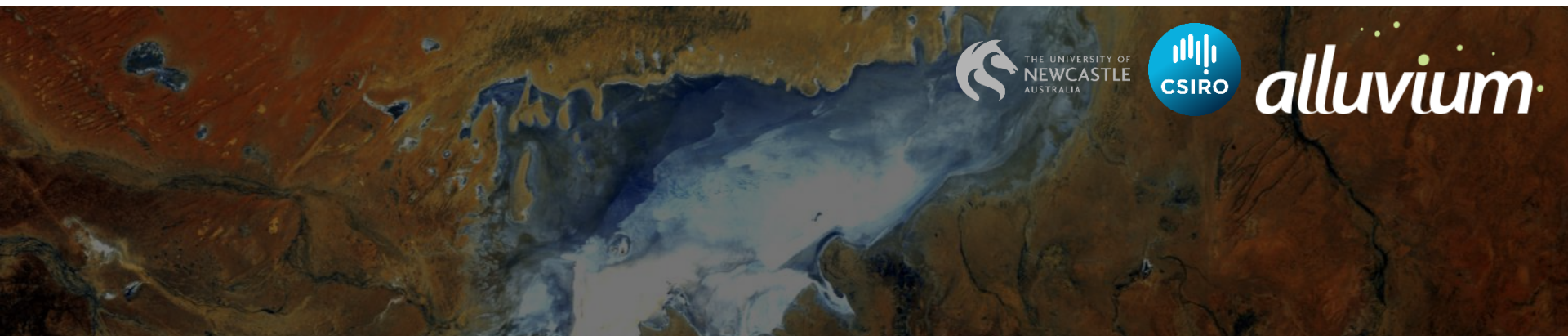
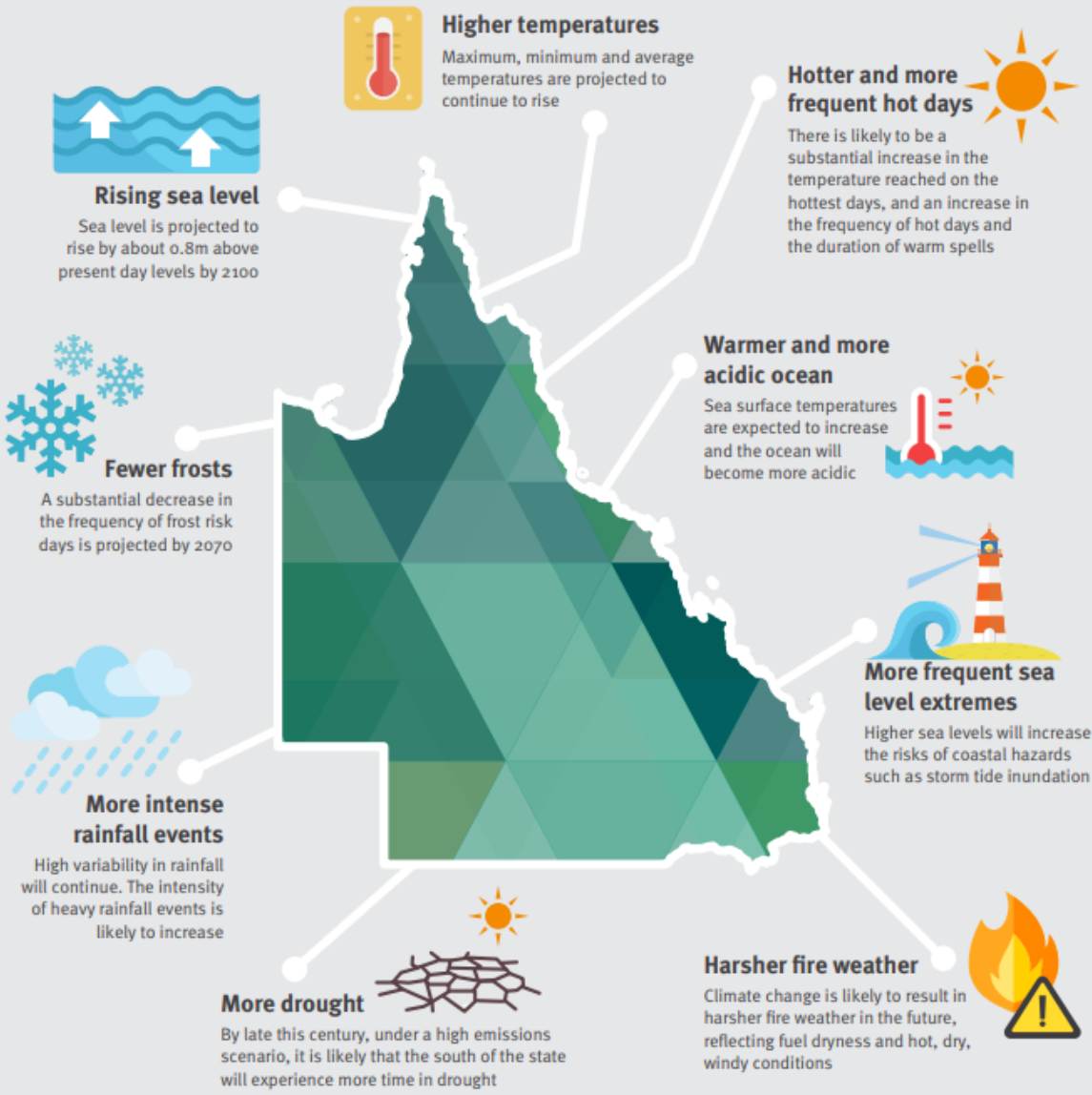


Critical Review of Climate Change and Water Modelling in Queensland

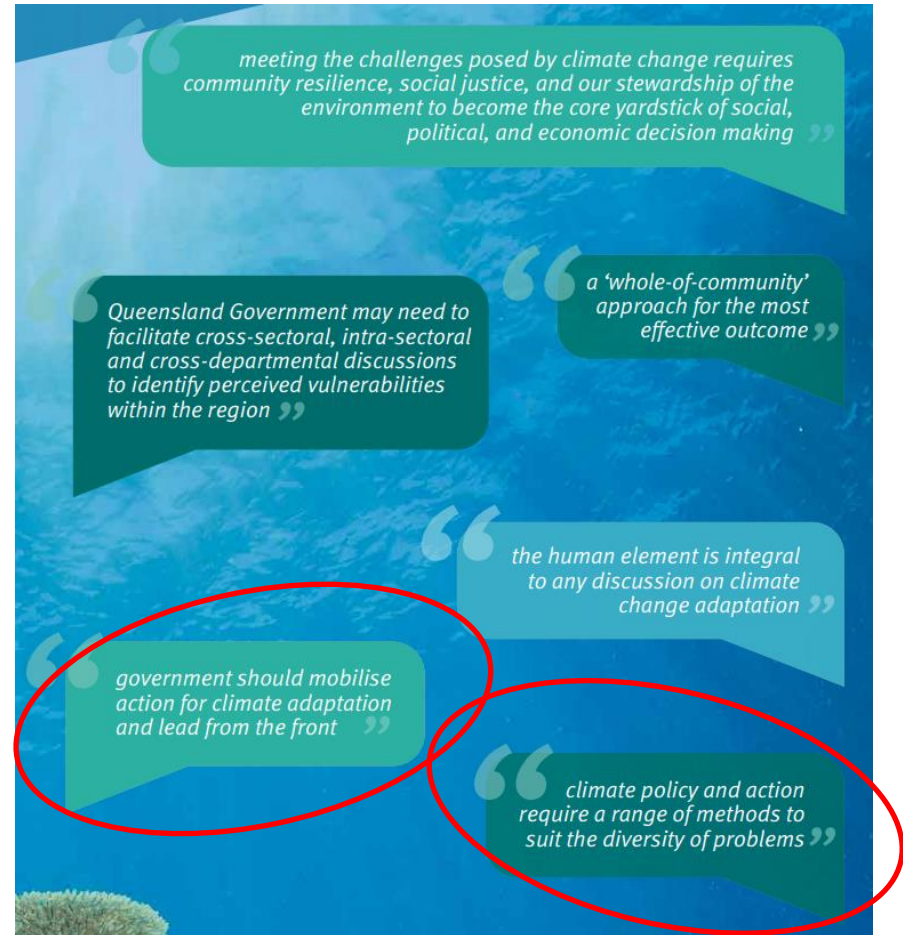
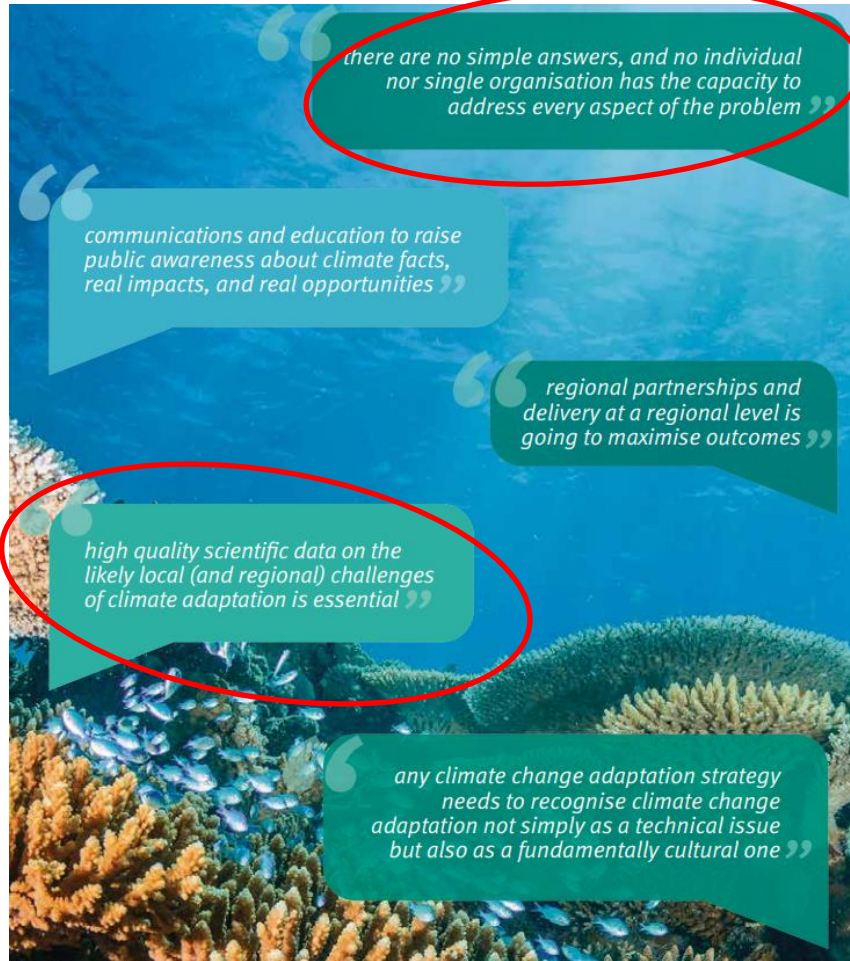
TONY WEBER, LISA WALPOLE AND ANTHONY KIEM
JUNE 26 2019



AS QUEENSLAND'S CLIMATE CHANGES, WE CAN EXPECT:



Project drivers



Pathways to a climate resilient Queensland

Queensland Climate Adaptation Strategy
2017–2030



Queensland Water Modelling Network

QWMN activities are based around five key themes:

- Model integration
- Model improvement
- Model management
- Building capacity and uptake
- Communications and engagement

**Research, Development and Innovation Strategy
(2018-2020) priorities:**

- *Climate change and variability*
- Landscape restoration and redesign
- Water planning, integration and management
- Model management

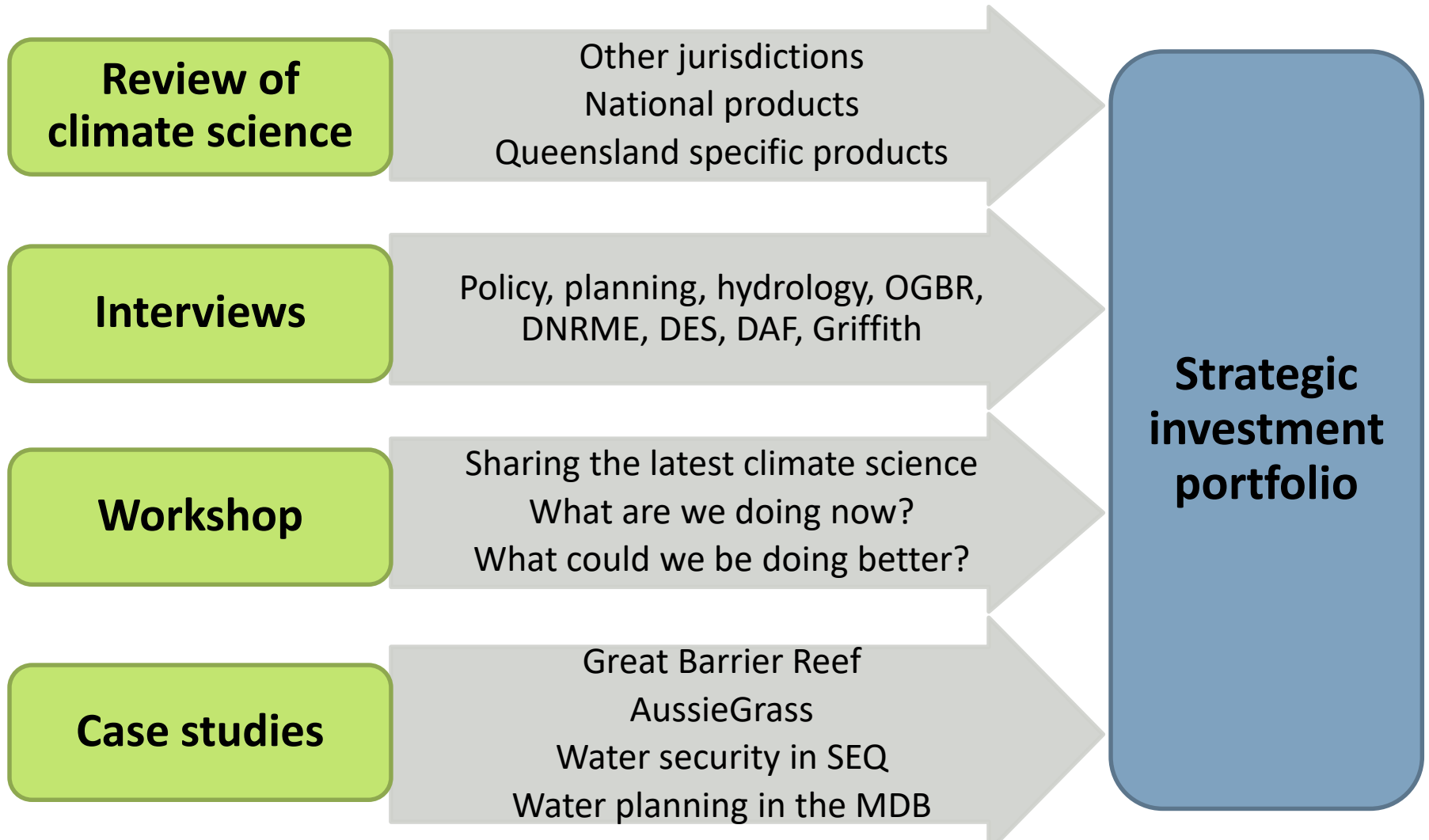
Outline



1. Project overview
2. Overview of climate science – Anthony Kiem
3. Strengths, gaps and opportunities
4. Recommendations and strategic investment portfolio

Project overview

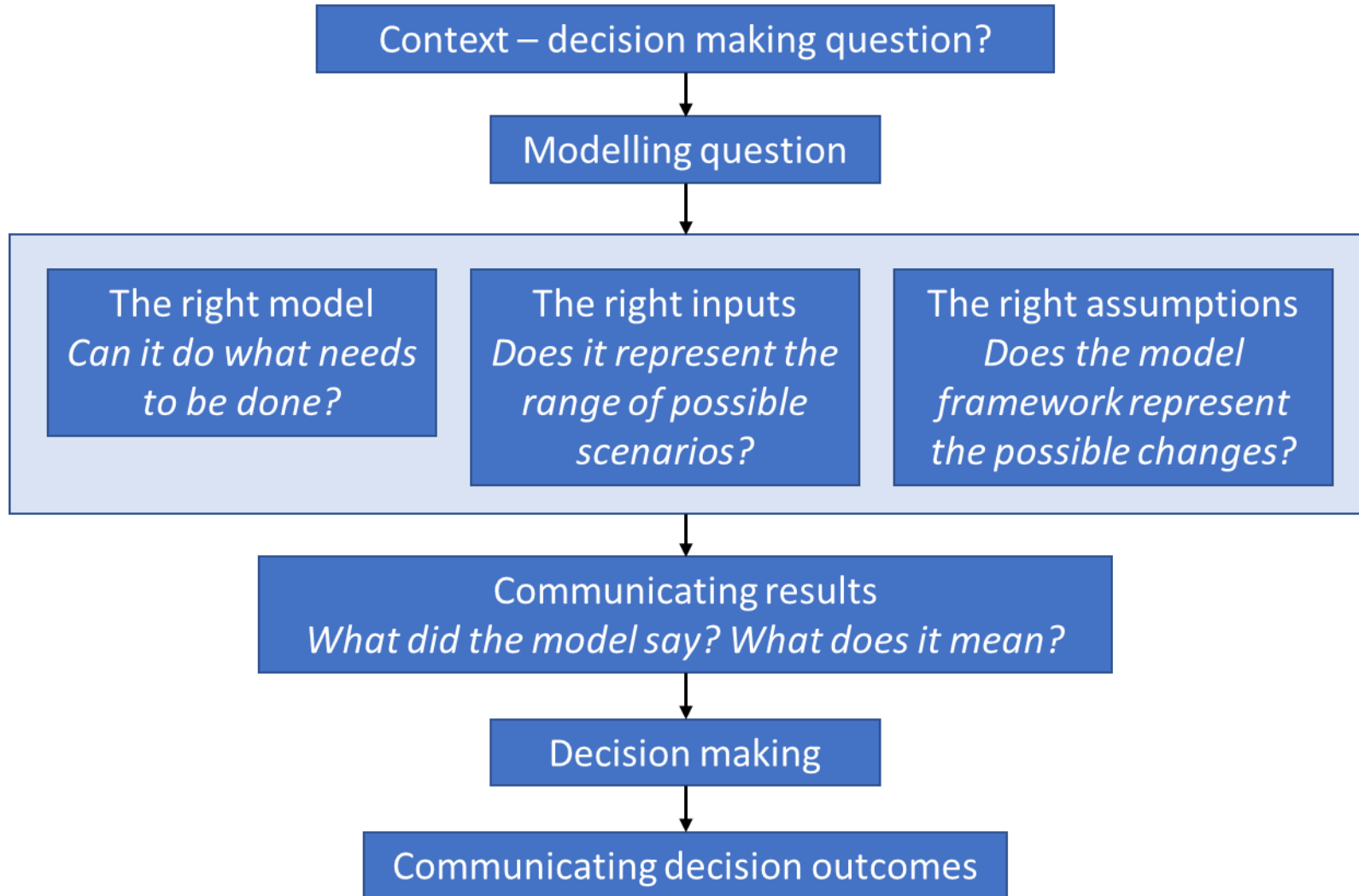
Multiple lines of evidence gathered to understand needs, strengths and opportunities



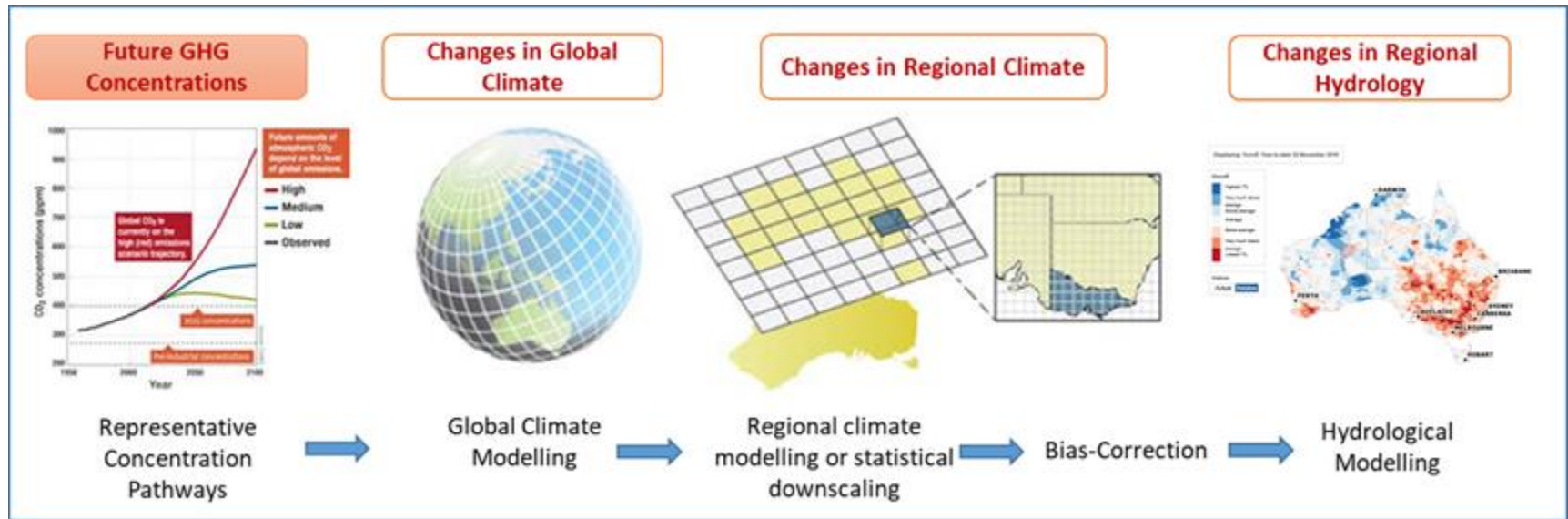
Who?

Sector roles	Key organisations	Other interested players
Modellers	Queensland Government: DES,	Insurance
Planners	DNRME, DAF, Emergency services	Developers
Operators	Local government	Landholders
Policy-makers	Consultants	Primary producers
Media and communication	Federal government: CEWH, BoM,	Tourism
Scientists	GBRMPA, DEE, MDBA	Industrial use
Politicians	Research: CSIRO, AIMS,	Mining and resources
Data providers	Universities	Other jurisdictional bodies
Software developers	NGOs: NRM groups, GBRF, HLW	Community groups
Investors	Utilities: Seqwater, Sunwater	The community
Students	Unitywater, QUU	
Regulators	Regulator: QCC	

Modelling philosophy



Projections to outcomes 'pipeline'



Global Climate Modelling

Regional downscaling

Hydrological/ biophysical Modelling

Communication

Decision Making

Communication

Review of Climate Science



Review led by:

Anthony Kiem – University of Newcastle

Francis Chiew and Jai Vaze – CSIRO

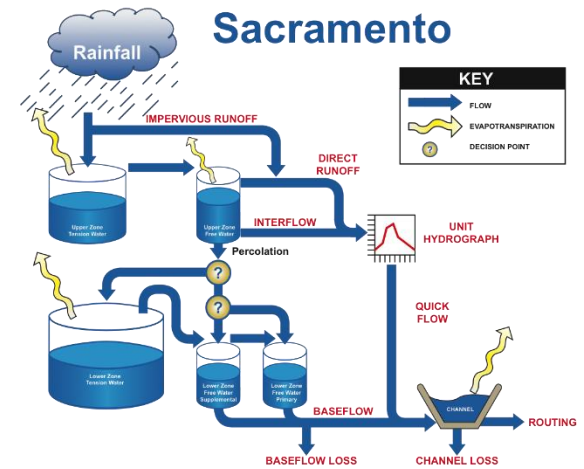
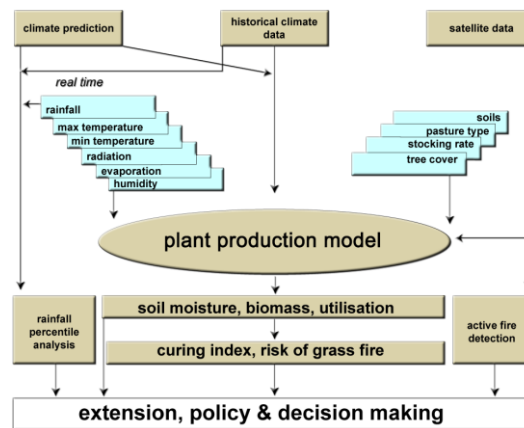
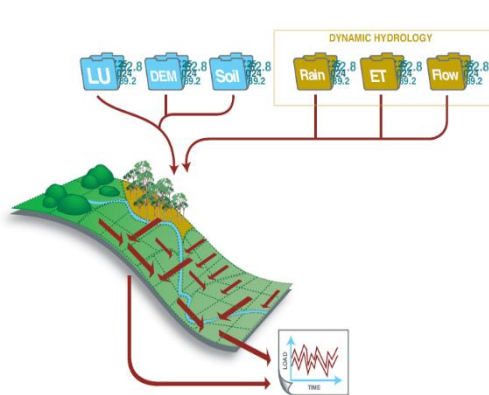
Key input from:

Jozef Syktus – Department of Environment and Science

Chantal Donnelly – Bureau of Meteorology

Case Studies

- 4 Case studies developed:
 - Paddock to Reef catchment modelling
 - AussieGRASS pasture model
 - Queensland MDB Water Resource modelling
 - SEQ water supply yield



Case Studies



- Key outcomes
 - Understanding hydrologic non-stationarity
 - Evaluating ecosystem responses under altered climate
 - Land cover/pasture
 - Soil ecosystems
 - Water quality responses within receiving waters
 - Ecological responses within waterways
 - Extreme event changes
 - Frequency, intensity
 - Accounting for altered water use patterns
 - Storage demands
 - Irrigation usage
 - Cropping patterns

Strengths, gaps and opportunities



1. Data, science and modelling platforms
2. Capability and capacity
3. Drivers for approaches
4. Communication and decision making

1. Data, science and modelling platforms

- Need for the availability and accessibility of appropriate, substantiated and relevant data, software, hardware, resourcing and capability
- The DES Climate Change and Sustainable Futures group is leading the development of high-resolution downscaled climate projection data and supporting information
- Bureau of Meteorology is releasing an ensemble of nationally downscaled and bias-adjusted climate data for use in water modelling

2. Capability and capacity

- Strong general awareness of the increasing need to consider climate change risk in planning and decision making
- Ability of individuals and groups to obtain and apply existing climate science effectively, and understand and communicate results, uncertainty and trends remains somewhat limited
- Targeted training, to more effectively use existing climate science, projections data products and modelling solutions
- Opportunity for alignment and sharing of course content across federal, state and local government training packages





3. Drivers for approaches

- Limited legislative imperative for climate change to be explicitly considered in water management, with the exception of the requirement for Water Resource Plans to 'consider climate change'
- The reality of changing frequency, duration and intensity of extreme climate events such as flood, drought, bushfire, cyclones and heat waves is perhaps the primary driver for improving the ability to understand water-related systems under future climate conditions

4. Communication and decision making

- Benefits of water modelling only become realised when the information produced is used effectively to support decision making
- This relies on the effective communication of results from those undertaking the modelling, the ability of decision makers to understand this information, and the communication skills and methods to share the outcomes, and related uncertainty, with broader stakeholders

Ski trail ratings overview

-  Easier ("beginner")
-  More difficult ("intermediate")
-  Most difficult ("expert")
-  Most difficult, use extra caution ("expert only")

Strengths, gaps and opportunities



1. Data, science and modelling platforms
2. Capability and capacity
3. Drivers for approaches
4. Communication and decision making

Back to Piet...

Draft recommendations and strategic priorities

OBJECTIVE

Enhance Queensland's ability to understand the impact of climate variability and change on water-related systems, to increase economic, social and ecological resilience

Outcome 1

Increase consistency and defensibility of approaches

Outcome 2

Interpret and summarise the applicability of existing climate science for Queensland

Outcome 3

Address climate science gaps through targeted research initiatives

Outcome 4

Empower individuals and collectives, and facilitate collaboration

Draft recommendations and strategic priorities

Timeline Actions

- Short-term**
- ▶ Develop an online climate risk assessment framework with corresponding approaches and guidance for quantifying response to climate variability and change
 - ▶ Undertake an independent review of downscaled climate projection data sources for Queensland
 - ▶ Review existing modelling systems used to confirm that they are suitable for use with future climate projections
 - ▶ Conduct training (in collaboration with Climate Change and Sustainable Futures group)
 - ▶ Establish a water and climate risk Centre of Excellence (experts) and Community of Practice (practitioners)
-

- Medium-term**
- ▶ Establish a centralised data access and sharing portal
 - ▶ Provide input to the LGAQ Cert IV-level course on climate risk management for local government
 - ▶ Create guidelines for effectively communicating climate, water, and ecological modelling results for decision makers and broader community engagement
 - ▶ Improve understanding of changing soil and vegetation impacts on hydrology and water quality
 - ▶ Improve understanding of how extreme event frequency, duration and intensity may change in a future climate
 - ▶ Evaluate impacts of climate variability and change on water storages in terms of yield, water quality and water demand
 - ▶ Review existing hydrological models to confirm that they are suitable for extrapolation to predict the future under climate change, and adapt the models if required
-

- Long-term**
- ▶ Collaborate with proposed climate science working group to influence future investment in climate science, climate risk assessment and training packages
 - ▶ Understand the biophysical processes in landscapes, rivers and receiving waters under changing climate conditions

An aerial photograph of a river delta system, showing a main river channel branching into numerous smaller channels and distributaries. The water is a deep blue-grey, and the surrounding land is a mix of green vegetation and light-colored sediment or sand. A dark semi-transparent rectangular box is overlaid on the lower-left portion of the image, containing the company logo and a mission statement.

alluvium

We are passionate about the protection and restoration of waterways, catchments and water resources. We strive to make a positive difference to the world we live in.