# Water Modelling Sector Advancements in Queensland

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# **Queensland Water Modelling Network**

Partnering with :

- Modelling community private, government & academic
- End users policy makers, planners and investment programs)
- Enabling environment universities, workplace capability and direction setters
- *to:*
- Address strategic challenges for water and sustainable management in Queensland.
- through research, development and innovation, enhanced water modelling capability and collaborations.



#### Purpose

• Improve Queensland's capacity to model its surface water and ground water resources and their quality

#### 5 Key Goals (medium-term changes in behavior)

- Build a state-wide network with national influence to deliver transformative change
- Foster integrated and scalable modelling to address water risks and opportunities
- Champion a community of practice to leverage expertise
- Encourage strategic co-investment and co-production in water modelling research, development and innovation (RDI)
- Increase application of water modelling to inform decision-making

#### Strategic challenges

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

#### **Delivery mechanisms**

- RD&I investment enhanced models 20+ projects
- Capability building in government, research and private sectors external engagement activities



# Enhance Capability

### **Community of Practice:**

problem ID & solving, peer to peer learning and collaborations

### **Enhanced capability:**

- Post doctorate: QWMN Fellow
- Industrial Doctorates: "Innovation Associates"
- Graduate/workforce mentoring

### **Communication:**

https://watermodelling.org/

Skills and Knowledge Audit Report & Response

QWMN External Engagement Consortia Led by International WaterCentre

In collaboration with: Australian Institute of Marine Science Griffith University Queensland Cyber Infrastructure Foundation, Queensland University of Technology University of Queensland University of Southern Queensland.



## **Strategic Challenges: Landscape restoration**

catchment, high resolution model Gully typology, Uncertainty analysis: (MIPs) monitoring and data Dynamic SedNet Water IP - water knowledge services standards (building on NESP) Measuring and modelling riverbank Improving how gully erosion and river sediment Improve daily scaling of transport processes are represented in Queensland and gully erosion: atchment models Effectiveness of model processes Ian P Prosser management (QWMN Fellow, GU) Soil properties Riverine classification, morphology monitoring Sediment quality and data standards model Instream deposition and re-trainment **Erosion small streams** A report to the Queensland Water Modelling Network June 2018 Management: Investment in system Spatial data: Monitoring, modelling, **Qld: Soil Con Guidelines** repair – Erosion mapping, reporting CSIRO: Reef Trust gullies, streambank, Groundcover, Land e.g. Paddock to Reef, Sediment and Erosion wetlands, condition, stream networks SEQ toolbox (CSIRO)

**Small** 



#### FINAL REPORT

Critical review of climate change and water modelling in Queensland



#### Queensland Future Climate Dashboard

Molecular Climate Heatwaves Extreme temperature indices Extreme precipitation indices SPI-drought indices SPI-flood indices

Queerstand's climate is highly variable in space and time, ranging sostally from the wet hopics to savarna woodlands and arid deserts. The State is impoded with episodic droughts, floods and tropical cyclon Droughts may persist for a number of years. Rainfal variability occurs at intersmual, quasi-decical, multi-decical and centernial time scales. Understanding our climate variability and likely future climate drouge is could in workstation and preparetness.



Other jurisdictions National products Queensland specific products

## 2. Evaluation Guide

The modelling question

Data inputs and forcing data

Conceptual process representation

Component models

Model outputs



### **Case studies & Solutions:**

- Paddock to Reef WQ modelling
- AussieGRASS pasture model
- Queensland MDB Water Resource
- SEQ Water supply



## **3. Strategic investment portfolio**

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 risk assessment approaches

### Outcome 2

Interpret and summarise the applicability of existing Qld climate science and datasets

### Outcome 3

Address climate science gaps through targeted research initiatives

#### **Outcome 4**

Empower individuals and collectives, and facilitate collaboration

Training. Communication and guidance







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# Model Management and Access



Be explicit: sensitivity and certainty of models

Considered and accessible data and outputs Uncertainty Analysis and Reduction through Simplified Model Run Parallelisation plus casestudies (groundwater, regional water quality) (John Doherty, Watermark Numerical Computing, DES, DNMRE)

Addressing uncertainty in coupled water models using machine learning techniques (*BMT*, *Uni WA*, *HLW*) improve load predictions in SEQ catchment.

**Visualisation of coupled economic and Queensland water quality models -** *natural resource management investment options for the Great Barrier Reef. (Truii Pty Ltd, OGBR, building on GBRF and Alluvium product*)

Model data portal to deliver catchment modelling data to end users of Paddock to Reef program. (*Truii Pty Ltd*, *OGBR*)





## 2018-2020

Purpose, 5 Key Goals, Strategic Challenges & Outputs

## Priority Models, Priority Regions and RD&I priorities

Post-2020 Investment for Impact



# Investment in the water modelling pipeline



Communication and consultation



# Investment in the water modelling pipeline



Communication and consultation



## **Dimensions of impact**



## Environmental

 Protecting biodiversity & the environment including the Great Barrier Reef

## Economic

- Agriculture & food security
- Urban, industrial and resource development

## Social

- Water supply, security & safety
- Water quality & a healthy environment

## Cultural

- Cultural flows
- Traditional knowledge
- Rainbow serpent hydrology



2018-2020	2020	2020-2024
Purpose Goals Strategic challenges Outputs	Monitoring & evaluation framework	Your chance to shape the direction & future of the network
		3pm- 4.15pm

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