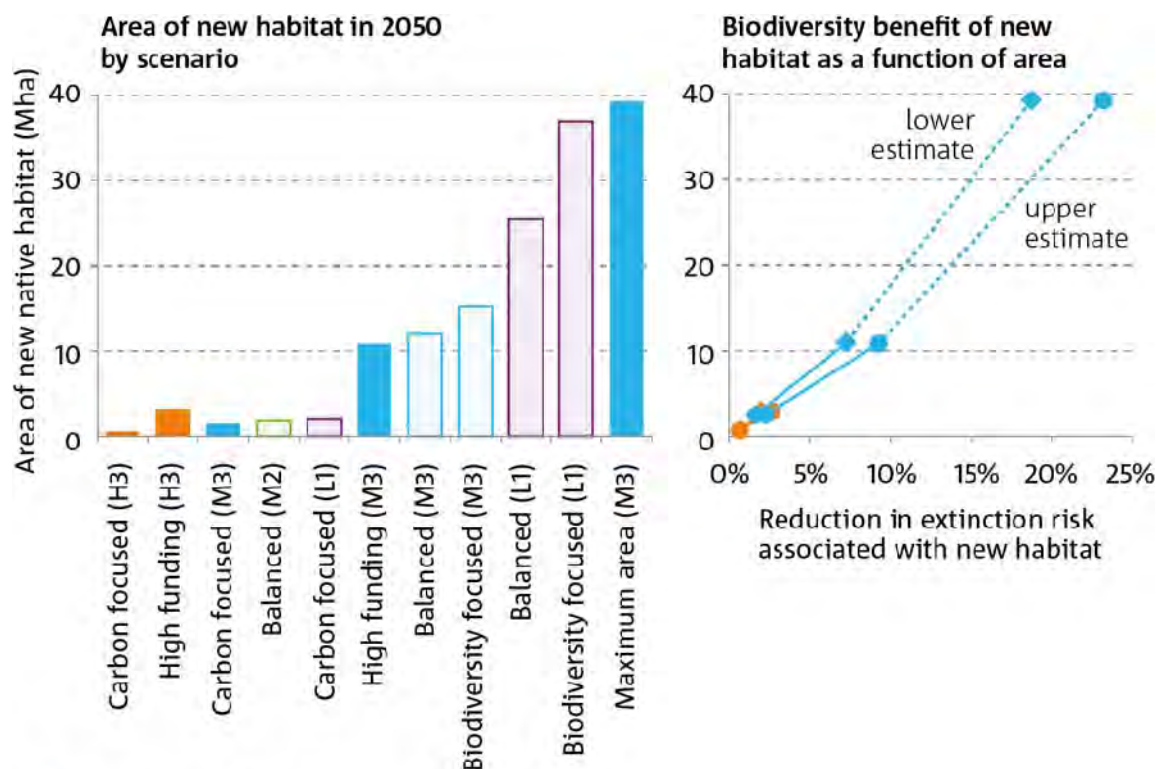
FIGURE 14 PROFITABLE RURAL LAND USE COULD SHIFT DRAMATICALLY, RAISING CHALLENGES AND OPPORTUNITIES





Carbon payments can be harnessed to restore habitat and biodiversity without large government outlays

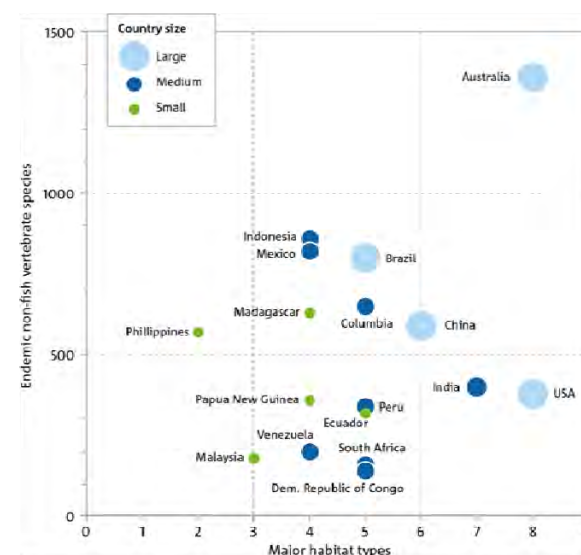
FIGURE 22 RESTORING NATIVE HABITAT COULD SIGNIFICANTLY REDUCE THE IMPACTS OF CLIMATE CHANGE



Abatement effort and temperature in 2100

- No abatement action (H3) (6°C)
 - Strong abatement (M3) (3°C)
 - Moderate abatement (M2) (3°C)
 - Strong abatement (M3) (3°C)
 - Very strong abatement (L1) (2°C)
- Solid colour scenarios assessed for biodiversity benefit

FIGURE 21 AUSTRALIA HAS GLOBALLY DISTINCTIVE BIODIVERSITY

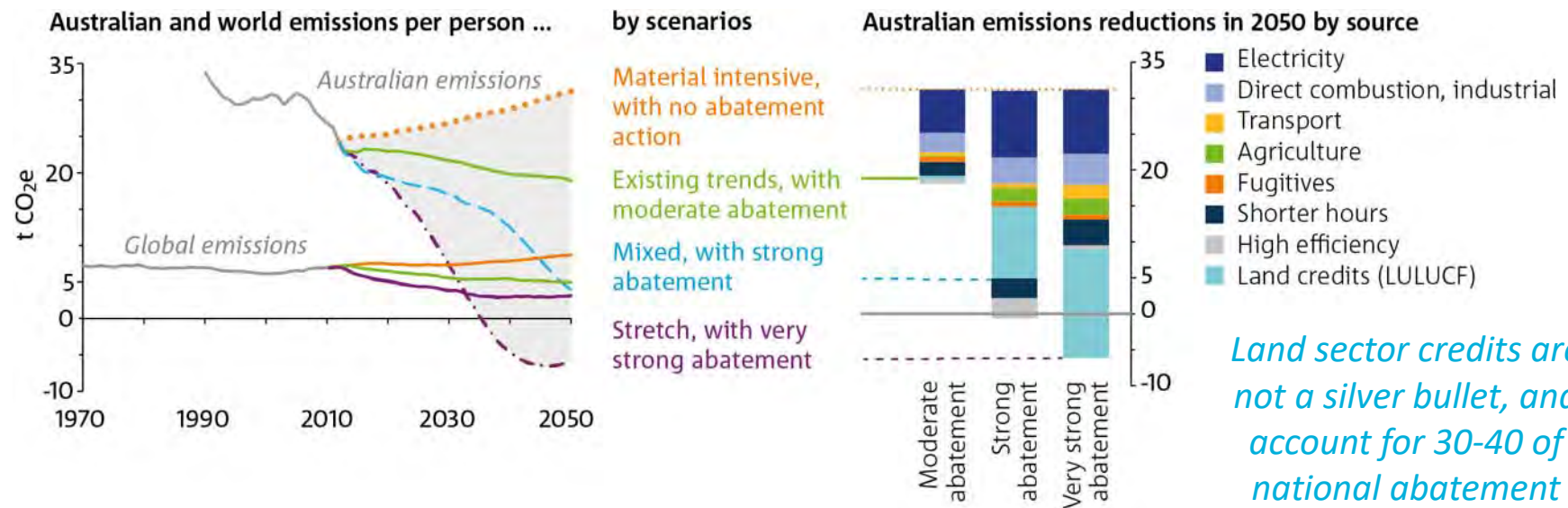


Source: Hatfield-Dodds et al. (2015) *Australian National Outlook 2015: Economic activity, resource use, environmental performance and living standards, 1970-2080*.



Surprising reductions in greenhouse emissions can be achieved, with effort across all sources

FIGURE 19 AUSTRALIAN PER CAPITA EMISSIONS CAN FALL BELOW THE GLOBAL AVERAGE, WITH CONTRIBUTIONS FROM ALL SECTORS



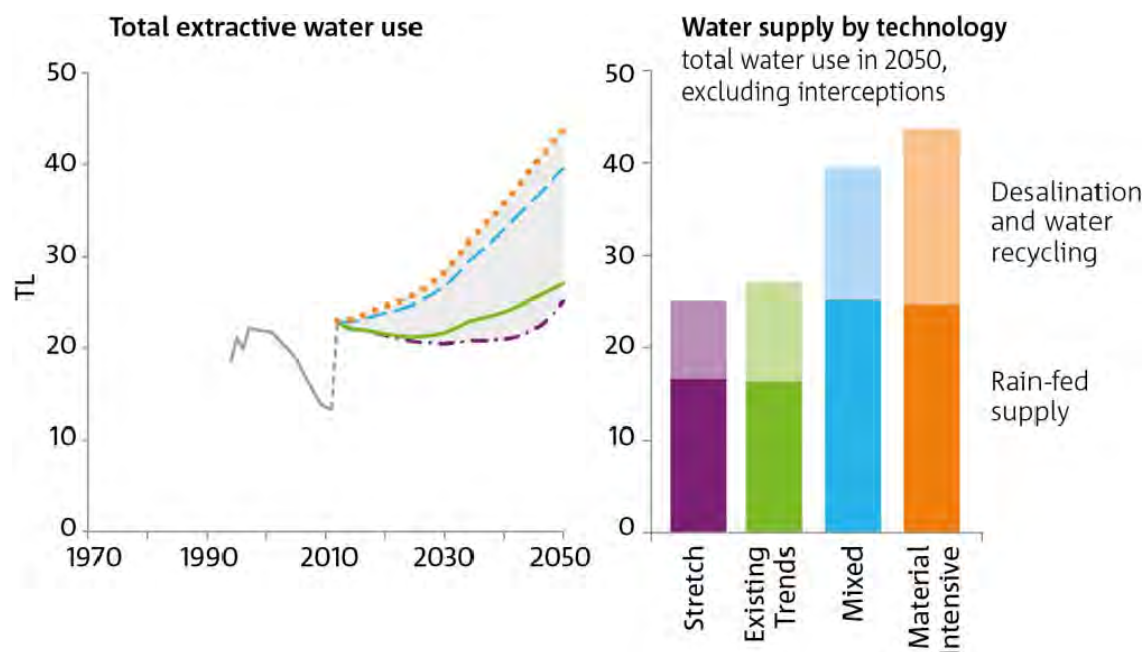


https://www.tes.com/lessons/P9i0jF_Y3_EnFA/overgrazing



Rising water demand can be met, while enhancing water security

FIGURE 17 NON-TRADITIONAL SUPPLY OPTIONS PLAY A SIGNIFICANT ROLE IN MEETING FUTURE WATER DEMAND



Source: Hatfield-Dodds et al. (2015) *Australian National Outlook 2016: Economic activity, resource use, environmental performance and living standards, 1970-2050*.

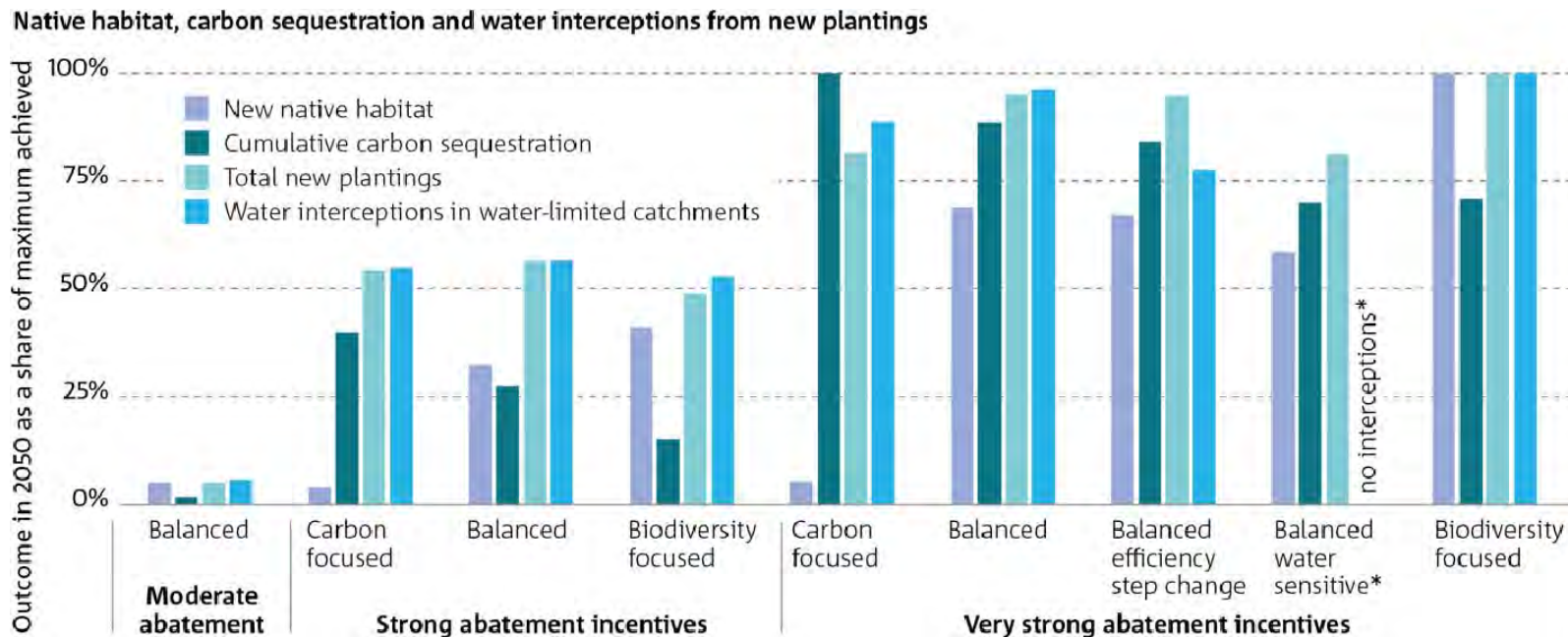
Projected increases in water demand of 65-150% by 2050 need not lead to increased pressure on water-limited catchments.

Desalination and water recycling account for 5-7% of national electricity use in 2050.

Impacts of land use change on surface flows require careful and integrated governance.

Policies and institutions are central to unlocking benefits, and managing trade-offs and risks

FIGURE 15 POLICY SETTINGS AND CHOICES DRIVE DIFFERENT OUTCOMES FOR CARBON, NATIVE HABITAT, AND WATER – EVEN WITH THE SAME LEVEL OF ABATEMENT INCENTIVE



Source: Hatfield-Dodds et al. (2015) *Australian National Outlook 2015: Economic activity, resource use, environmental performance and living standards, 1970-2050*.



Agricultural output increases by 50% or more, even with land use shifting to other uses

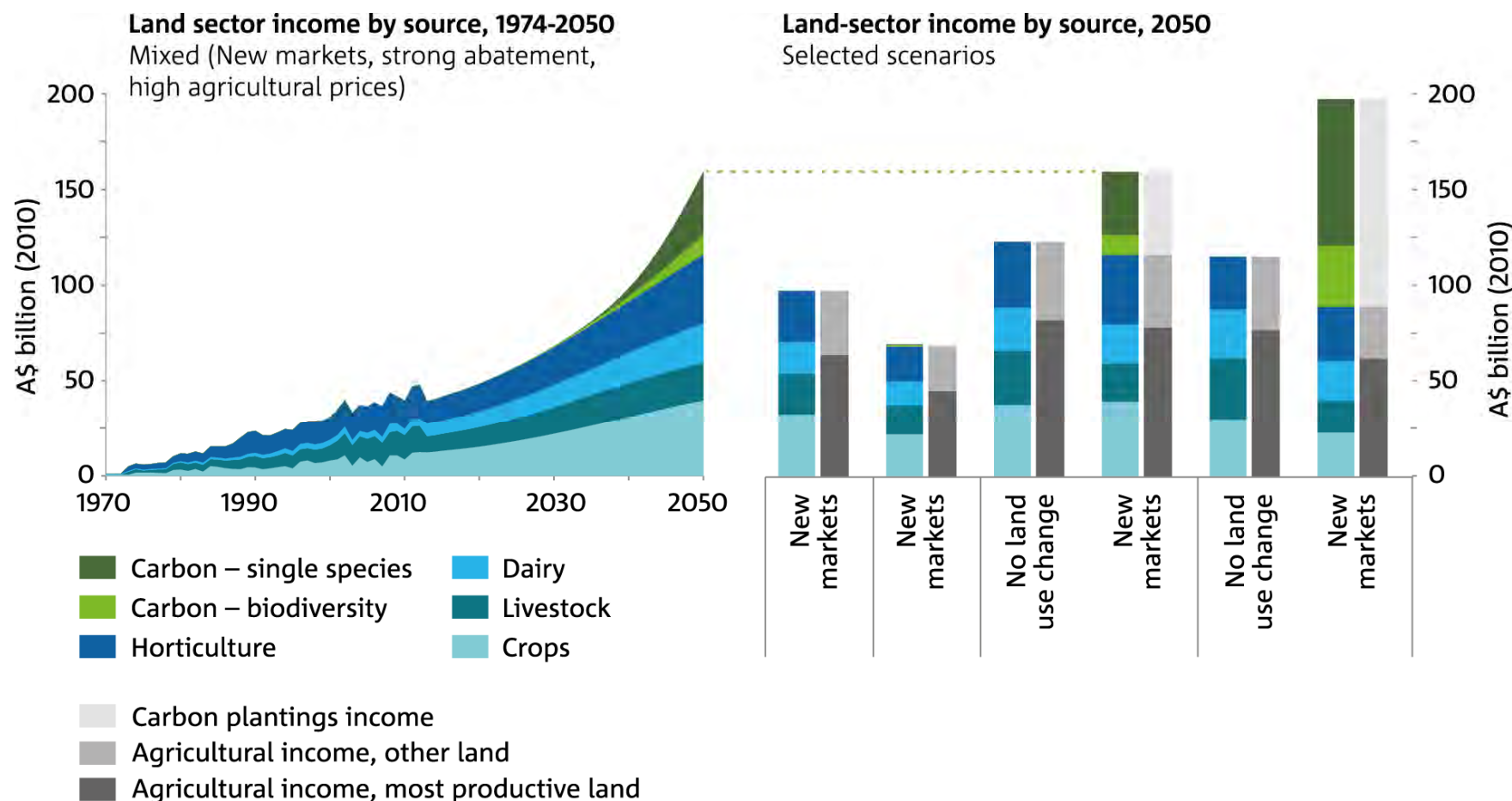


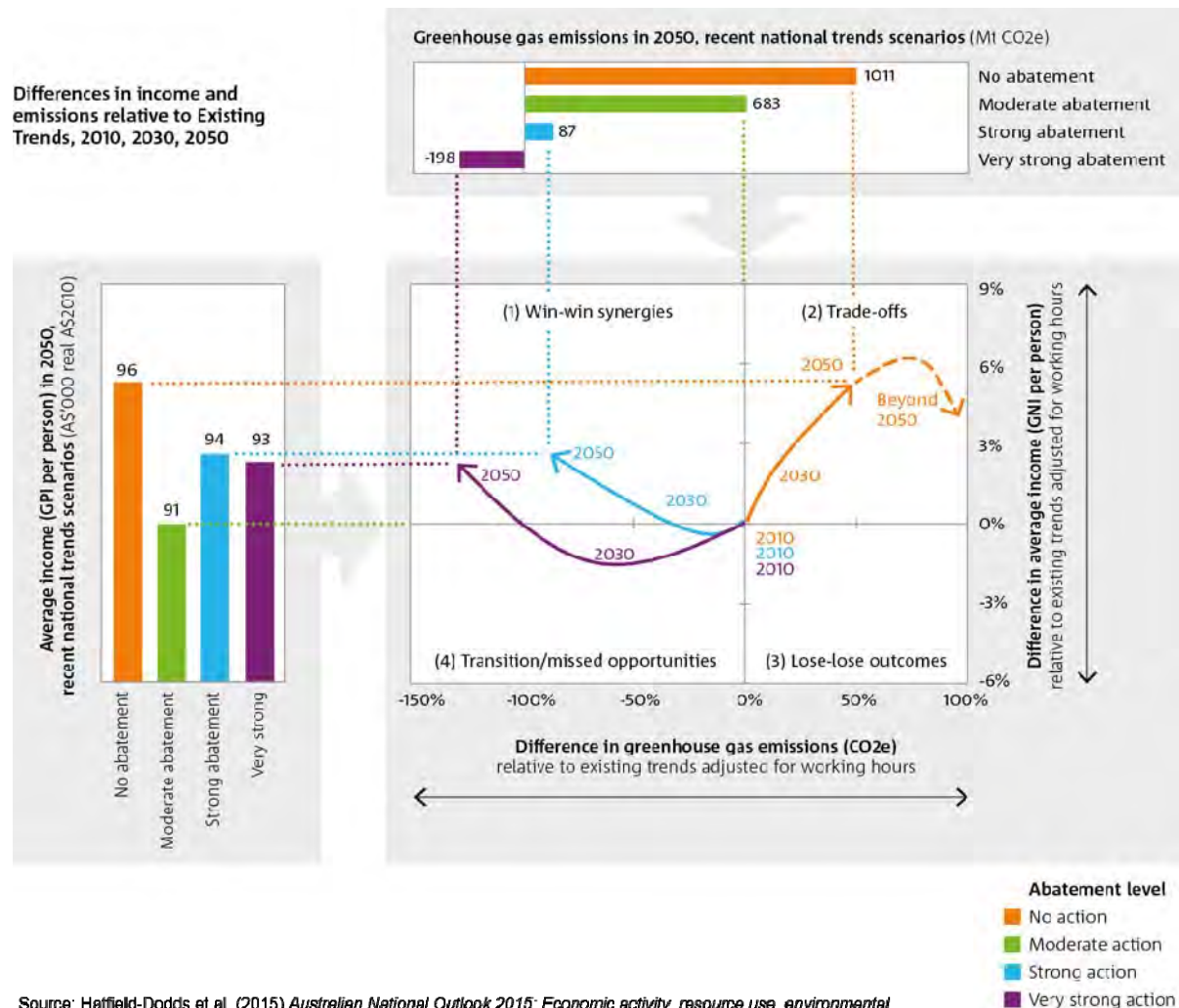
Figure 25 from Hatfield-Dodds et al (2015) *Australian National Outlook 2015 – Technical Report: Economic activity Living standards, resource use, environmental performance and living standards, 1970–2050*. CSIRO, Canberra.

Australia could harness global shifts to create new areas of advantage:

Living resources and renewables could outperform non-renewable resources

... with smart and integrated policies

FIGURE 20 STRONGER GLOBAL ACTION TO REDUCE GREENHOUSE GAS EMISSIONS PROVIDES WIN-WIN ECONOMIC AND ENVIRONMENTAL OUTCOMES BEFORE 2050



Source: Hatfield-Dodds et al. (2015) *Australian National Outlook 2015: Economic activity, resource use, environmental performance and living standards, 1970-2050*.

There is no wealth but life ...

John Ruskin (1862)



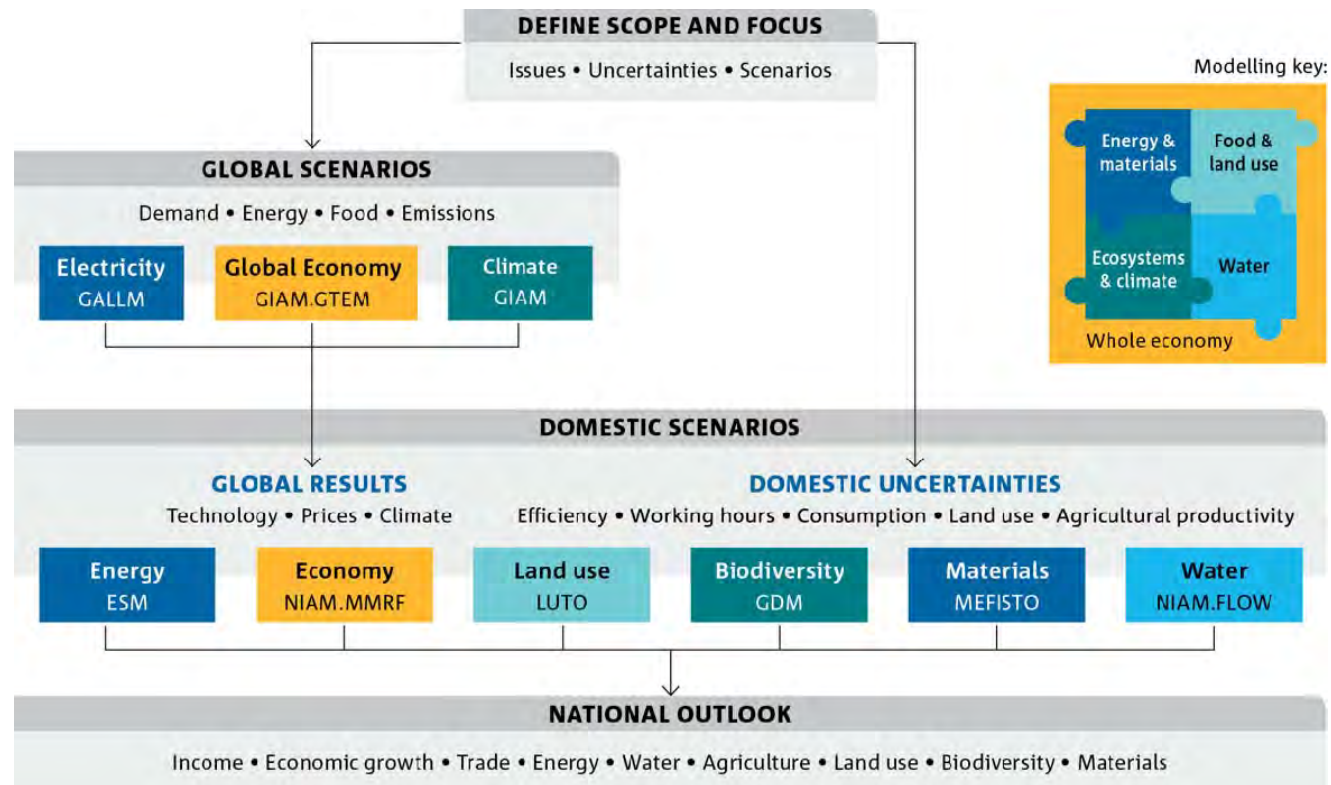
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Our analytical framework

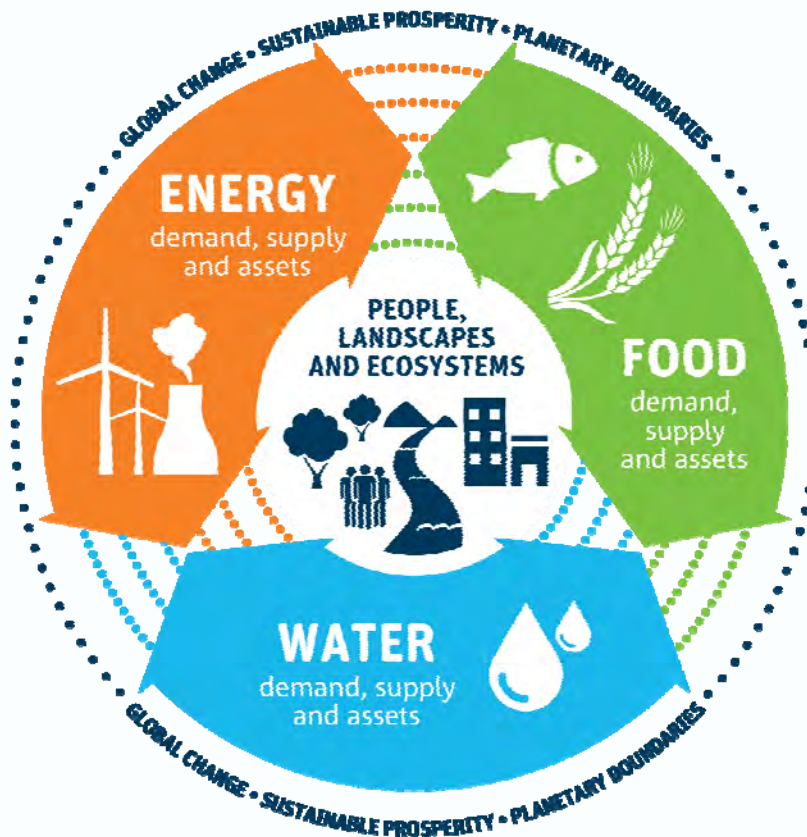
FIGURE 3 OVERVIEW OF THE NATIONAL OUTLOOK ANALYTICAL FRAMEWORK, AND PROJECT FLOW



The *National Outlook* is the most integrated and evidence-based national scenario assessment of these issues yet attempted. The analysis uses nine linked models to explore global and national trends and uncertainties.

Source: Hatfield-Dodds et al. (2015) *Australian National Outlook 2015: Economic activity, resource use, environmental performance and living standards, 1970-2050*.

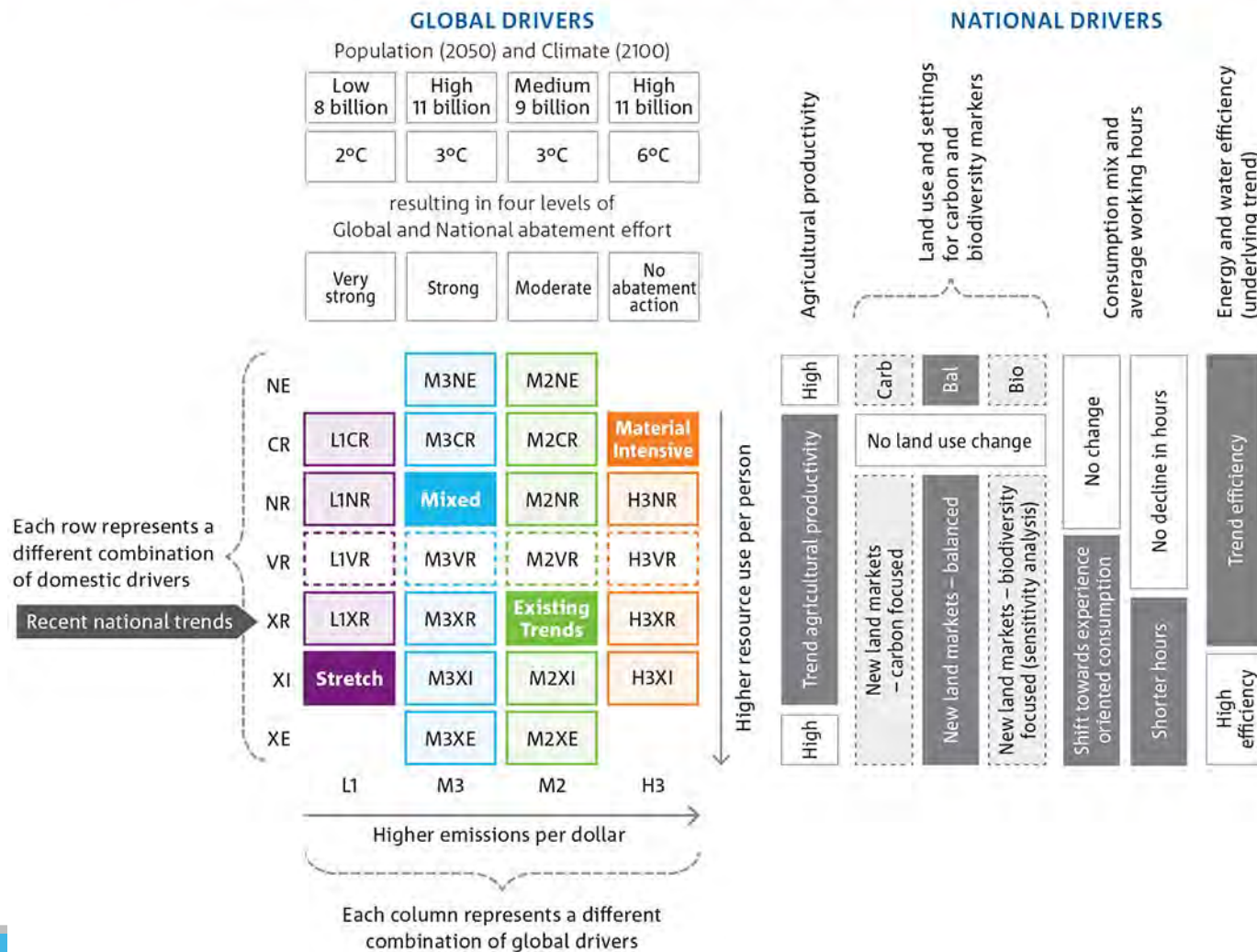
Integrated modelling explores possible futures



The Australian National Outlook links nine national and global models to explore the food-energy-water nexus in the context of global change and economic growth

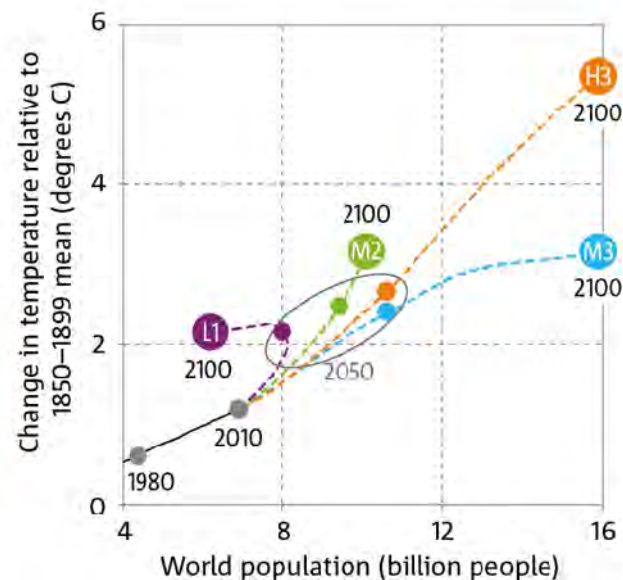
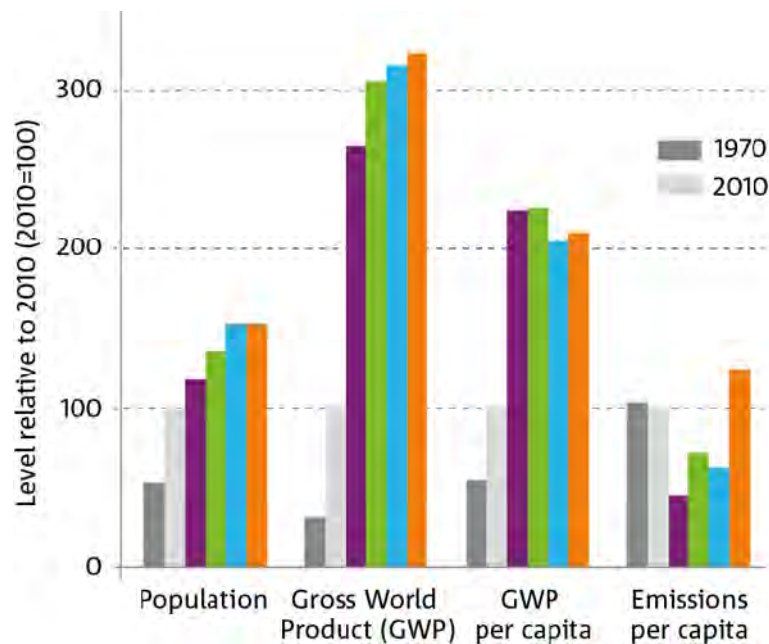
National Outlook scenarios and drivers

FIGURE 22 THE SET OF NATIONAL OUTLOOK SCENARIOS, IN RELATION TO GLOBAL AND NATIONAL DRIVERS



Key results for the global context scenarios

FIGURE 26 KEY INDICATORS FOR THE FOUR GLOBAL CONTEXT SCENARIOS, 1970, 2010, 2050, OR 1980-2100

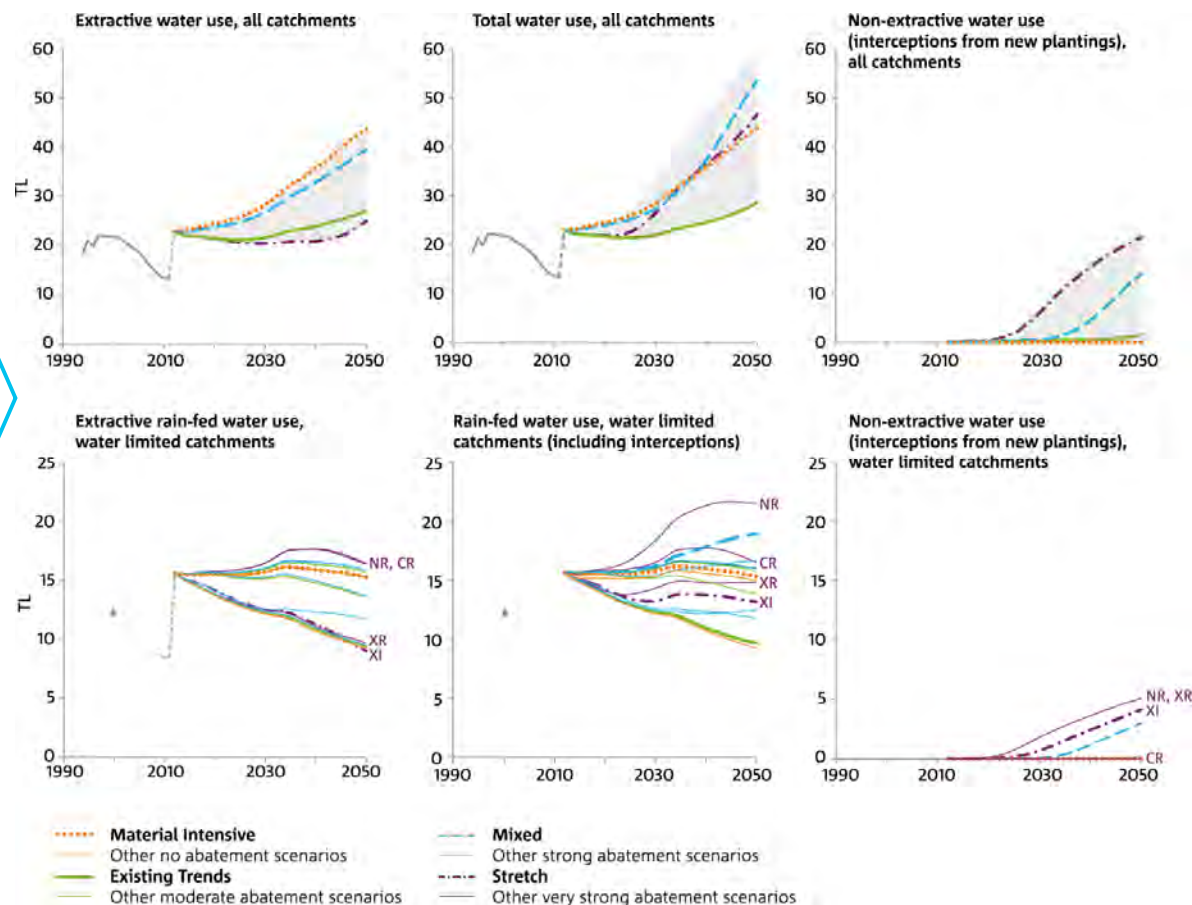
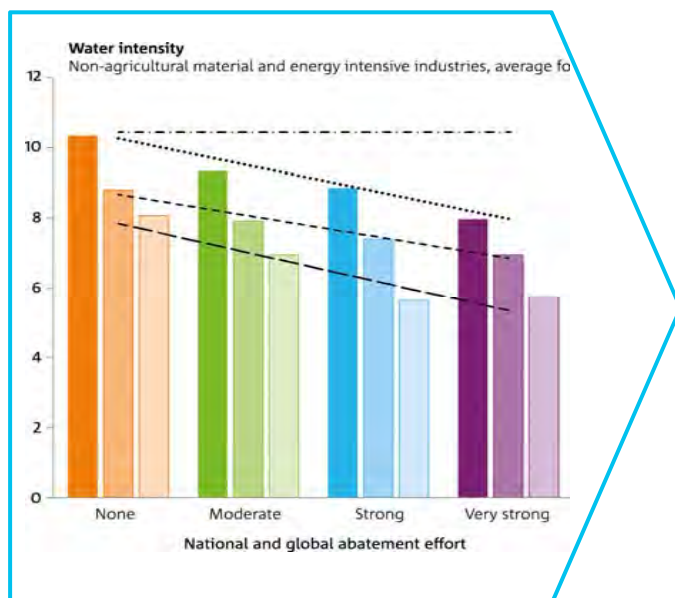


The different levels of global abatement effort have a significant impact on per capita emissions in 2050, but the full climate implications – and impacts – of the different emissions trajectories do not occur until later in the century.

Source: Hatfield-Dodds et al. (2015) *Australian National Outlook 2015: Economic activity, resource use, environmental performance and living standards, 1970-2050*

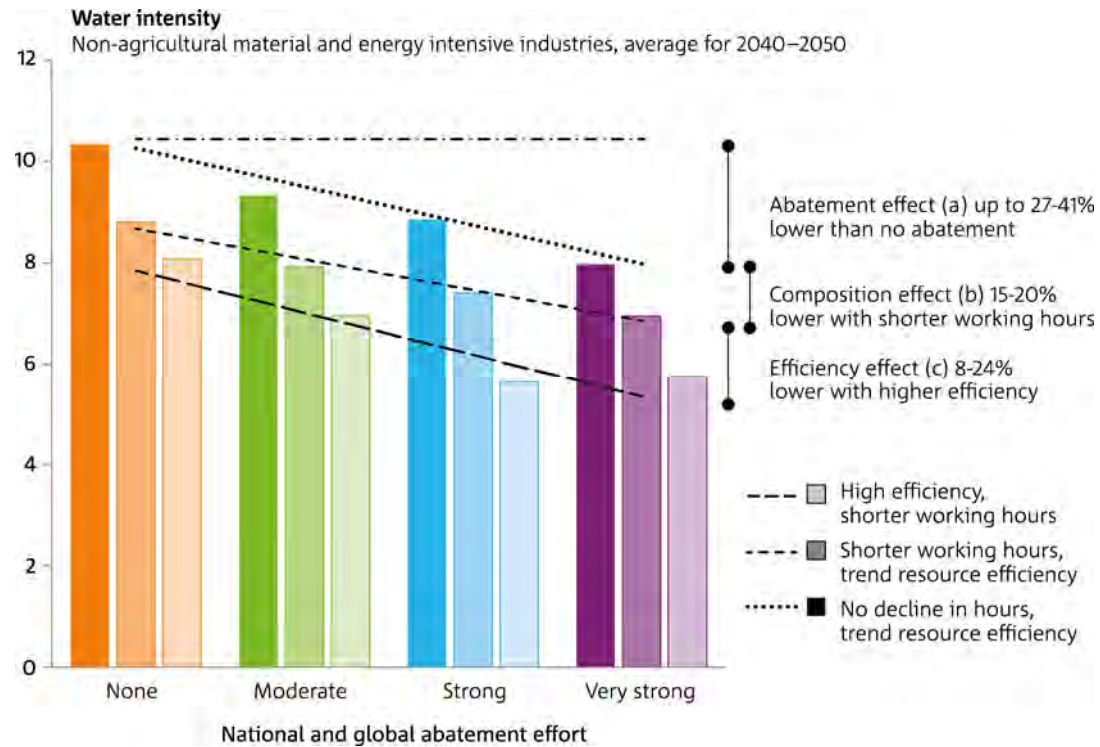


Water is central, and possibly the most complex issue we model



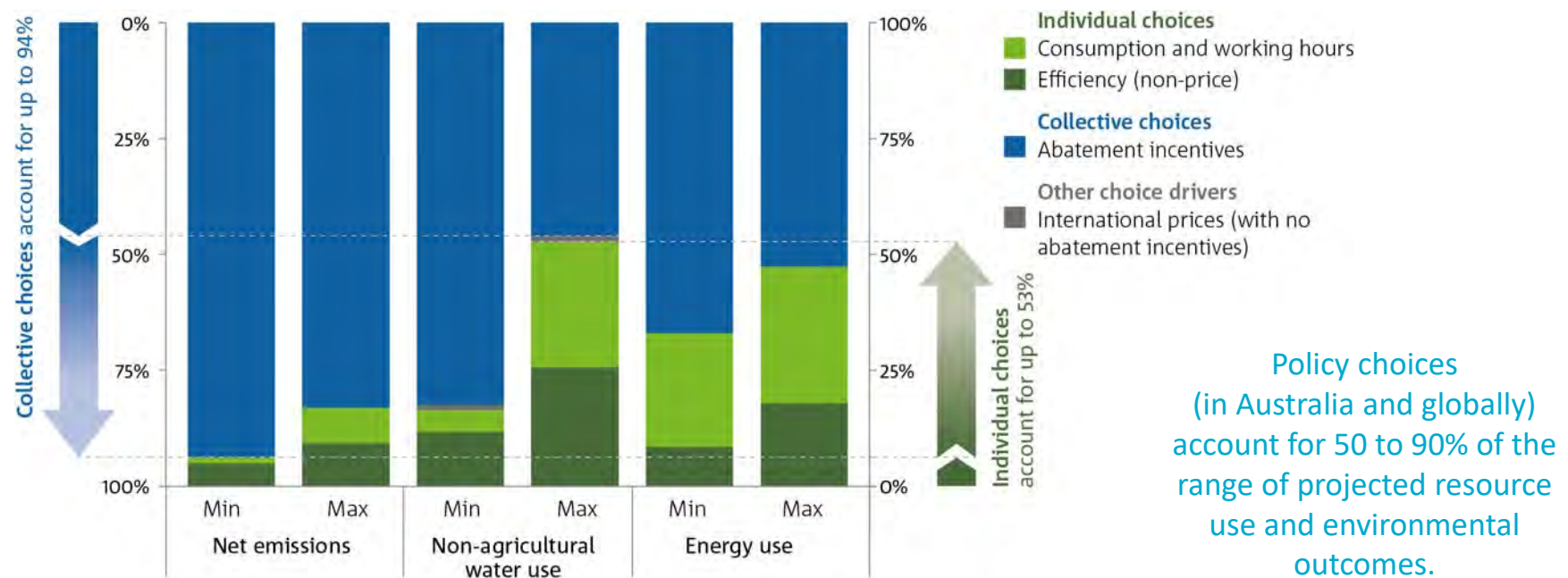
Future extractive water demand

is strongly influenced by demand from energy intensive industries



Calculating the contribution of different choices

FIGURE 18 COLLECTIVE CHOICES ACCOUNT FOR THE MAJORITY OF PROJECTED DIFFERENCES IN RESOURCE USE AND ENVIRONMENTAL PRESSURES IN 2050



Source: Hatfield-Dodds et al. (2015) *Australian National Outlook 2015: Economic activity, resource use, environmental performance and living standards, 1970-2050*.