Australian Government

BIOREGIONAL ASSESSMENTS

PROVIDING SCIENTIFIC WATER RESOURCE INFORMATION ASSOCIATED WITH COAL SEAM GAS AND LARGE COAL MINES

Editors as integrators in interdisciplinary environmental assessments

Becky Schmidt
CSIRO Land and Water Flagship, Canberra, Australia

7 May 2015

Write | Edit | Index

A scientific collaboration between the Department of the Environment, Bureau of Meteorology, CSIRO and Geoscience Australia

Outline

- What is a bioregional assessment?
- Three techniques to integrate
  - Information model
  - Consensus on content
  - ‘Community agreement’ for words and pictures
- Automate for efficiency to offset the cost of integration

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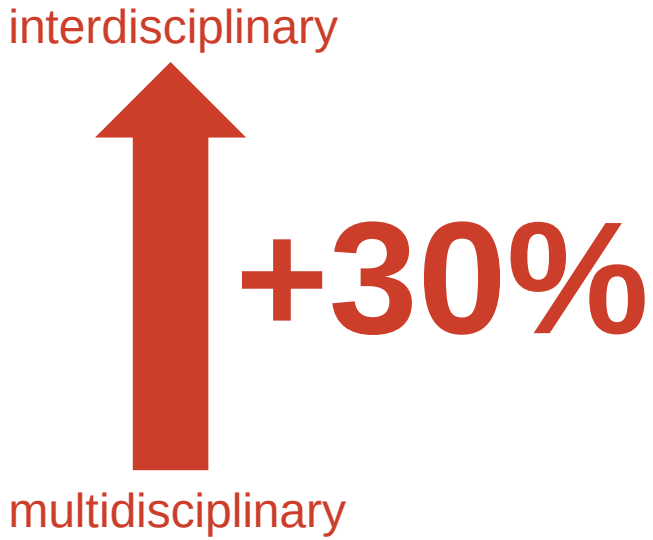

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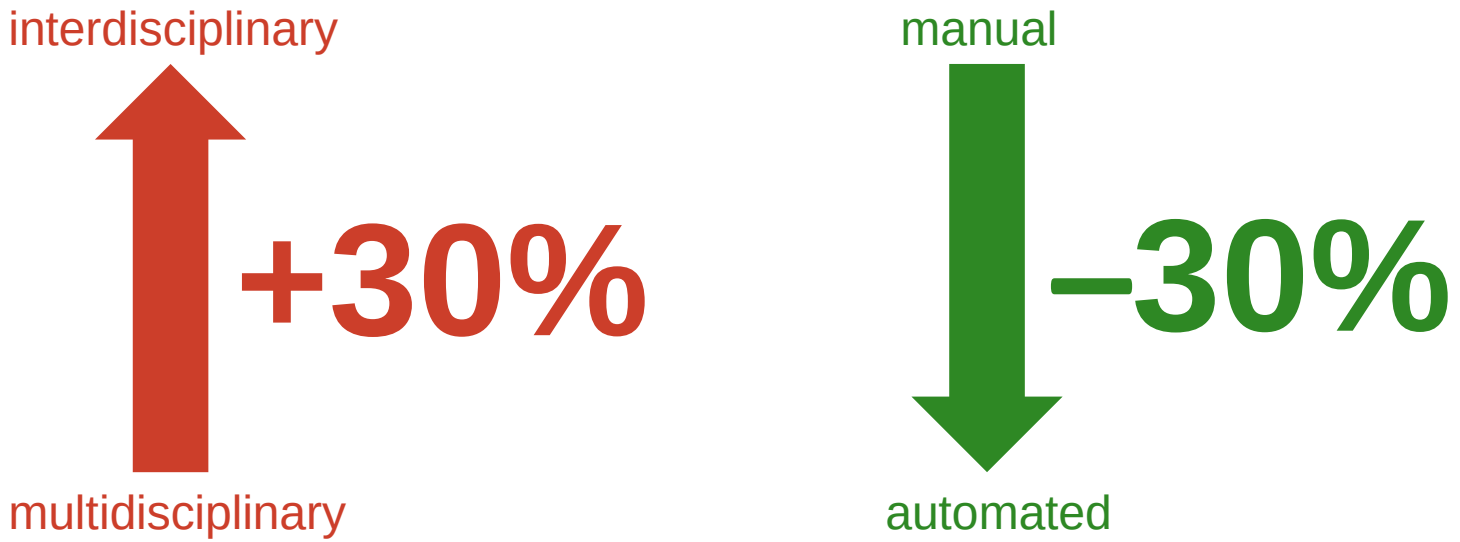
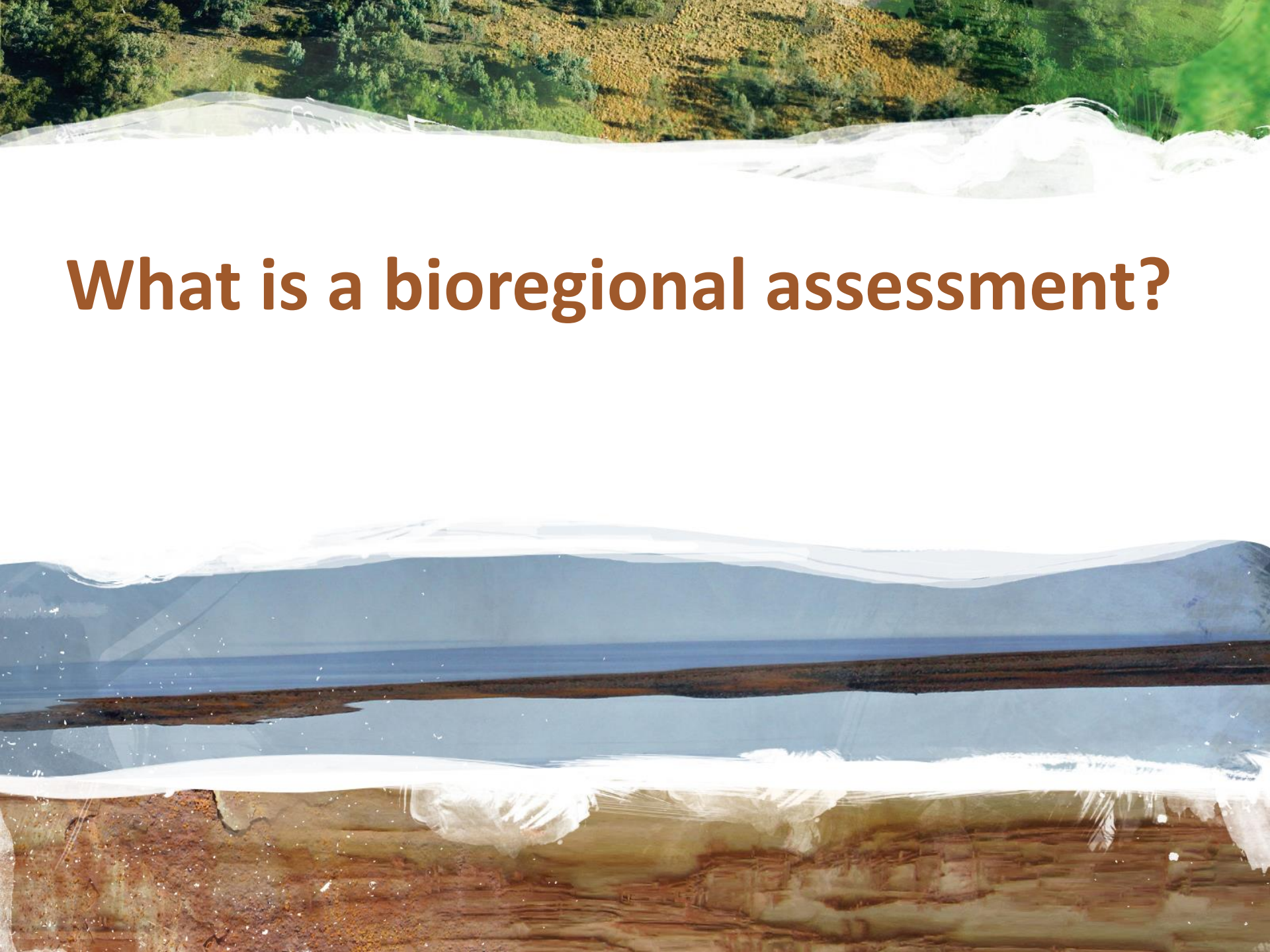


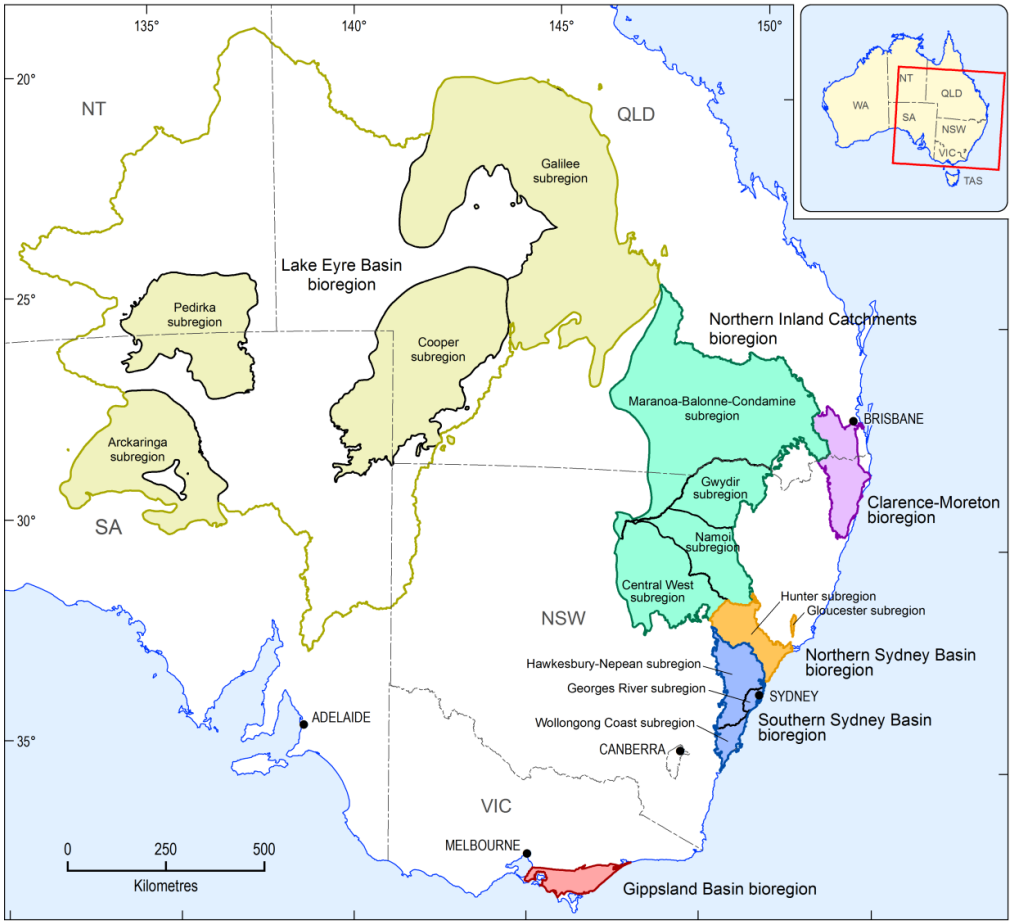
Acknowledgements

- **Bureau of Meteorology:** Julie Burke, Bronwyn Ray, Sarah van Rooyen
- **CSIRO:** Maryam Ahmad, Daniel Aramini, Damian Barrett, Heinz Buettikofer, Nick Car, Simon Cox, Susan Cuddy, Peter Fitch, Simon Gallant, Mick Hartcher, Brent Henderson, Karin Hosking, David Lemon, Frances Marston, Linda Merrin, David Post, Becky Schmidt, Sally Tetreault-Campbell, Catherine Ticehurst
- **Geoscience Australia:** Trevor Dhu, Veronika Galinec, Steven Lewis, Daniel McIlroy, Daniel Rawson

What is a bioregional assessment?



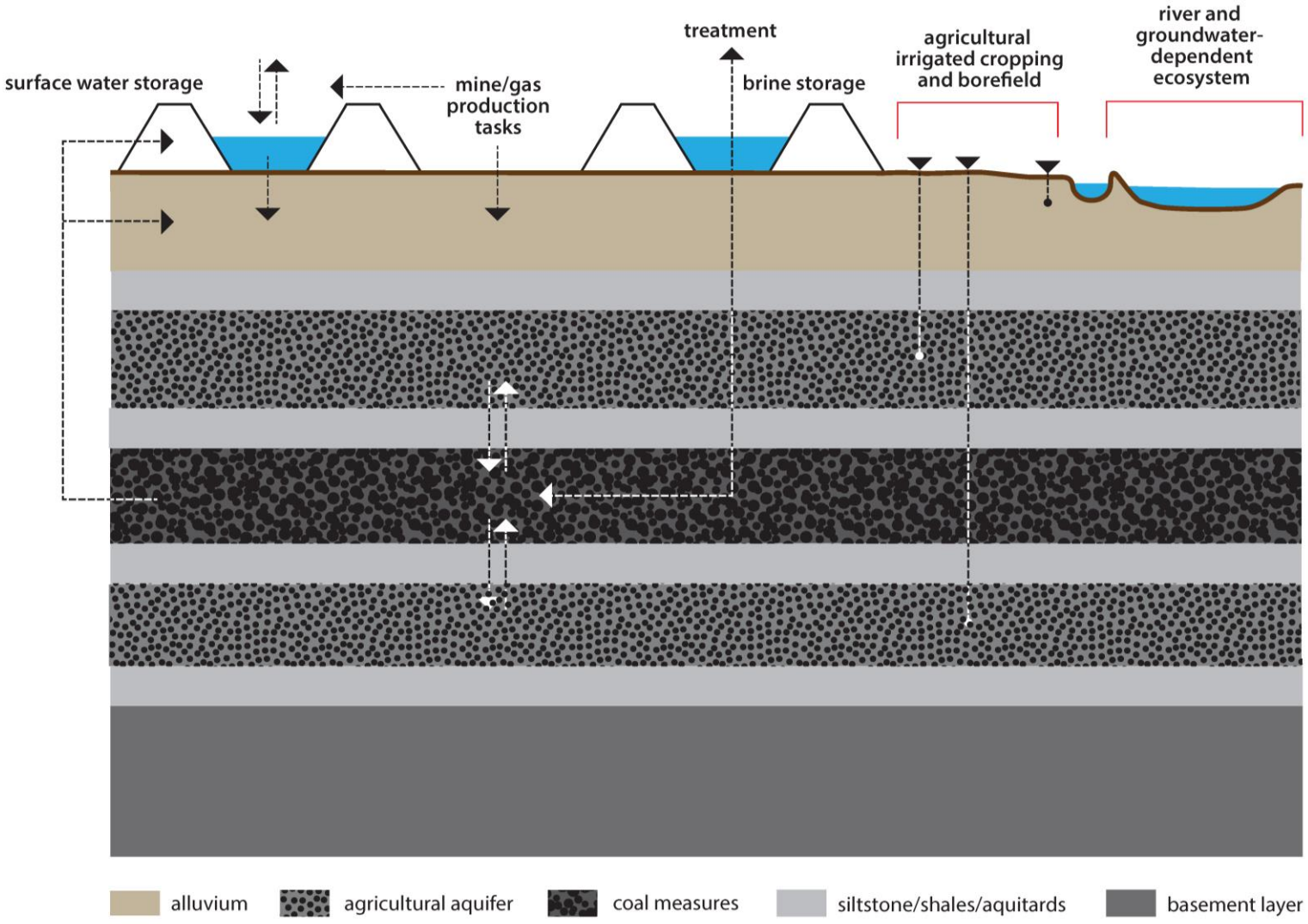
What is a bioregional assessment?



What are the **impacts** of **coal mining** and **coal seam gas extraction** on **water resources**?

http://www.bioregionalassessments.gov.au/documents/bioregional-assessment-factsheet.pdf

Coal and coal seam gas



What are we delivering?

Scientific advice

- easily digestible and searchable for a policy and public audience
- customised for each bioregion
- transparent: report uncertainty and provenance

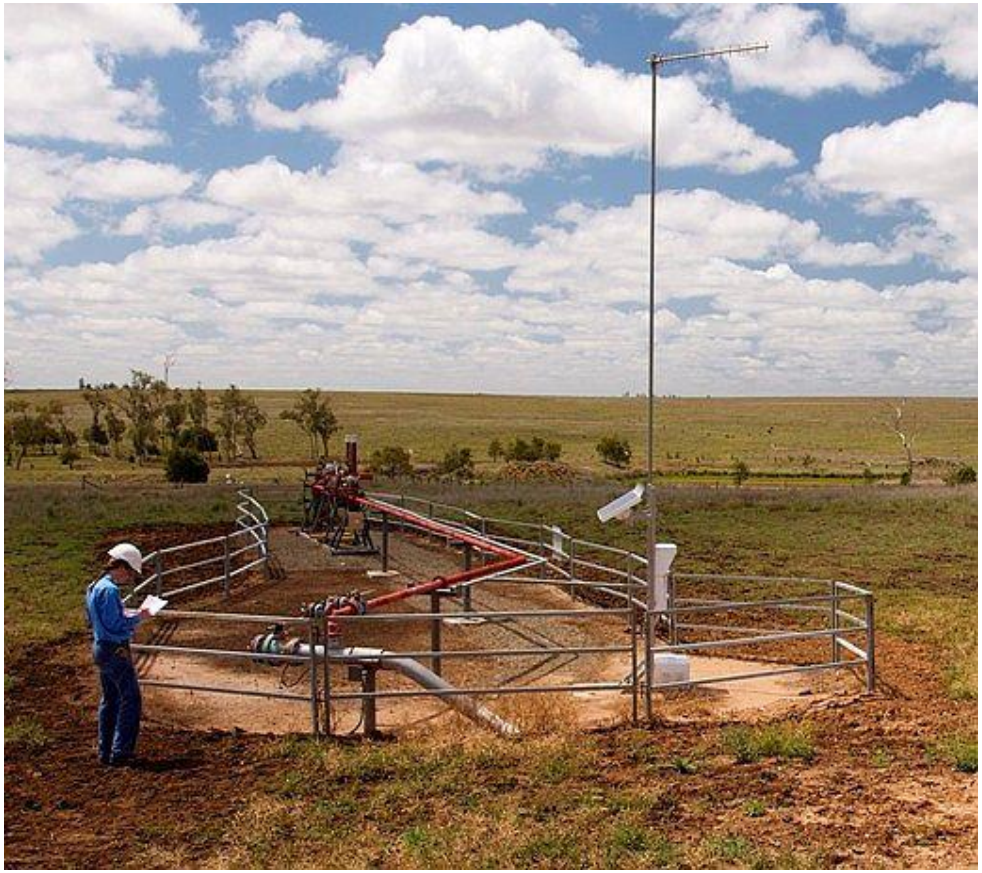
iesc
Independent Expert Scientific Committee
on Coal Seam Gas and Large Coal Mining Development

Proponent applies for development approval → Gov't Advice Team gathers and synthesises **supporting information,** writes draft advice → IESCconsiders proposal, **supporting information,** synthesis and draft advice → At IESC meeting, wordsmith advice → Minister uses advice to make decision on development approval

http://www.iesc.environment.gov.au

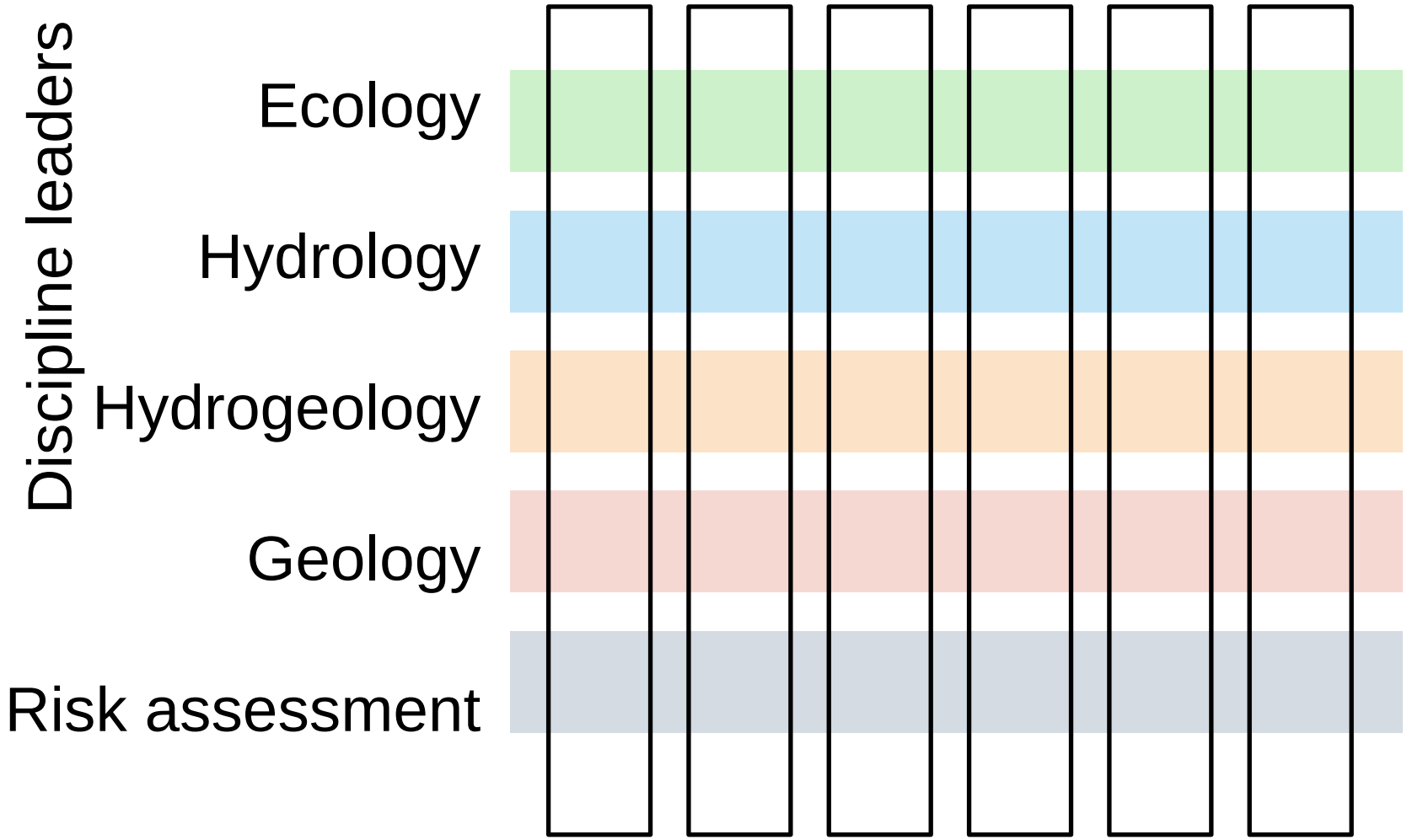
Who?

- Four agencies
- 200 people
- 13 bioregions, subregions
- Five disciplines
  - Ecology
  - Hydrology
  - Hydrogeology
  - Geology
  - Risk assessment
- Cross-cutting
  - Information Management
  - Products QA/QC



Australian Government
Department of the Environment
Bureau of Meteorology
Geoscience Australia

CSIRO


Project leaders:
bioregions or subregions
Discipline leaders
Ecology
Hydrology
Hydrogeology
Geology
Risk assessment

BIOREGIONAL ASSESSMENTS

Content delivered via information platform

web page for 1.1.3.3 in Component 1

Mini executive summary
The basin is old.

Medium confidence

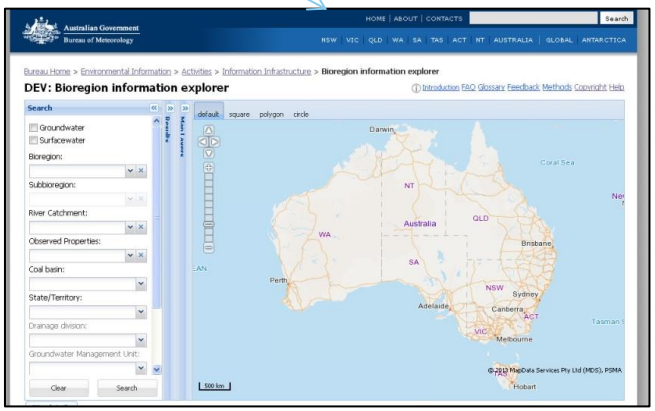
link to underpinning data in BAIP data explorer

link to appropriate section in BA methodology (3.2.1.3)

link to appropriate section in analogous technical report

3.2.1.3 Basin history

Basin history – with particular reference to coal-bearing units, aquifers and aquitards – needs to be obtained from pre-existing modelling and exploration data. The thermal history of a basin must be documented as this determines coal rank, the composition (including CO_2 content) and volume of gas associated with coal and coal permeability. These are key factors in determining the potential of a coal to constitute either a mineable deposit and/or a source of CSG. Basin history must include an understanding of the evolution of groundwater systems. This approach will enable factors in a basin's evolution to be identified that may have an impact on potential economic CSG and coal resources.



NSB-GLO-1.1.3.3

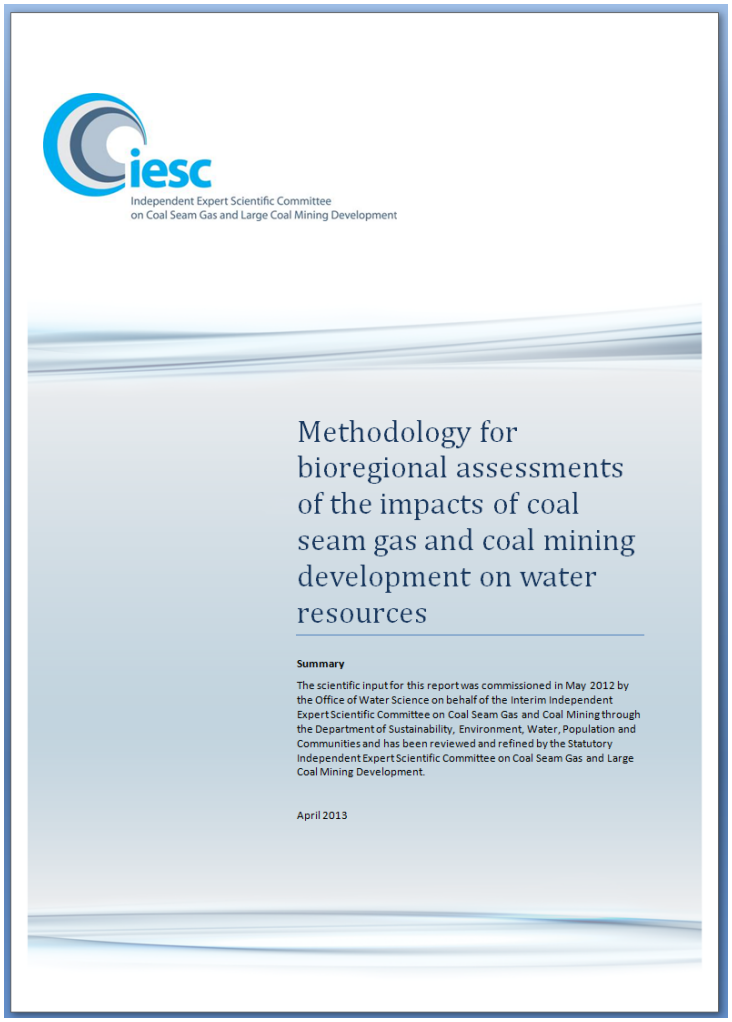
Medium confidence

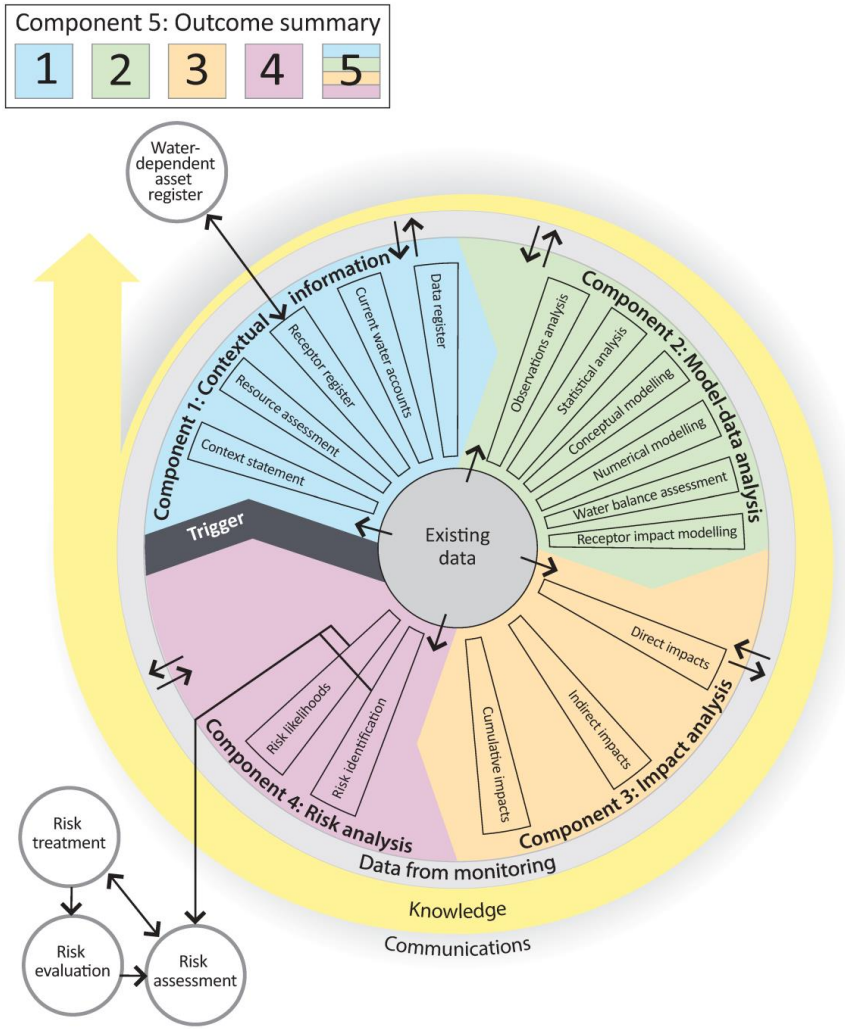
Mini executive summary
The basin is old.

Technical information
The layers that form the basin were deposited in the Triassic period.

V01 30 June 2013

The methodology for bioregional assessments

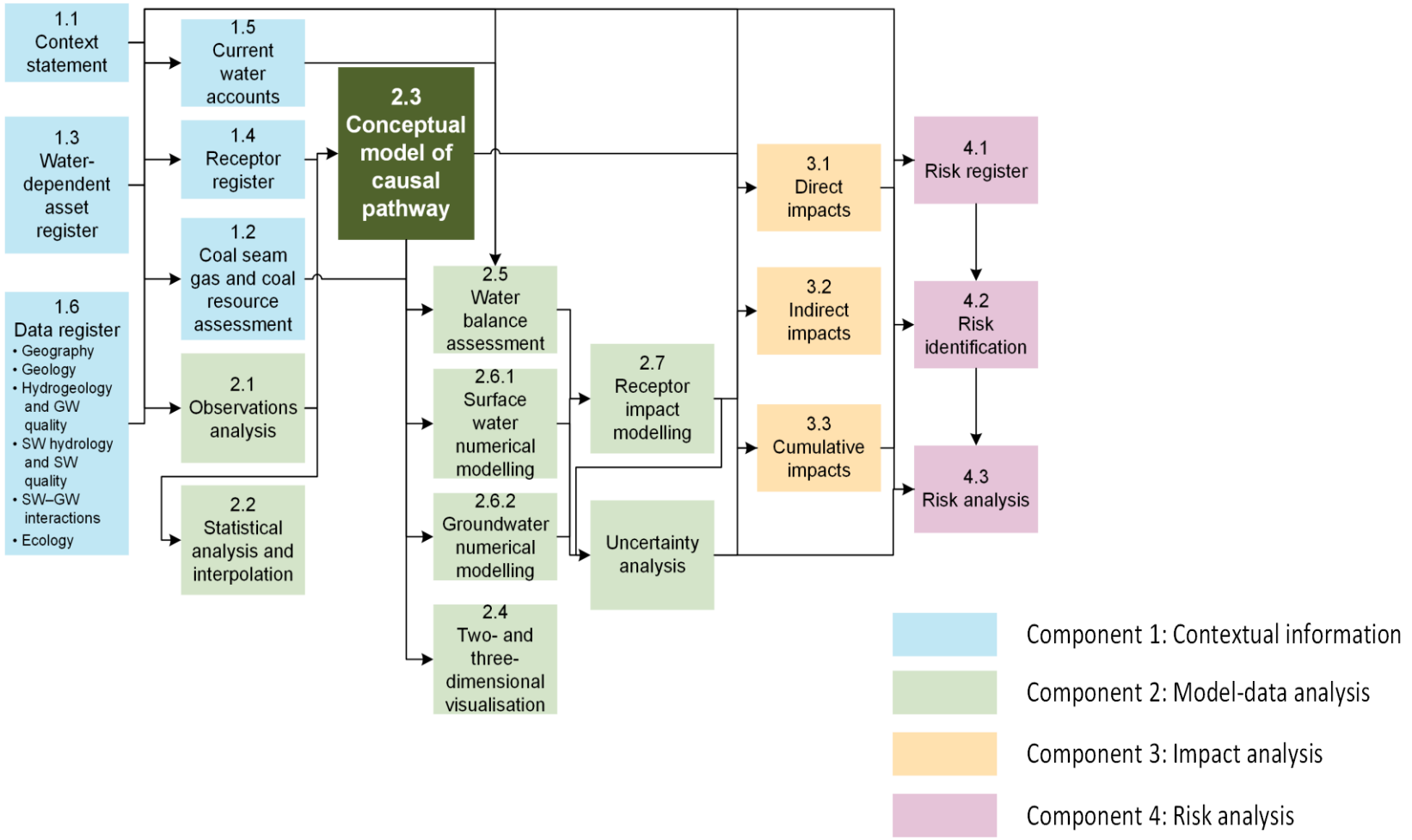




http://iesc.environment.gov.au/pubs/methodology-bioregional-assessments.pdf

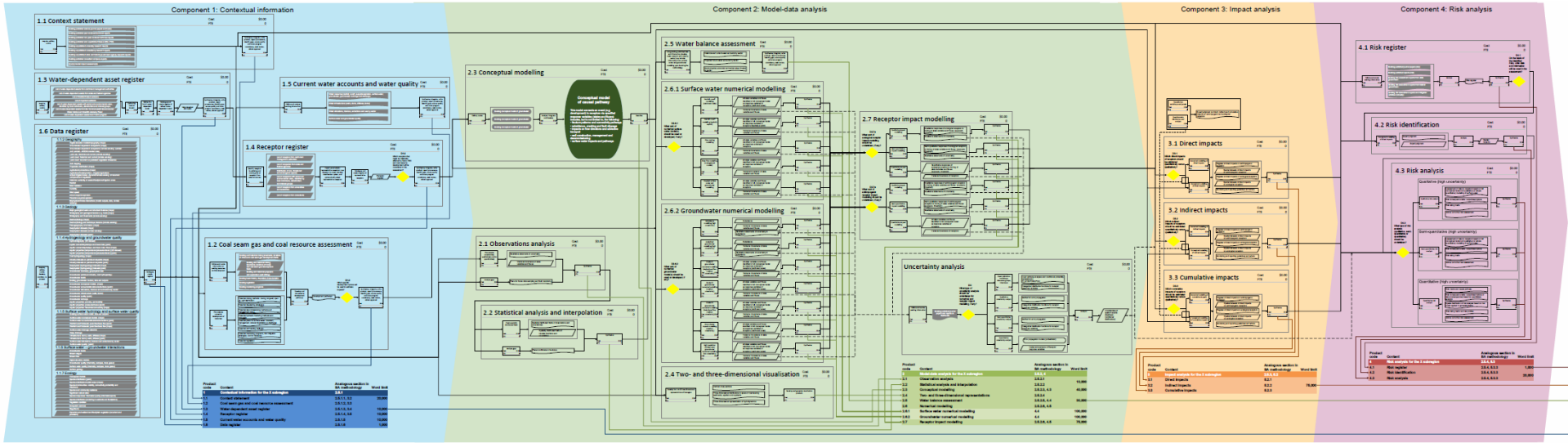
Techniques for integration
1 Information model

Products from bioregional assessments



Example: http://data.bioregionalassessments.gov.au/product/NIC/MBC/1.1

Products from bioregional assessments



http://www.bioregionalassessments.gov.au/documents/bioregional-assessment-decision-tree.pdf

2.7 Receptor impact modelling

Cost $0.00
FTE 0

D2.7e
What sort of ecological receptor impact modelling should be undertaken, if any?

Qualitative impact modelling
Cost $0.00
FTE 0

Qualitative responses of ecological receptors to forcing of state variables and fluxes (exposure, threshold)

Qualitative statements of uncertainty

Synthesise
Cost $0.00
FTE 0

Semi-quantitative impact modelling
Cost $0.00
FTE 0

Semi-qualitative responses of ecological receptors to forcing of state variables and fluxes (exposure, threshold)

Qualitative statements of uncertainty

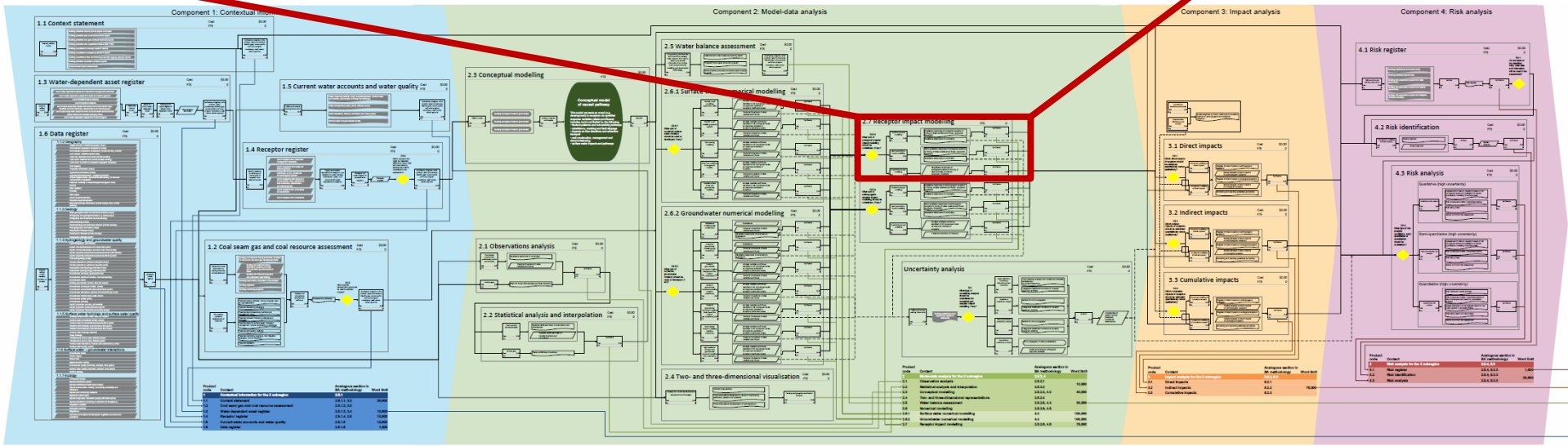
Synthesise
Cost $0.00
FTE 0

Quantitative impact modelling
Cost $0.00
FTE 0

Quantitative responses of ecological receptors to forcing of state variables and fluxes (exposure, threshold)

Variance/covariance of receptors

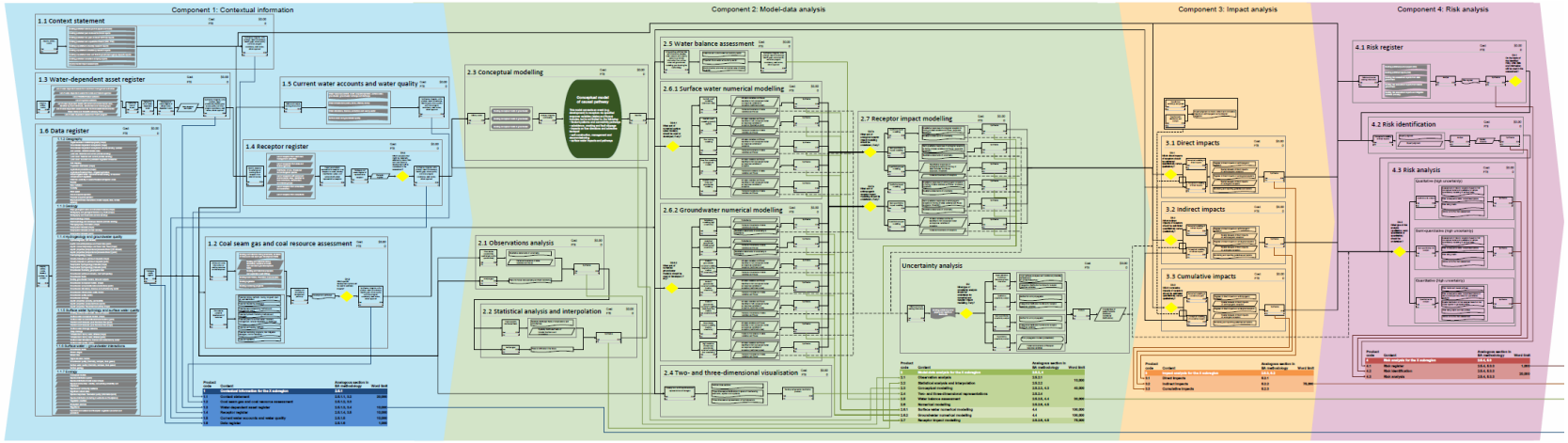
Synthesise
Cost $0.00
FTE 0



http://www.bioregionalassessments.gov.au/documents/bioregional-assessment-decision-tree.pdf

Benefits of specifying a model

- Organise and integrate the information
- Communicates visually the interdisciplinary linkages
  - Bioregional assessors
  - Framework to communicate content, uncertainty and provenance
  - Stakeholder engagement
- Demystifies informatics for bioregional assessors – so that they are more open to more sophisticated solutions on horizon



Techniques for integration
2 Consensus on outlines

Product list

Product code	Chunks of content	Section in BA methodology	Word limit	Maximum # figures (maps)
1	•Contextual information for the X subregion	2.5.1		
2	•Model-data analysis for the X subregion	2.5.2, 4		
3	•Impact analysis for the X subregion	2.5.3, 5.2		
4	•Risk analysis for the X subregion	2.5.4, 5.3		
5	•Bioregional assessment of X subregion: outcome summary	2.5.5		

Product list

Product code	Chunks of content	Section in BA methodology	Word limit	Maximum # figures (maps)
1	•Contextual information for the X subregion	2.5.1		
1.1	••Context statement	2.5.1.1, 3.2	20,000	80 (40)
1.2	••Coal seam gas and coal resource assessment	2.5.1.2, 3.3	10,000	10 (5)
1.3	••Water-dependent asset register	2.5.1.3, 3.4	10,000	10 (5)
1.4	••Receptor register	2.5.1.4, 3.5	10,000	10 (5)
1.5	••Current water accounts and water quality	2.5.1.5	1,000	10 (5)
1.6	••Data register	2.5.1.6	1,000	10 (5)
2	•Model-data analysis for the X subregion	2.5.2, 4		
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1	•Contextual information for the X subregion	2.5.1		
1.1	••Context statement	2.5.1.1, 3.2	20,000	80 (40)
1.1.1	•••Bioregion	3.1.1		
1.1.2	•••Geography			
1.1.3	•••Geology	3.2.1		
1.1.4	•••Hydrogeology and groundwater quality	3.2.2		
1.1.5	•••Surface water hydrology and surface water quality	3.2.3		
1.1.6	•••Surface water – groundwater interactions			
1.1.7	•••Ecology	3.2.5		
1.2	••Coal seam gas and coal resource assessment	2.5.1.2, 3.3		
1.2.1	•••Available coal seam gas and coal resources	3.3.1	10,000	10 (5)
1.2.2	•••Existing mining activity and tenements	3.3.2		
1.2.3	•••Proposals and exploration	3.3.3		
1.2.4	•••Development pathways			
1.3	••Water-dependent asset register	2.5.1.3, 3.4	10,000	10 (5)
1.4	••Receptor register	2.5.1.4, 3.5	10,000	10 (5)
1.5	••Current water accounts and water quality	2.5.1.5	1,000	10 (5)
1.6	••Data register	2.5.1.6	1,000	10 (5)

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1.1	••Context statement	2.5.1.1, 3.2		
1.1.1	•••Bioregion	3.1.1		
1.1.1.1	••••Definition used	3.1.1		
1.1.2	•••Geography			
	••••Summary			
1.1.2.1	••••Physical geography			
1.1.2.2	••••Human geography		20,000	80 (40)
1.1.2.3	••••Climate			
1.1.3	•••Geology	3.2.1		
	••••Summary		20,000	80 (40)
1.1.3.1	••••Geological structural framework	3.2.1.1		
1.1.3.2	••••Stratigraphy and rock type	3.2.1.2		
1.1.3.3	••••Basin history	3.2.1.3		
1.1.4	•••Hydrogeology and groundwater quality	3.2.2		
	••••Summary			
1.1.4.1	••••Groundwater systems			
1.1.4.2	••••Groundwater quality			
1.1.4.3	••••Groundwater flow			
1.1.5	•••Surface water hydrology and surface water quality	3.2.3		

Product list

Product code	Chunks of cont			
1	•Contextual in			
1.1	••Context stat			
1.1.1	•••Bioregion			
1.1.1.1	••••Definition			
1.1.2	•••Geography			
	••••Summary			
1.1.2.1	••••Physical geography			
1.1.2.2	••••Human geography		20,000	80 (40)
1.1.2.3	••••Climate			
1.1.3	•••Geology	3.2.1	20,000	80 (40)
	••••Summary			
1.1.3.1	••••Geological structural framework	3.2.1.1		
1.1.3.2	••••Stratigraphy and rock type	3.2.1.2		
1.1.3.3	••••Basin history	3.2.1.3		
1.1.4	•••Hydrogeology and groundwater quality	3.2.2		
	••••Summary			
1.1.4.1	••••Groundwater systems			
1.1.4.2	••••Groundwater quality			
1.1.4.3	••••Groundwater flow			
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3.2.1.3 Basin history

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1.1.1	•••Bioregion	3.1.1		
1.1.1.1	••••Definition used	3.1.1		
1.1.2	•••Geography			
	••••Summary			
1.1.2.1	••••Physical geography			
1.1.2.2	••••Human geography			
1.1.2.3	••••Climate			
1.1.3	•••Geology			
	••••Summary			
1.1.3.1	••••Geological structural frame			
1.1.3.2	••••Stratigraphy and rock type	3.2.1.2		
1.1.3.3	••••Basin history	3.2.1.3		
1.1.4	•••Hydrogeology and groundwater quality	3.2.2		
	••••Summary			
1.1.4.1	••••Groundwater systems			
1.1.4.2	••••Groundwater quality			
1.1.4.3	••••Groundwater flow			
1.1.5	•••Surface water hydrology and surface water quality	3.2.3		

Product code used in both reports and website

NSB-GLO-1.1.3.3

[Bioregion]-[subregion]-[product code]

Templates for products

BA-GIP-GIP-112-Geography-v00.docx

1.1.2 Geography

Summary

Summary of Section 1.1.2 for a public audience. Number of words about 10% of the total words in Section 1.1.2.

1.1.2.1 Physical geography

Physical context, general context and location, climate, landforms and land use

1.1.2.2 Human geography

Population, land use and water use

1.1.2.3 Climate

References

Techniques for integration

3 Community agreement for words and pictures

Community agreement ('standards')

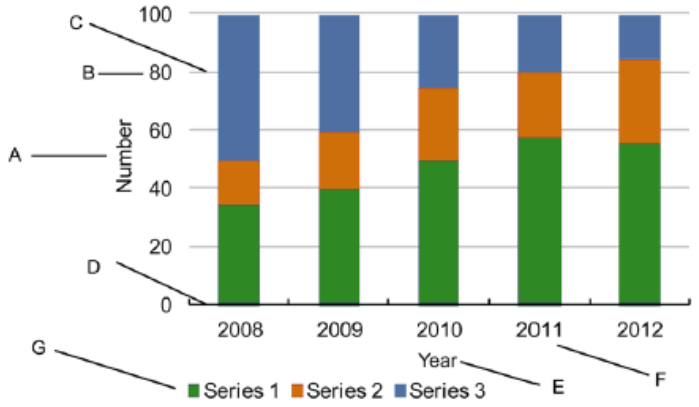


Figure 3 Common elements of a chart. Refer to Table 7 for descriptions ar

Table 7 Specifications for common elements of charts

Element	Name	Specifications
A	y-axis label	Arial, black, 8 pt. Sentence case, rotated 270°
B	y-axis text	Arial, black, 8 pt. Sentence case, right aligned.
C	Gridlines	0.25 pt, grey (R194, G194, B194).
D	x-axis line	0.75 pt, black. Major tick marks inside.
E	x-axis label	Arial, black, 8 pt. Sentence case, centred. (Not
F	y-axis text	Arial, black, 8 pt. Sentence case, centred

Numbers

^{18}O

~~1D~~ (use 'one-dimensional' instead)

^{222}Rn

~~2D~~ (use 'two-dimensional' instead)

^{2}H

~~3D~~ (use 'three-dimensional' instead)

^{4}He

^{86}Sr

^{87}Sr

A

A Directory of Important Wetlands in Australia

~~activities~~ (use 'development' instead in phrases such as 'impacts of coal seam gas and large coal mining development on water resources')

Acts (see 'legislation' in Table 3)

actual evapotranspiration (AET)

airborne electromagnetic (AEM)

American Petroleum Institute units (API units)

animals: common names (lowercase, do not italicise in text)

animals: species names (italicise in text)

anthropogenic receptor

aquifer

aquitard

ArcGIS

Arckaringa Basin

Arckaringa subregion (in Lake Eyre Basin bioregion, do not shorten)

artesian aquifer

AS/NZS ISO 31000:2009 Risk management – principles and guidelines (on first mention, then subsequently 'the ISO 31000:2009 standard')

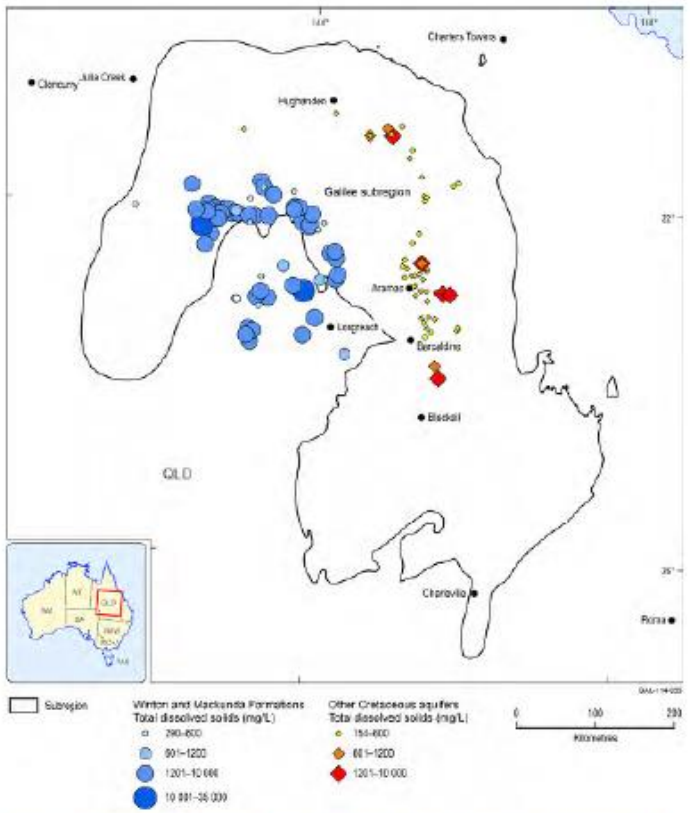


Figure 28 Groundwater quality of the Winton and Mackunda formation aquifers and other Cretaceous aquifers of the Eromanga Basin

Source data: RPS (2012) Appendix E

1.1.4.2.4 Cenozoic aquifers

The Cenozoic aquifers, which include the Quaternary alluvium and other Cenozoic sediments, are important groundwater resources in the subregion. In the RPS (2012) dataset, the groundwater sample depth ranged from less than 10 m to approximately 150 m (Figure 29), with most Quaternary alluvium sampled at depths of less than 30 m and the other Cenozoic aquifers sampled between 30 and 140 m. RPS (2012) suggested that there are probably at least twice as many bores as those shown in Figure 30 tapping into the Cenozoic aquifers.

The water quality of the Cenozoic alluvial aquifers ranges from fresh to saline (minimum and maximum of 48 to 13,618 mg/L TDS respectively). According to the Australian Drinking Water Guidelines classification (NHMRC and NRMMC, 2011), most groundwater in the Cenozoic aquifers is classed as fresh (<600 mg/L TDS) or fair to poor (600–1,200 mg/L TDS), with a median of 492 mg/L and a mean of 1057 mg/L TDS (Figure 29).

The water quality in the Quaternary alluvium aquifer shows an increase in salinity with depths (Figure 29), from very fresh (<100 mg/L TDS) to brackish (~3000 mg/L TDS). This may represent the chemical evolution of the groundwater as it flows from shallow recharge areas to deeper parts (~30 m depth) of the alluvium. In comparison, the water quality from other Cenozoic aquifers does not exhibit any distinct relation with depth or spatial pattern (Figure 30).

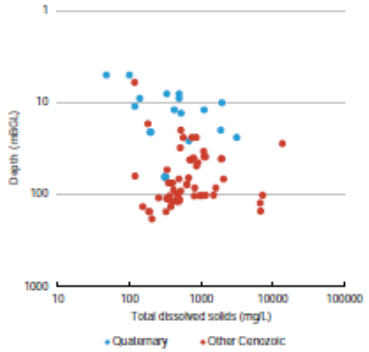


Figure 29 Graph of depth and groundwater quality for Cenozoic aquifers

Source data: RPS (2012) Appendix E

BA Vocabulary service

Maryam Ahmad and Sally Tetreault-Campbell 11:45 am

Register: Bioregional Assessments Glossary

URI: http://registry.it.csiro.au/test1/ba-glossary

no description supplied

Core metadata

Reg metadata

All properties

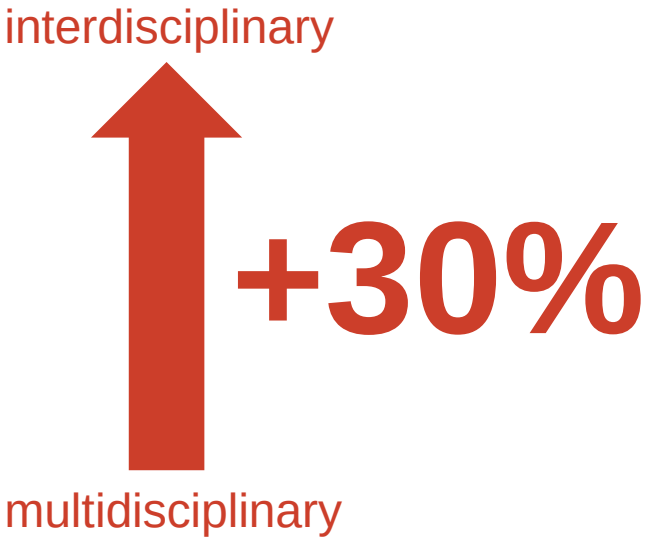
Download

Contents

Name	Notation	Description	Types	Status
aquitard	aquitard	A saturated geological unit that is less permeable than an aquifer,...	Concept	Experimental
artesian aquifer	artesian_aquifer	an aquifer that has enough natural pressure to allow water in a bor...	Concept	Experimental
assets	assets	see 'water-dependent assets'	Concept	Superseded
basement	basement	the crust below the rocks of interest. In hydrogeology it means non...	Concept	Experimental
bioregion	bioregion	the land area that constitutes a geographic location within which i...	Concept	Experimental

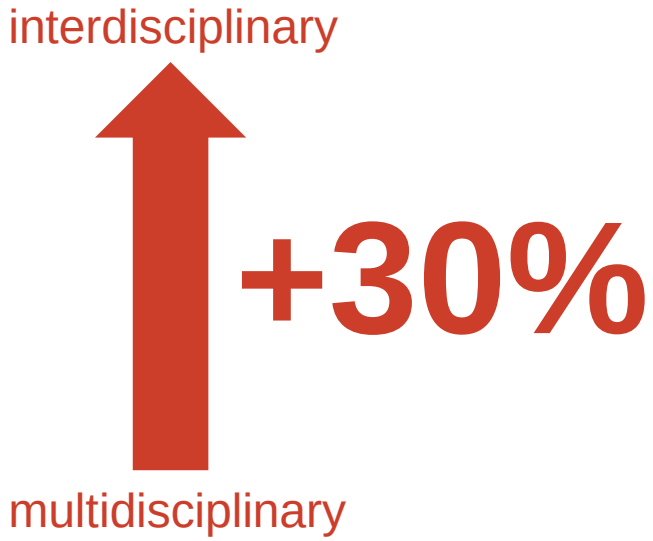
Offsetting the costs of integration

Costs

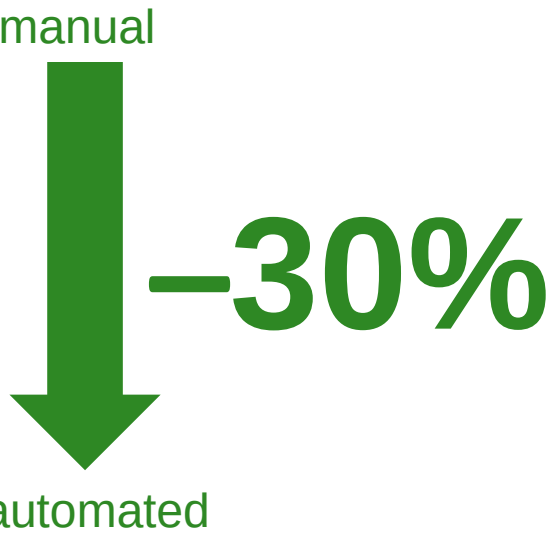


- Talking to many people
- Travelling, face to face meetings
- Consistency
- Language
- Complex review & approvals

Costs offset by automation



- Talking to many people
- Travelling, face to face meetings
- Consistency
- Language
- Complex review & approvals



- SharePoint workflows
- PerfectIt, macros
- Production and conversion
- Metadata, data management

Costs offset by automation

interdisciplinary

multidisciplinary

+30%

- **Talking to many people**
- **Travelling, face to face meetings**
- Consistency
- Language
- Complex review & approvals

manual

automated

–30%

- SharePoint workflows
- PerfectIt, macros
- Production and conversion
- Metadata, provenance

CSIRO

Becky Schmidt
Research Team Leader, Knowledge Integration Team

e Becky.Schmidt@csiro.au
w http://people.csiro.au/S/B/Becky-Schmidt.aspx

Australian Government
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