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Case study: Drought and the future of small inland towns- Project



Authors

Anthony S. Kiem, Environmental and Climate Change Research Group (ECCRG), University of Newcastle; Louise E. Askew, Centre for Urban and Regional Studies (CURS), University of Newcastle; Meg Sherval, CURS; Danielle C. Verdon-Kidd, ECCRG; Craig Clifton, Sinclair Knight Merz; Emma Austin, ECCRG; Pauline M. McGuirk, CURS; and; Helen Berry, Centre for Rural and Remote Mental Health, University of Newcastle and Centre for Research and Action in Public Health, University of Canberra.

Summary of the Project

Australia's vulnerability to climate variability and change has been highlighted by the recent (and current) drought situation. For example, a persistent rainfall deficiency over the last seven to ten years has resulted in low inflows into the Murray-Darling system, with some active storages currently at less than 20% of capacity. Droughts are, and always will be, part of the Australian climate and it is impossible to prevent these natural disasters from occurring. There is also the possibility that the frequency, intensity and duration of droughts may increase due to

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anthropogenic climate change, stressing the need for robust drought adaptation strategies. However, answers to the following questions remain highly uncertain:

- what are the effects of long-term drought on small rural towns?
- what are the critical water security issues?
- what options do small rural towns have in terms of drought adaptation?
- do small rural towns actually have the capacity to implement adaptive strategies that are required to mitigate drought related impacts and remain viable into the future?

Two case study sites (Mildura and Donald) have been chosen. Both towns are located in Victoria but each has differing water sources, rainfall/climatic patterns, economic bases, population sizes, and water resource management practices, and importantly both have been strongly impacted by the current drought. For each case study site, this project will:

- place water supply and drought into context;
- identify where drought related problems lie, what the potential solutions are, what adaptation strategies are in place or have been trialled, what decision-making processes were/are in place to arrive at drought management solutions;
- collate information on the experiences of people living with water shortages;
- discuss the likely future under different water resource scenarios, including options for adaptation to drought in the future.

Aim and Objectives of the Project

The objective is to provide, for the two case study sites, a whole-of-government (Federal, state and local), business and community perspective on the:

- context and impact of drought on water supply and availability
- context and impact of drought on society, economy, and mental health;
- adaptation measures being put in place as a result of the knowledge gained from previous drought experiences (e.g. use of alternate water supplies, water reuse, water savings projects, drought awareness programs, change in town focus from agricultural to tourism or mining etc); and
- areas where future adaptation measures need to be developed following subsequent reflection on ways of better preparing for such events (e.g. additional/alternative water supplies, changes in agricultural practice, changes in industrial water use).

Adaptation and mitigation: Identifying low risk climate change mitigation and adaptation in catchment management while avoiding unintended consequences.

Adaptation in industry and business: Climate change adaptation for Australian minerals industry professionals - best practice guidelines.

Adaptation in industry and business: Climate change adaptation - a framework for best practice in financial risk assessment, governance and disclosure.

An assessment of the nature and utility of adaptive capacity research

An assessment of the nature and utility of adaptive capacity research

Methods

The Case Studies

Mildura (Vic): is a rural town of about 30,000 people in the Mallee region of north-west Victoria. The city has a diversified economy, which is based on agriculture, tourism, mining and support services (education, health, welfare etc.). The agricultural and tourist economies are obviously and critically dependent on the Murray River. Irrigators have experienced reduced allocations in recent years: this has led to enhanced adoption of various forms of adaption, but also resulted in growing financial impact on sections of the industry. Management of river levels in weir pools has ensured sufficient water is available to support tourism and recreational activity and maintain town water supplies.

Mildura's dry climate, remote location and lack of alternative water supply exposes it to great risk from prolonged droughts which deplete Murray River system water storages. With Murray system storages already depleted, the city faces such risks now. It is not implausible that within the next few years irrigators will receive zero allocations or even that the Murray River ceases to flow for an extended period. Consequences of either outcome for the irrigation sector would be grave. Impacts would flow through to the remainder of the regional economy. They could result in irreversible changes in the regional economy and society.

The case study will assess the likelihood of such extreme losses of water security and the potential impacts on Mildura's economy and society of loss of security of town and irrigation supplies. It will consider the relative severity of impacts from either scenario. The case study will identify adaptations to recently experienced climatic change among irrigators, urban water consumers and the regional urban water corporation. It will also consider what adaptations may be appropriate given short and longer term climate change scenarios.

The case study will draw on a recent climate change risk assessment and adaptation planning process undertaken by Sinclair Knight Merz (SKM) for the Mallee Catchment Management Authority (CMA). It may also link with work being undertaken for the Rural City of Mildura with funding from the Department of Environment, Water, Heritage and the Arts' (DEWHA's) Strengthening Basin Communities program (yet to be approved). SKM (via Craig Clifton and others) has strong links with key local stakeholders, including the Mallee CMA, Lower Murray Water and the Rural City of Mildura, as well as their counterparts across the Murray River in NSW. Linkages to existing work and stakeholders will help to ensure the case study provides insights which are useful regionally and address project objectives.

Donald (VIC): is a town of about 1700 people and is located in the northern Wimmera region of Victoria. Its economy is based on dryland agriculture (mostly cropping). This was traditionally supported by tourist traffic associated with the nearby Lakes Buloke and Batyo Catyo. The town is located in the lower reaches of the Richardson River, part of the internally drained Avon-Richardson catchment. The region has experienced long-standing reductions in rainfall and urban and rural water security. The natural Lake Buloke has been empty for about a decade, as has Lake Batyo Catyo, a buffering storage for the former Wimmera Mallee stock and domestic channel system. Tourist activity (and the local amenity) associated with the lakes has disappeared. Rainfed cropping has struggled in recent years due to a run of poor seasons, with late (or absent) autumn break and poor spring rains.

Town water has traditionally been supplied from storages dependent on streams flowing from the Grampians, some 50-100 km to the south. These streams have been amongst the most critically stressed in Victoria under the dry conditions of the last decade. The one benefit of the prevailing dry conditions has been the mitigation of impacts from dryland salinity, which devastated the lower reaches of the Richardson Rivers.

This case study will assess historical changes in rainfall, river flows and water security and draw on other work to assess implications of climate change. It will investigate - with stakeholders - how the urban and rural water corporation has adapted to changed water availability and opportunities to extend those adaptations. It will assess impacts of recent and projected climate change on the community and economy of Donald and note challenges to be faced for the community to remain viable. The case study will involve discussions with the local Donald community, the North Central CMA, Buloke Shire, Goulburn-Murray Water, regional health services and other relevant groups.

The Hydroclimatological Context

Objective: Provide perspective on the context and impact of drought on water supply and availability.

The current drought, known as the 'big dry' has been one of the most severe and longest droughts on record. The hydroclimatological context of the 'big dry' and resulting impacts will be provided for each case study based on research findings and methodologies recently developed by members of the research team (e.g. Kiem and Verdon-Kidd, 2009; Verdon-Kidd and Kiem, 2009a, 2009b).

Where and when have similar droughts occurred before and how frequently? How bad is this

drought historically (i.e. how do the impacts of this drought compare with previous droughts? In addition, possible changes in the frequency and severity of droughts in the future will be investigated (e.g. via review of Murray Darling Basin Sustainable Yields, South East Australia Climate Initiative (SEACI) and other projects carried out by members of the project team (see CVs for details)). Insights into how the frequency and intensity of drought may change in the future, and the impacts this will have on small towns, will also be provided.

As well as placing the current drought into perspective climatologically, water supply systems and consumptive trends for each of the case studies will also be detailed. Where is water obtained from? How reliable is this water source in light of (a) recent and future climatic changes and (b) other expected changes (e.g. reduced water allocations, increased demand, increased environmental flow requirements etc).

The Socio-economic Context

Objective: Provide perspective on the context and impact of drought on society, economy, and mental health.

It is well-known that many rural Australian communities continue to endure prolonged drought conditions. How these communities cope and what strategies they engage in when faced by long-term and chronic natural disasters such as drought, is less well understood (e.g. Australian Government, 2008). Thus the aim of this section of the project is to use qualitative research methods to investigate the experience of drought in two communities in the state of Victoria. By focusing on the rural city of Mildura, and the much smaller remote town of Donald, a comparative analysis can be conducted to examine both the specificities and generalities of local impacts from drought. Place specific data allows for a more accurate assessment to be made in terms of a town and community's ability to adapt during lengthy periods of crisis.

As protracted drought periods are one of the features of climate change (e.g. Whetton et al., 1993), it is vital that this project include integrated approaches that consider vulnerability and risk so that an accurate assessment can be made about the town's current and future adaptive capacity. By engaging with community stake holders such as water managers, local government officials, lobby/industry groups (e.g. farmers associations, local chamber of commerce, tourism representatives etc) and other community members and individuals, by way of semi-structured interviews and focus groups, a more accurate description and understanding of the perceived extent of problems can be obtained and analysed. These methodologies open up new avenues of investigation previously unconsidered.

The interviews (with institutional actors representing business and local government bodies etc) will address the effects of drought at an operational level. At the individual level, through focus groups conducted with community members (recruited through advertisement in local newspapers) data will be gathered on the effect of drought on the town and community and on individuals, their families and business, in terms of health and attitudes towards uncertainty. It is important to gain this level of information as it allows for an initial mapping of social vulnerability (Alston and Kent, 2004; Albrecht et al., 2007). Without acknowledgement of this factor, it is difficult to measure what current and perhaps future levels of distress related to financial, environmental, health and psychological problems might be, and what the exact triggers are for these. As Sartore et al (2008) note: 'the stressors affecting farming communities during times of drought are likely to be associated with increased risk [and] mental health problems'. As such, as this research continues beyond the initial stage, further mapping will allow for a greater understanding of the depth of social and economic vulnerability felt and identify where gaps might exist as the community reacts and responds to what many might consider as an ongoing threat to their livelihood.

Situational stresses like potential loss of income or job loss, crop viability, continued farm sustainability and so on have flow-on effects throughout rural communities dependent on farming as an industry. As such, to fully comprehend what a reduction or loss of this might mean for the communities of Mildura and Donald, the initial stage of the project will include social demographic profile research for both towns including an analysis of the socio-economic changes over the last century (e.g. employment, type of industry etc). This will allow for subtle and less subtle changes in the data sets to be recorded and then used to correlate the rate of change during the worst extremes of drought.

While these case study towns are exemplars of the local impact of drought, they provide a necessary key to understanding what is occurring on the ground in other locations. By applying a temporal and spatial scale to this study, it is possible to begin to conceptualize a model for assessing social vulnerability in relation to environmental hazards such as drought and extreme climate change events. The role of social scientists in this study is paramount as social science has contributed to the study and assessment of vulnerability and adaptation to natural hazards for a long period of time. Adger (1999) confirms this noting that 'geographers and anthropologists have identified many ways in which traditional practices allow for greater adaptive capacity, and how a disruption of social cohesion reduces people's adaptive capacity, making them less resilient to environmental stress'.

Existing and Potential Alternate Adaptation Responses

Objective: Provide perspective on the adaptation measures being put in place as a result of the knowledge gained from previous drought experiences.

Objective: Provide perspective on where future adaptation measures need to be developed following subsequent reflection on ways of better preparing for such events

Finally, the research will also consider strategies in place showing where resilience is seen to be occurring and the opportunities that exist for future adaptive strategies (e.g. Grothmann and Patt, 2005; Berkhout et al., 2006; Caldwell and Boyd, 2009). As adaptation in the face of climate extremes is what is needed to mitigate or enhance resilience, a place specific study such as this combining both qualitative and quantitative measures allows for a more holistic approach to the complex issue of drought and how it is manifested locally (Smailes, 2002; Dept. Transport & Regional Services, 2005).

The study of the existing adaptation response will focus on three aspects.

- Water supply and demand strategies in place to reduce consumption and increase reliability of supply (e.g. change in household use, water recycling initiatives, new sources of water supply, increased efficiency in agriculture and industry etc);
- Change in town's planning focus (i.e. has the recent 'big dry' resulted in different sources of employment, industry, agriculture, tourism etc);
- Adaptations to social and health implications of drought and changes in water security.

This stage of the project will also include social demographic profile research for both towns including an analysis of the socio-economic changes over the last century (e.g. employment, type of industry etc).

The data for this component of the study will be obtained through:

- interviews with water managers, local government, lobby/industry groups (e.g. farmers associations, local chamber of commerce, tourism representatives etc.) and other relevant community organisations;
- reference to primary sources (journal papers, government agency reports, newspapers, local government documents etc.); and,
- knowledge held by project team members.

To address the principal objective of this project (i.e. the viability of small towns given declining populations and projected increased intensity/duration of droughts (Argent, 2002)) various potential adaptation options, and the capacity of Mildura and Donald to implement these strategies, will also be investigated. This will consider both incremental modification of existing adaptations to adverse water supply conditions, as well as potential responses to step change impacts of climatic change (e.g. Murray River ceases to flow). Adaptation options will be explored with representatives of key stakeholder organisations in the two communities. Consultation will also explore thoughts on how communities can build capacity to adapt to major changes in water security without disempowering or otherwise disengaging communities (e.g. Lawton, 2006; Moser, 2009).

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