

Climate Change Adaptation Research Grants Program - Freshwater Biodiversity Projects

Project title:

Joining the dots: integrating climate and hydrological projections with freshwater ecosystem values to develop adaptation options for conserving freshwater biodiversity

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Lead organisation: University of Tasmania

Objectives:

To establish adaptation planning for freshwater biodiversity in response to climate change by integrating downscaled climate model outputs with spatial freshwater biodiversity conservation planning data to scope and prioritise adaptation actions at local, regional and state scales.

Project design and methods

Tasmania is uniquely placed in Australia to use state-of-the-art, downscaled climate model projections to evaluate adaptation opportunities at local, regional and state scales. Three key, existing ingredients make this possible within the time frame for this project:

1. A new, state-wide set of downscaled climate projections (the CFT or Climate Futures Tasmania 12 Climate data set);
2. A state-wide set of hydrological projections for 20,000 sub-catchments derived from the above downscaled model outputs & applied to the state stream drainage (CFT Hydrology data 12);
3. A state-wide, comprehensive consistent and integrated database on aquatic ecosystem values, condition and conservation value, linked to the same drainage layer and DEM as used above (Conservation of Freshwater Ecosystem Values database - CFEV).

These resources allow us, for the first time in Australia to link climate and flow projections to aquatic ecosystem values and management across an entire state using a consistent, integrated approach, and to identify risk and adaptation management opportunities.

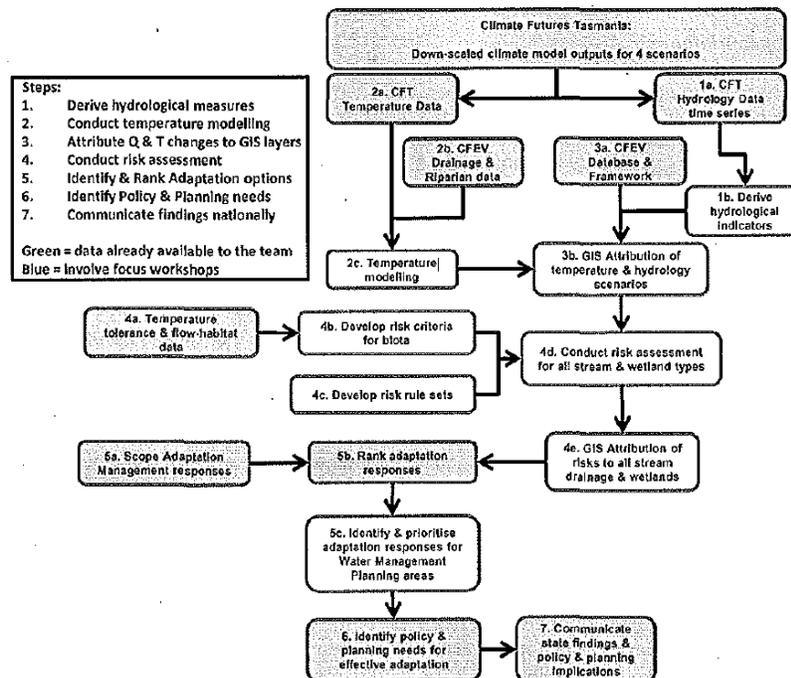


Figure 1. Flow chart of project steps and tasks.

The key steps (refer to Figure 1) will be to:

1. Use the existing hydrological time series derived from the down-scale CFT climate projections for the entire state to derive hydrological measures of ecological relevance for streams and wetlands, using the eWater CRC RAP river analysis package.
2. Conduct temperature modelling - using the Land & Water Australia Streamline model, and the gridded CFT projection temperature data. CFEV riparian vegetation cover data and CFEV stream drainage attributes as inputs.
3. Attribute hydrological and temperature changes to the CFEV wetland and stream GIS layers for each climate change scenario.
4. Conduct a risk assessment by:
 - a) Developing risk criteria (thresholds) for Tasmanian aquatic fauna (fish, platypus, macroinvertebrates, crayfish) and flora (riparian and wetland vegetation) against the relevant hydrological and temperature indicators ('hazards'). This involves using existing south-eastern Australian data on temperature thresholds and flowhabitat requirements of aquatic biota, and identifying thresholds for key hydrological and temperature variables which would pose significant risk to the biota;
 - b) Developing the risk matrices (rule sets) which relate the likely consequences and probabilities of each hazard for the aquatic biota to a level of risk. This will be based on expert elicitation from local aquatic ecologists in a structured workshop combined with data mining from the CFEV database;
 - c) Apply the thresholds and risk rules to the CFEV ecological data set for streams and wetlands, initially in two pilot catchments, then across the entire CFEV statewide dataset;
 - d) Attribute the risk levels to the CFEV wetland and stream GIS layers for each climate change scenario.
5. Identify & rank adaptation options by:
 - a) Scoping potential adaptation management responses within the state Water Management Planning framework with our state water manager partners & selected NRM stakeholders in a focussed workshop;
 - b) Ranking the adaptation responses for each level of risk for each stream & wetland ecosystem type in a second workshop the same workshop group;
 - c) Identify & prioritise the range of adaptation responses for streams & wetlands within each Water Management Planning area for each climate change scenario based on spatial data on risk for each area and the ranked adaptation options, taking into account the connectivity of stream drainage links and wetlands within sub-catchments.
6. Identify Policy & planning needs for effective adaptation at regional, state & national level. Using the outcomes from 5, the requirements for existing and possible future policy and planning instruments will be identified. This will also involve a focussed workshop with policy and planning staff from the relevant Tasmanian and selected invited inter-state agencies.
7. Communicate the project findings, the risk framework, and the policy and planning implications via two dedicated NCCARF meetings/workshops, and seek feedback from a range of state jurisdictional planners' & policy staff.

Dissemination will be via the NCCARF network, and we can refine our technology transfer using via our close links with the National Environmental Research Program's (NERP) Landscapes and Public Policy (LAP) project. The project timing is summarised in the Gantt chart at the end of this section. Stages 5 and 6 require iterative engagement with stake holders and two focus workshops are planned early and mid-way through the project to ensure that the project activities deliver outputs that capture the needs of water management and NRM stakeholders. These engagements are crucial to ensure uptake and use of the project outputs. We will also share learnings from the Tasmanian experience of adaptation and adoption at any NCCARF network activities that coincide with the project's deliverables.