How does variability in water affect communities in the northern Murray–Darling Basin?

Presentation by Dr Vicki Martin - 2pm, Wednesday 24 April 2024

Acknowledgement of Country

Mosaic Insights recognises and acknowledges the unique relationship and deep connection to Country shared by Aboriginal and Torres Strait Islander people, as First Peoples and Traditional Owners of Australia. We pay our respects to their Cultures, Country and Elders past and present.

Artwork by Melissa Barton. This piece was commissioned by Alluvium and tells our story of caring for Country, through different forms of waterbodies, from creeklines to coastlines. The artwork depicts people linked by journey lines, sharing stories, understanding and learning to care for country and the waterways within.

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Alluvium Group

Funding and Research Team

ONE BASIN CRC

Quickstart Project #8

Social scientists

Dr Natalie Jones

Jess Walker

Dr Vicki Martin

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Overview

01	Project aims and context
02	Method
03	Findings
04	Research gaps

01

Project context

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Project aim

To understand ***effects*** on ***communities*** from ***variability in water access and availability*** in the ***northern region of the Murray Darling Basin***.

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Northern Murray-Darling Basin (Northern Basin)

Photos: Tony Weber

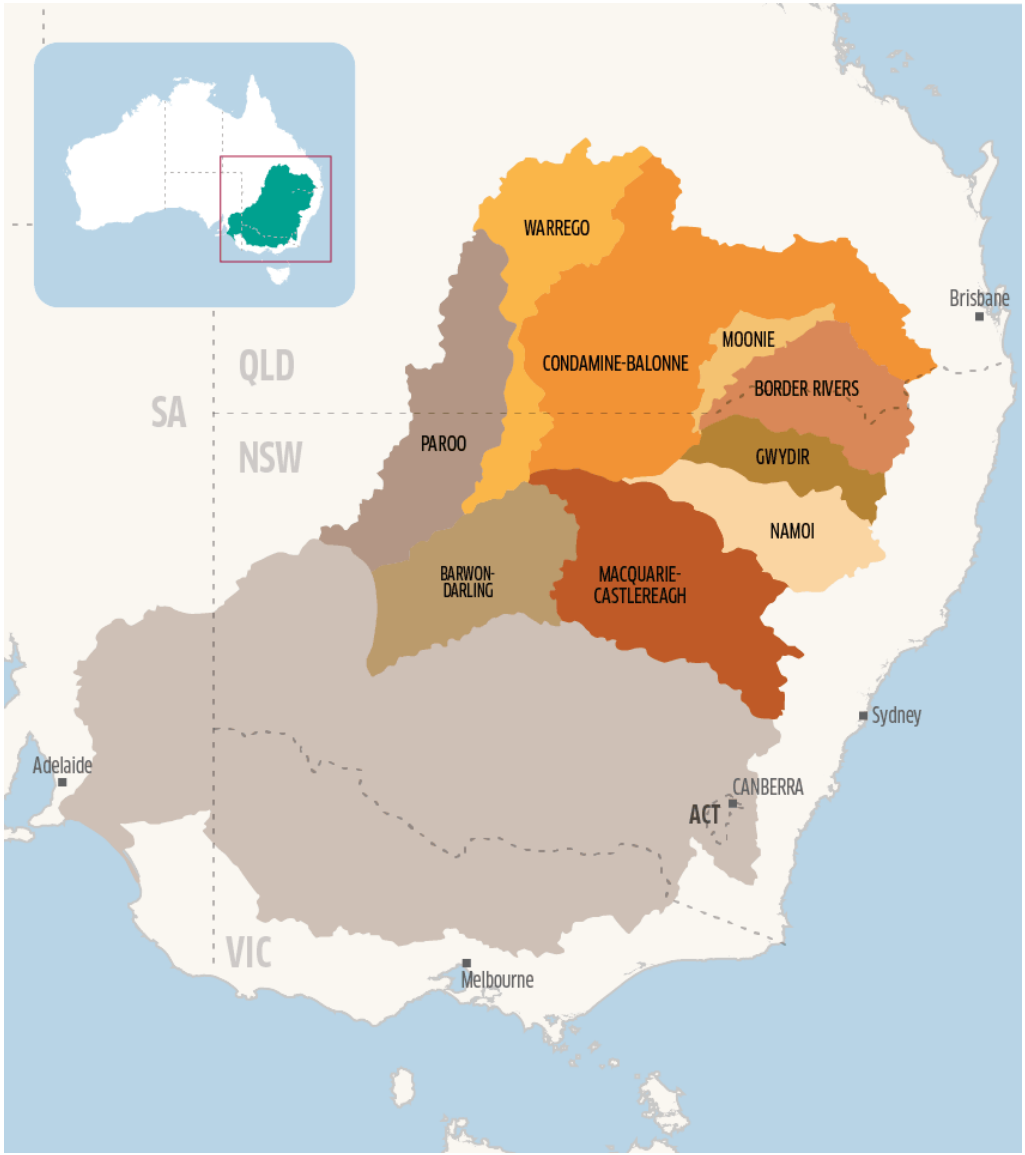

Image Source: MDBA (2024) (Northern Basin catchments highlighted in colour)

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Northern Basin waterways

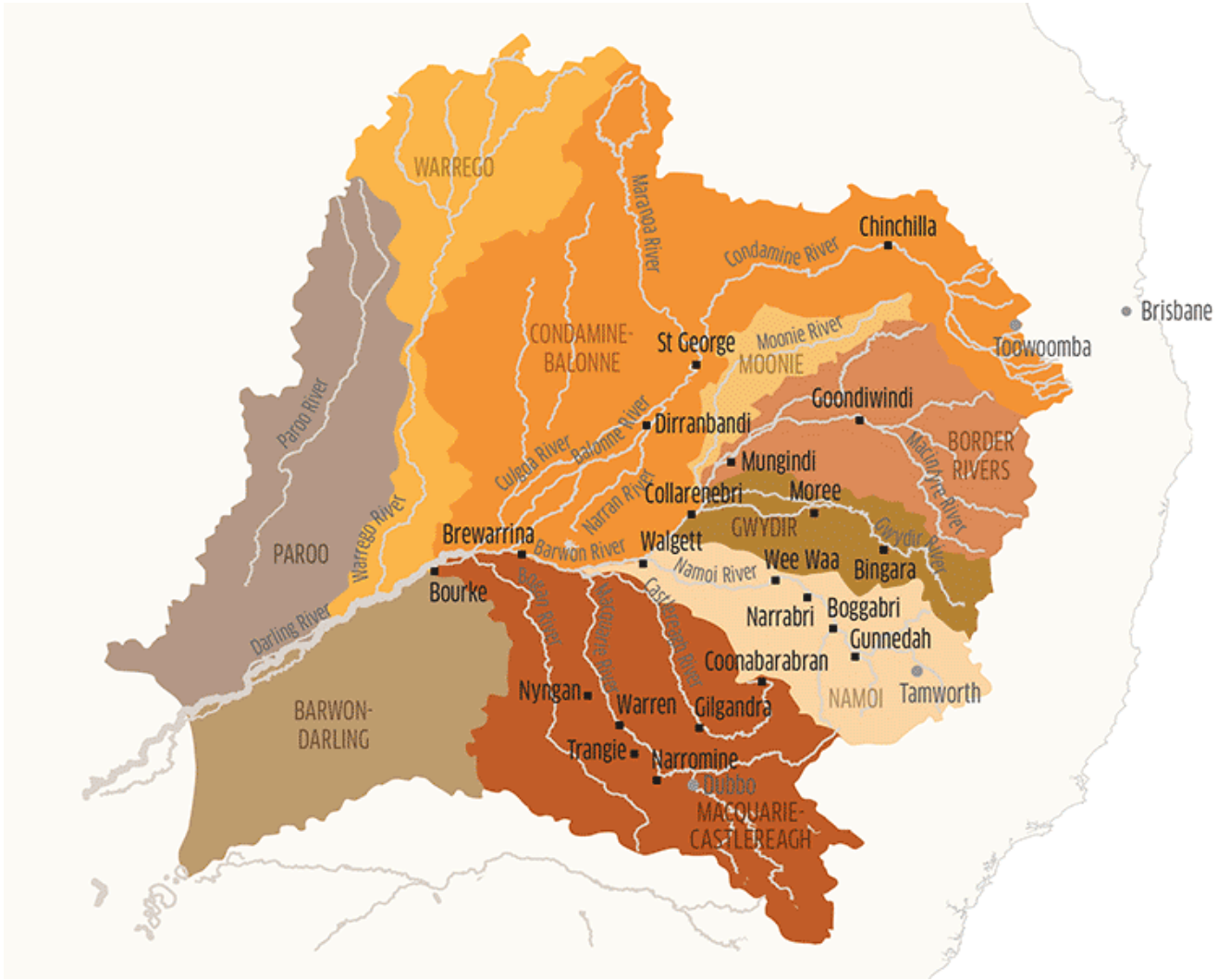

Image Source: MDBA (2024)

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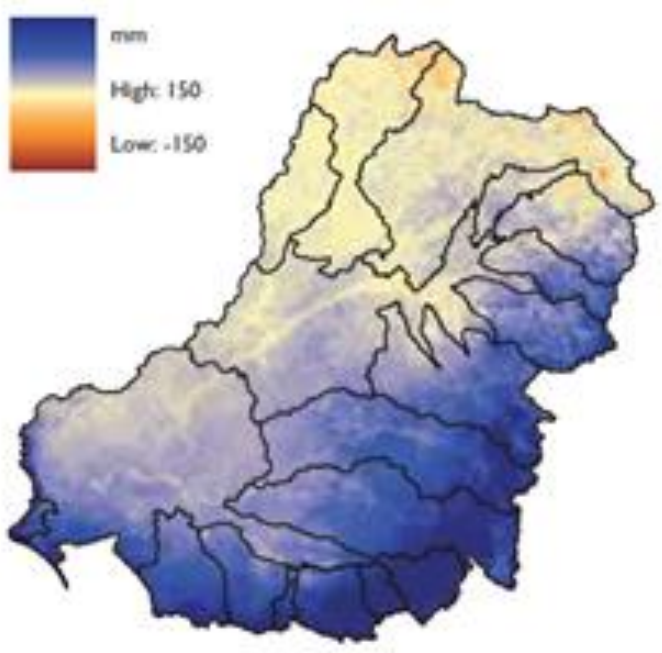
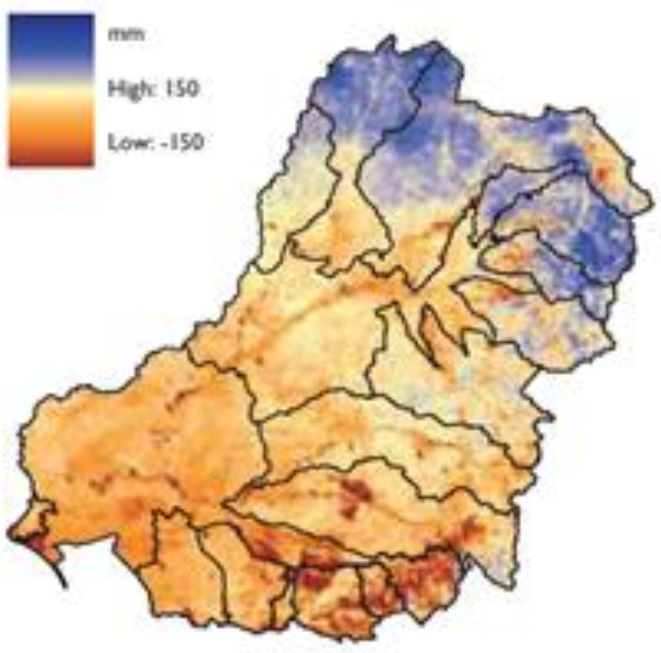
Water balance in the Murray-Darling Basin

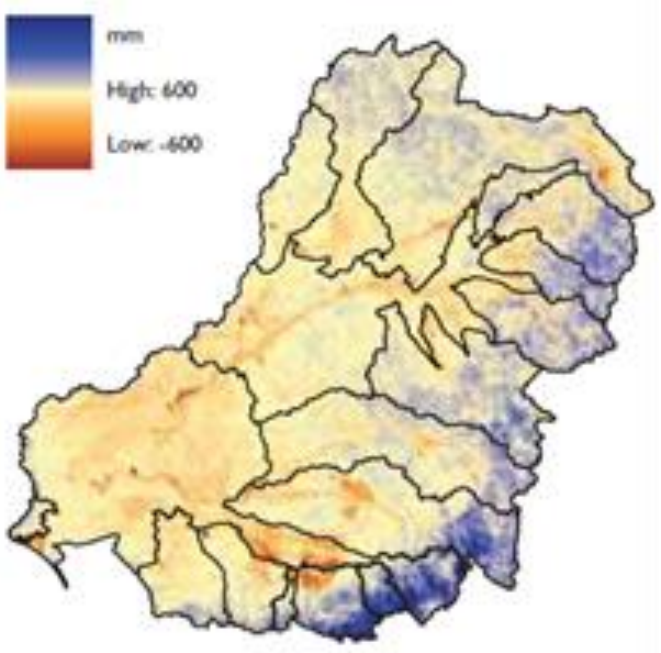
Winter water balance



Summer water balance



Annual water balance



Source: CSIRO (2008)

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Other drivers of water variability

<u>Regulating structures, e.g.:</u>

- dams and storages (some public, most are private)
- river diversions
- water transfer pipelines
- floodplain harvesting

<u>Millennium drought</u>

- 2001-2009
- ~35% less rainfall than normal

<u>Managed environmental flows</u>

- used to try to maintain healthy ecosystems
- limited capacity for environmental flows in Northern Basin
- to date, only in the Macquarie River and parts of the Gwydir River

Photo credits: Tony Weber

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Research question

How does variability in access and availability of water affect communities in the Northern Murray Darling Basin?

Sub questions

1. What does research to date tell us?
2. What are the gaps in knowledge?

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02

Method

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Project tasks

1. Literature review (scientific & grey literature)
2. Draft conceptual model
3. Ground-truthing workshop
4. Finalise conceptual model

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Systematic literature review

Article type	• empirical evidence of social effects (scientific or grey research) • excluded discussion articles, book reviews, systematic reviews, etc.
Spatial scope	whole of Murray-Darling Basin
Publication period	2000 – November 2023
Publication sources (scientific)	Databases: • Web of Science • Scopus • ProQuest • APA PyschInfo
Publication sources (grey)	Relevant websites: • MDBA • Local and Regional Councils in MDB • Murray River Group of Councils • State and Federal government agencies (QLD DES, QLD Police, QLD Office of the Chief Scientist, NSW DPIE, VIC DEECA, SA WaterConnect, Commonwealth Environmental Water Office, Environmental Water Advisory Groups) • QLD government library services

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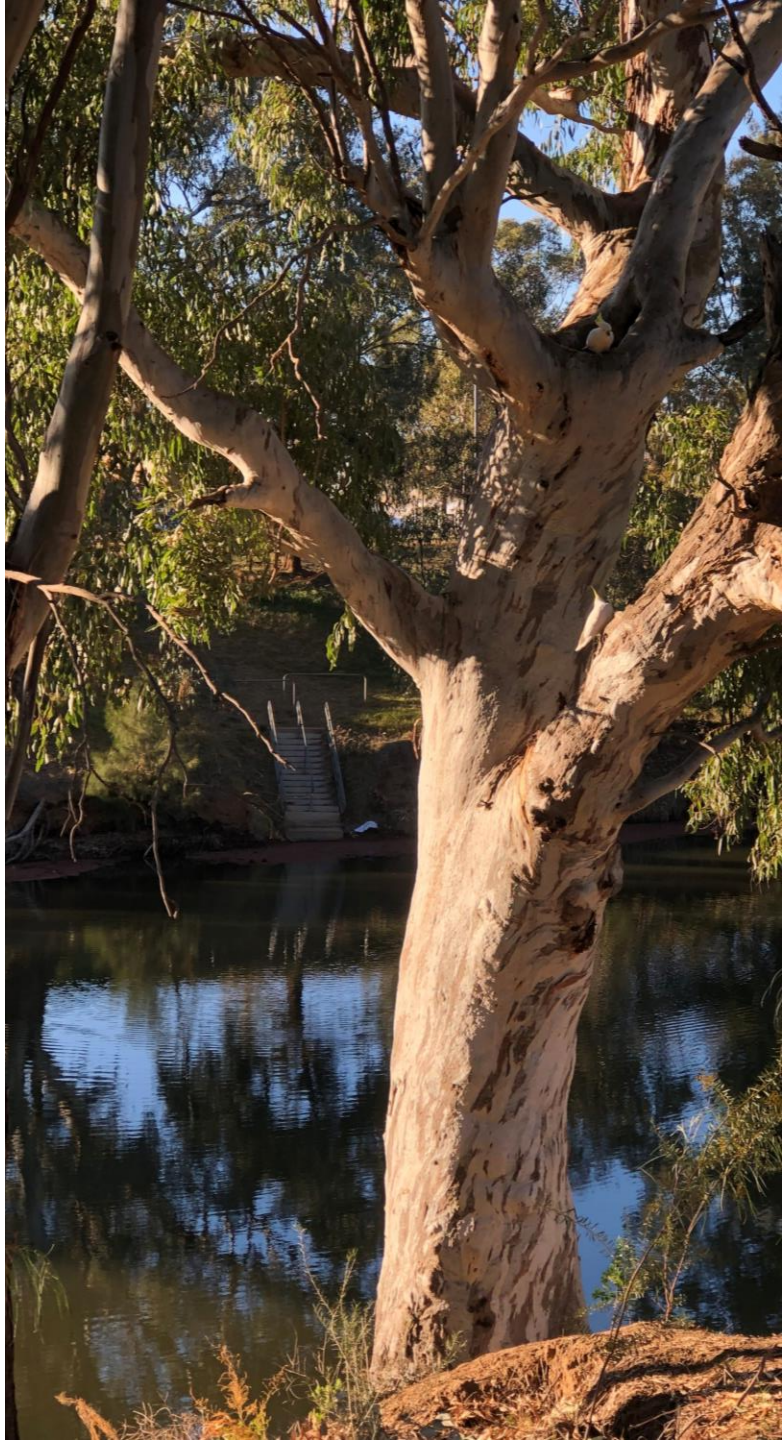
Search terms

Place

- Murray Darling
- Murray Darling Basin
- Northern Connected Basin
- Murray Darling Northern Basin
- Murray River
- Darling River
- Paroo
- Warrego
- Condamine-Balonne
- Moonie
- Border Rivers
- Gwydir
- Namoi
- Macquarie-Castlereagh
- Barwon-Darling
- Ward River
- Langlo River
- Nive River
- Maranoa River
- Macintyre River
- Dumaresq River
- Severn River
- Weir River
- Horton River
- Macdonald River
- Manilla River
- Peel River
- Mooki River
- Cockburn River
- Fish River
- Campbell River
- Cudgegong River
- Turon River
- Bell River
- Little River
- Talbragar River
- Culgoa River
- Bokhara River
- Gwydir River
- Namoi River
- Castlereagh River
- Macquarie River
- Bogan River



Search terms

Variability in water access and availability

- river flow
- variability in water flows
- flow rates
- variation in flow
- water level variability
- flow volume
- baseflow*
- high flow
- streamflow
- flow regime
- inflow
- cease to flow
- flood
- inundation
- high water flows
- drought
- Millennium drought
- water level variability
- floodplain inundation
- water depth
- water recovery
- Water Act
- Basin Plan
- water for the environment
- environmental flow
- allocation price
- water license
- water entitlement
- inter-valley trade
- cap and trade
- water buyback
- water reform
- water market
- water allocation
- Water Reform Framework
- National Water Policy
- natural verses actual
- natural baseline modelled flow
- flood plain harvesting
- water accounting

Search terms

Social effects

- social impacts
- social outcomes
- social effects
- human
- social
- people
- users
- mental health
- psychological
- anxiety
- depression
- wellbeing
- suicide
- physical health
- exclusion
- inclusion
- employment
- income
- unemployment
- debt
- savings
- welfare
- vulnerability
- financial stress
- financial pressure
- recreation*
- boating
- fishing
- swimming
- leisure
- quality of life
- housing
- community services
- social services
- social infrastructure
- cultural flows
- First Nations
- Aboriginal
- Indigenous
- culture
- Country
- customs
- practices
- social cohesion
- cohesion
- belonging
- attachment
- community identity
- family structure
- family
- social networks
- social equity
- gender
- women
- marginalised
- social capital
- capacity
- human capital
- perception
- education
- crime
- tension
- violence
- truancy
- theft
- domestic violence
- migration
- immigration
- emigration
- outward migration
- aging
- food security
- nutrition
- food supply

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Systematic literature review

Databases searched	Number of papers
Web of Science	1,041
Scopus	924
ProQuest	324
APA PsychInfo (EBSCOhost)	22
Grey literature	94
Sub total	**2,405**
Removed:	
Duplicates	461
Excluded (did not meet criteria)	1,850
TOTAL	**94**

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Systematic literature review

Each source was interrogated to identify the:

- **study location** (Northern, Southern, or whole of Basin)
- **water level** (low, high, managed)
- **research method** (qualitative, quantitative, or mixed)
- **social effect** experienced by the study community

How can we categorise social effects?

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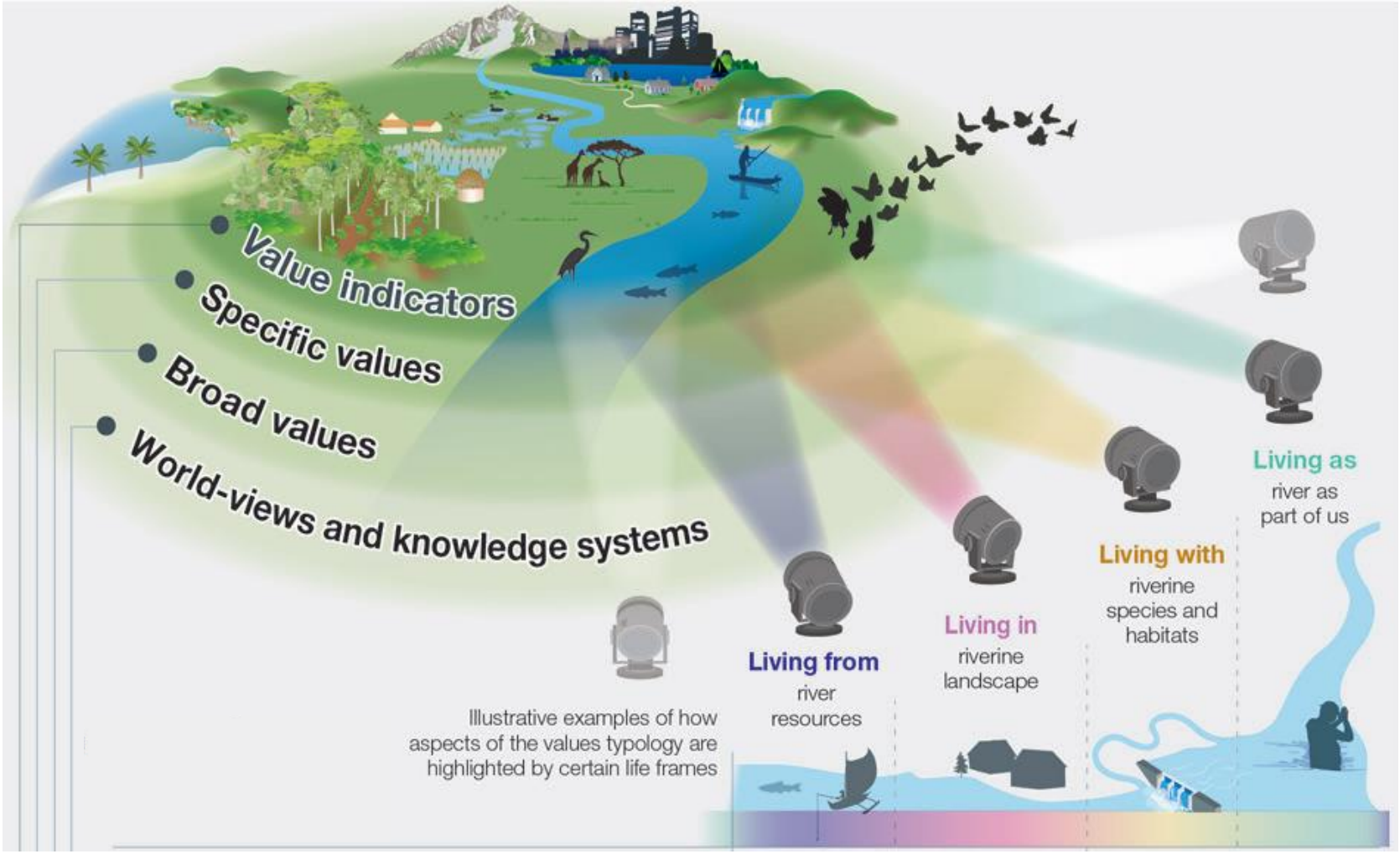
Conceptual model development

IPBES Values Assessment Typology

Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Service (2022)



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Social effects framework

IPBES LIFE FRAME	DEFINITION	STUDY TERM ADOPTED
Living from	Refers to the importance of 'using' natural resources, including water, to sustain people's livelihoods and needs, including food.	**Waterway use**
Living in	Refers to the values people attribute to using nature as social settings. This includes providing a place to live and carry out social practices and recreational activities.	**Waterways as social settings**
Living with	Refers to valuing ecological processes that sustain all of life, including humanity. This includes learning how to live with and take care of environmental resources systems (i.e., stewardship).	**Stewardship and ecological learning**
Living as	Refers to the relationships people have with the environment when they see nature as part of themselves - physically, mentally and spiritually – and not separate.	**Spiritual and cultural connections**

Categories adapted from Values Assessment Typology (IPBES, 2022)

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03

Findings

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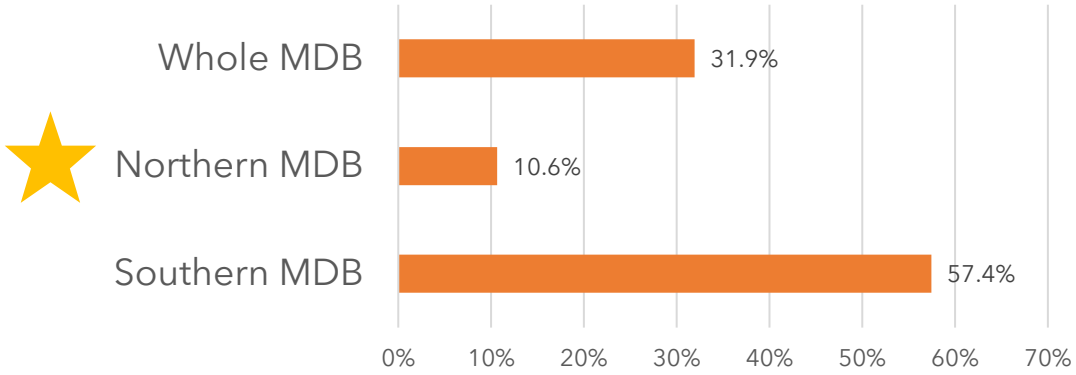
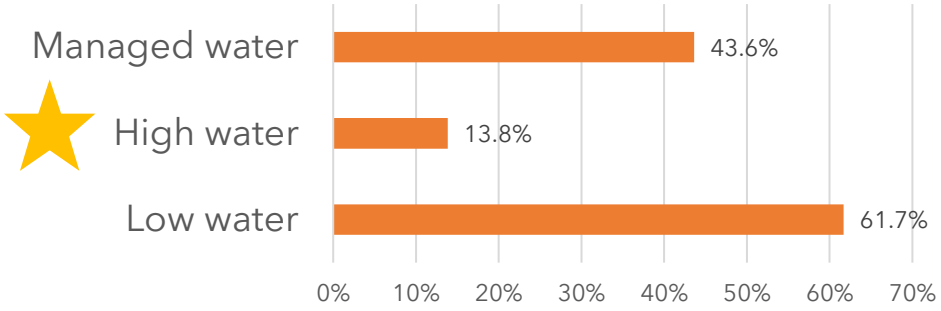
Literature overview

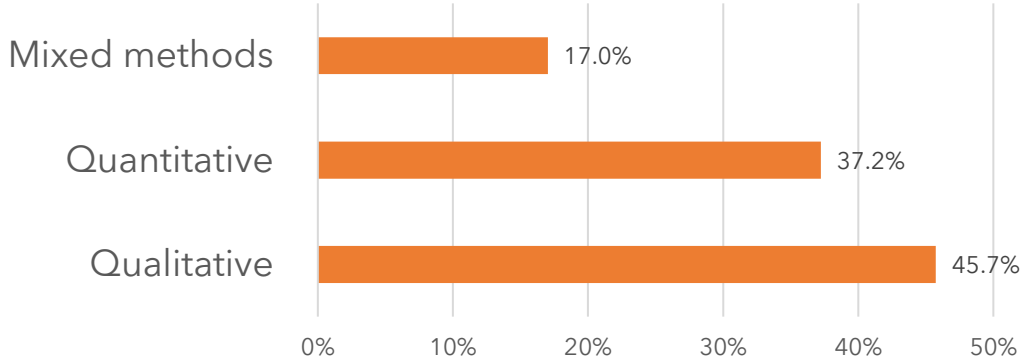
Study location



Water level discussed in paper



Method of research



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Social effects

Words repeated at least 4 times or more in effects summary

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Number of studies across water variability type

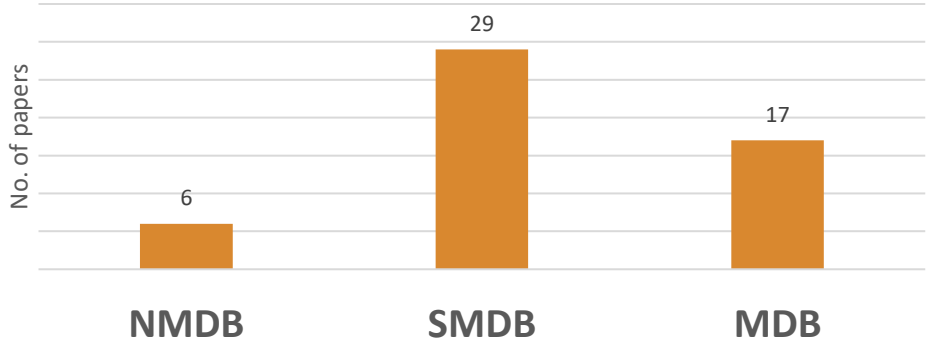
WATER VARIABILITY

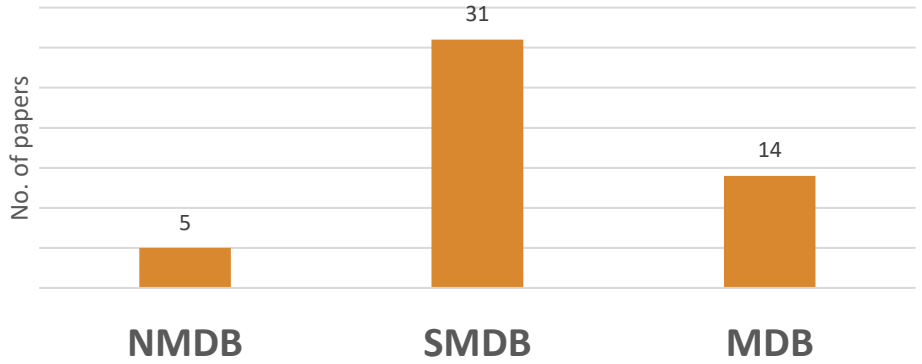
Low water
- Drought
- Overextraction
- Reduced allocation
- Water storage infrastructure

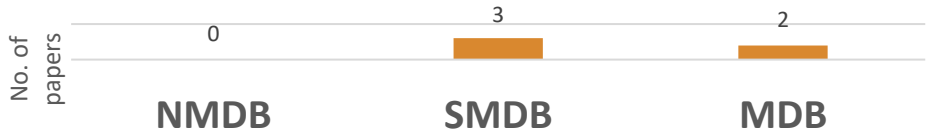
Managed water
- Water trading/ markets
- Water allocations (licences)
- Cultural flows
- Environmental flows

High water
- Floods

NUMBER OF STUDIES





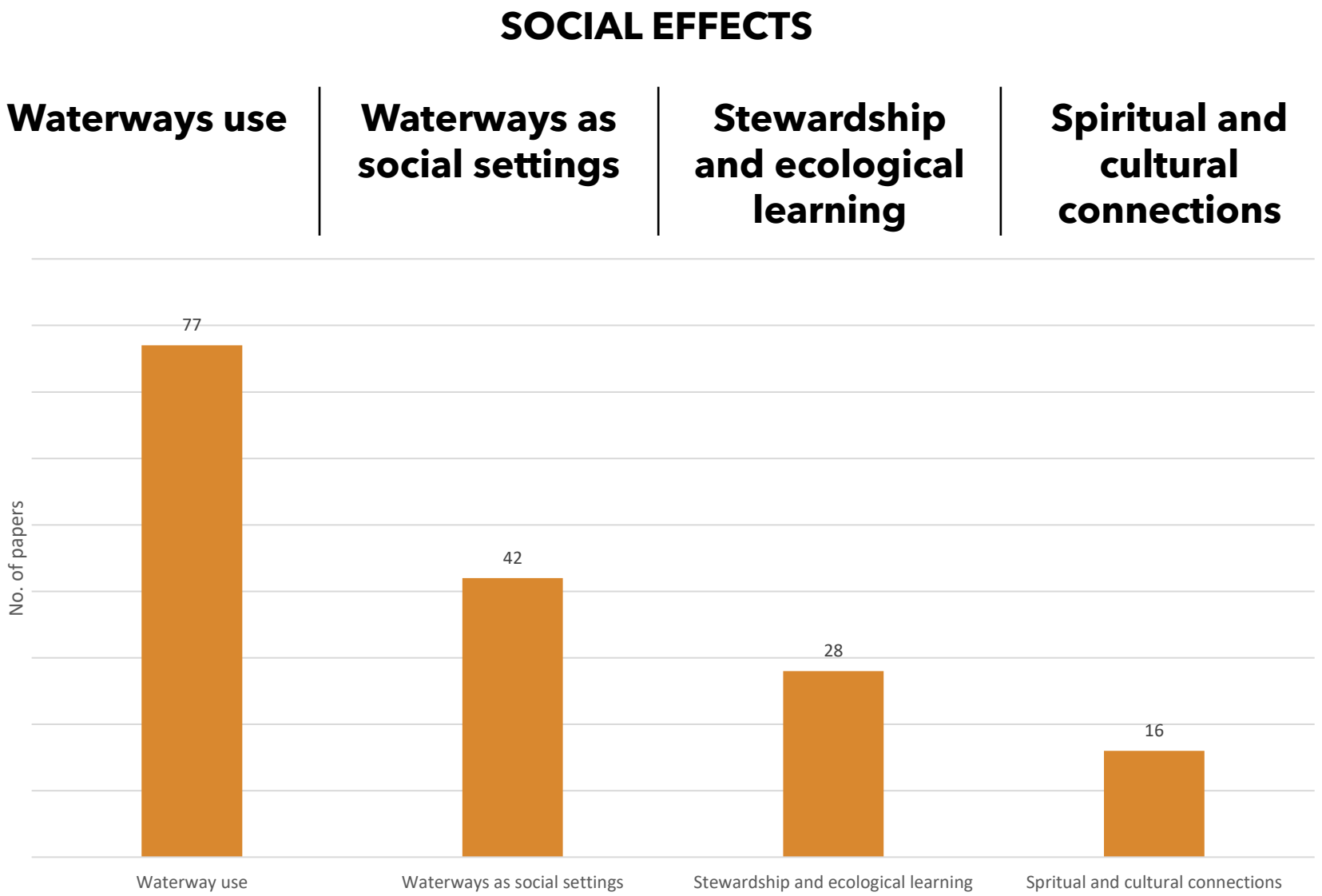


NMDB = *Northern Murray Darling Basin*

SMDB = *Southern Murray Darling Basin*

MDB = *whole of Murray Darling Basin*

Number of studies across social effect types



Draft conceptual framework

	SOCIAL EFFECTS			
WATER VARIABILITY	**Waterways use**	**Waterways as social settings**	**Stewardship and ecological learning**	**Spiritual and cultural connections**
Low water				
Managed water				
High water/ flooding				

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Ground-truthing workshop

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Final conceptual framework & results

WATER VARIABILITY	SOCIAL EFFECTS			
	Waterways use (6)	**Waterways as social settings** (3)	**Stewardship and ecological learning** (2)	**Spiritual and cultural connections** (2)
Low water 	• Livelihoods (+ −) • Physical and mental well-being (−) • Participation in water use decision-making (+ −) • Use of waterway resources to sustain people (e.g., food and drinking water) (−)	• Individual identity (+ −) • Community identity and well-being (−) • Social settings (i.e., a place for social gatherings and interactions) (−) • Waterways for recreation (−) • Property prices (−)	• Places of learning and knowledge exchange (+ −) • On-farm innovation (i.e. management water scarcity) (+) • Stewardship participation, roles and responsibilities (+ −)	• Spiritual and cultural connection (− +) • Kinship with rivers and other species (−) • Physical and mental well-being derived from connecting to waterways (−)

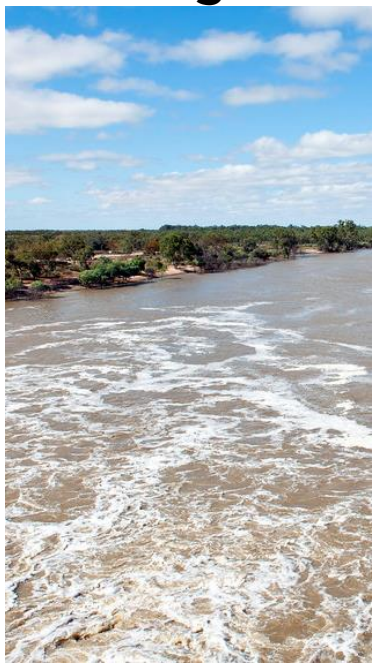
LEGEND: (#) Number of Northern Basin papers (+) Positive effect (−) Negative effect (●) Neutral effect

Final conceptual framework & results

WATER VARIABILITY	SOCIAL EFFECTS			
	Waterways use (5)	**Waterways as social settings** (2)	**Stewardship and ecological learning** (2)	**Spiritual and cultural connections** (2)
Managed water 	• Livelihoods (+ − ●) • Physical and mental well-being (+ −) • Participation in water use decision making (+ −) • Use of waterway resources to sustain people (e.g., food and drinking water) (+)	• Individual identity (●) • Community identity and well-being (+ −) • Social settings (i.e. a place for social gatherings and interactions) (+ −) • Waterways for recreation (−)	• Places of learning and knowledge exchange (+ −) • Stewardship participation, roles and responsibilities (+)	• Spiritual and cultural connection (+ −)

LEGEND: (#) Number of Northern Basin papers (+) Positive effect (−) Negative effect (●) Neutral effect

Final conceptual framework & results

WATER VARIABILITY	SOCIAL EFFECTS			
	Waterways use (—)	**Waterways as social settings** (—)	**Stewardship and ecological learning** (—)	**Spiritual and cultural connections** (—)
High water/ flooding 	• Livelihoods ⊖ ⊕	• Waterways for recreation ⊖ • Human health ⊖ • ***Community identity and well-being*** • Property prices (*and* ***insurance costs***) ●	• Places of learning and knowledge exchange* ⊕ • On-farm innovation (i.e., management of pests) ⊕	

LEGEND: (#) Number of Northern Basin papers ⊕ Positive effect ⊖ Negative effect ● Neutral effect. ***Italics*** = *factors identified in workshop*

04

Research gaps

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Gaps and areas for future research

Northern Basin research gaps:

High water (flooding)
- All effect categories (especially *spiritual and cultural connections*)

Low water
- Waterways as social settings
- Stewardship and ecological learning
- Spiritual and cultural connections

Managed water
- Waterways as social settings
- Stewardship and ecological learning
- Spiritual and cultural connections

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Thank you!

For more information about One Basin CRC and other Quickstart projects, visit: https://onebasin.com.au/
or email: projects@onebasin.com.au. Special thanks to Tony Weber for many of the photos in this presentation.

References

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