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Voluntary relocation – An exploration of Australian attitudes in the context of drought, recycled and desalinated water

Anna Hurlimann [a,*], Sara Dolnicar [b]

[a] Faculty of Architecture Building and Planning, The University of Melbourne, Victoria 3010, Australia
[b] School of Management and Marketing, University of Wollongong, Northfields Ave, 2522 Wollongong, New South Wales, Australia

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ABSTRACT

Throughout history settlements have been abandoned due to lack of water. Such a fate is of concern to public officials in settlements facing water scarcity – a condition which is anticipated to increase due to the impacts of climate change, and other factors including increasing per capita water use, and population growth. Key questions surround how to best adapt to these circumstances. A strategy little explored is relocation. This paper presents results from a qualitative study conducted in eight geographically diverse Australian locations. The willingness of individuals to relocate under three hypothetical water scenarios was investigated: (1) if the water in their community ran out, (2) if recycled wastewater was put in their community's drinking water supply, and (3) if desalinated water was put in their community's drinking water supply. Results indicate that most people would not relocate if recycled or desalinated water was used to augment their community's drinking water supply, but they would if their water supply ran out. Our results highlight that while there is initial public opposition to the augmentation of existing potable water supplies with recycled or desalinated water, people would prefer these solutions, over being forced to move location. Respondents were highly aware of the social, economic and public infrastructure costs associated with relocation decisions. Relocation would therefore, for most, only be the very last option if their water demands could not be met. However, it was difficult for most to imagine the situation becoming so dire. Our results highlight the importance of a comprehensive and consultative approach to managing supply in water scarce locations.

1. Introduction

Water is a resource which is critical to the survival, integrity and wellbeing of humans and the environment. However, the availability of fresh water supplies is becoming increasingly scarce, and is projected to intensify in the future. In the past, settlements have been abandoned due to water scarcity (Tannehill, 1947; Wilhite, 2005), a fate which most modern public policy officials would seek to avoid. However, little is known about the water circumstances which would drive populations to relocate. For example, there has been documented public opposition to potable recycled and desalinated water supply augmentation projects (Eccleston, 2006; Sydney Community United Against Desalination, 2005), but would this opposition be significant enough to prompt those in opposition to relocate? Or would the community water supply running out be a trigger for people to move?

A review of water related behaviours by Hurlimann et al. (2009) found that limited water related social science has been undertaken to date. Most of the work which has been undertaken has focused on a very narrow range of water-related behaviours. Additionally, the reasons why people engage in specific water related behaviours is little understood. Research into a wider range of water related behaviours is essential, including the behaviour of relocation due to changing water circumstances.

The study reported in this paper contributes to this gap in knowledge by investigating, in the context of Australia, water related circumstances under which residents would consider relocating. Specifically, we investigate the willingness of individuals to relocate under three hypothetical water scenarios: (1) if the water in their community ran out, (2) if recycled wastewater was put in their community's drinking water supply, and (3) if desalinated water was put in their community's drinking water supply. This was investigated through a qualitative study, conducted in eight geographically diverse locations in Australia. Six to ten in-depth interviews and one focus group session was held in each of the locations, providing a rich data set from which to base our analysis. The aim was to provide a detailed understanding of the relocation intentions of Australians under

* Corresponding author. Tel.: +61 3 8344 6976; fax: +61 3 8344 5532.
E-mail addresses: hurac@unimelb.edu.au (A. Hurlimann), sarad@uow.edu.au (S. Dolnicar).

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these three water circumstances and the factors which would influence these intentions.

We begin by providing a review of literature to demonstrate the importance of this research. We then provide details of our study's method before presenting and discussing the results of this research. Lastly, we provide concluding comments which highlight the contribution of our research in this increasingly pertinent area.

2. Literature review

This review of literature is necessarily diverse due to the nature of the paper's subject. We begin by highlighting the importance of water to human and environmental integrity, before detailing the increasing scarcity of water and the various management responses employed to address this. We detail not only the policy and management debates surrounding these management responses, but also provide a précis of the social research undertaken to date. We then emphasise the possibility of mass migration due to water scarcity by providing an overview of historical cases. In doing so we demonstrate the paucity of research regarding people's willingness to voluntarily relocate due to water circumstances – an area to which our research seeks to contribute.

2.1. The importance of water

Water is critical for sustainable development, environmental integrity, the eradication of poverty and hunger, and is indispensable for human health and well-being (United Nations, 2003). Throughout civilisation, the location of cities has been determined by ready access to safe drinking water (Lynch, 1971). In developed nations water use has increased significantly over the past 100 years, particularly with the introduction of sanitary reforms and accompanying piped water and underground sewerage (Davison, 2008). This contrasts with developing nations where such infrastructure is still largely lacking and per capita consumption is still relatively low. At present 1.6 billion people world wide do not have access to an adequate supply of safe fresh water daily, and 2.5 billion people live without basic sanitation (United Nations, 2009).

The ample availability of water is also critical to the success of a city's further growth. As highlighted by Mumford (1989) water is one of the physical limits to metropolitan expansion: as a metropolis becomes more crowded the local water supplies are progressively abandoned for larger reservoirs of water. This is evidenced in cities such as New York (Mumford, 1989) and Mexico City (Falkenmark and Lindh, 1993). With the construction of the Croton system (of reservoirs and aqueducts) in 1842, New York was the first major city to achieve adequate supply of water. However in 1951, a year of drought, the city was dangerously close to running out of water (Mumford, 1989).

2.2. The increasing scarcity of water

Increasing water scarcity is threatening the future of many human settlements. The reason for this water scarcity is often due to a complex mix of factors including increasing population, increasing per capita consumption, increasing pollution of freshwater sources, and climatic changes. The seriousness of water scarcity globally has been acknowledged in numerous declarations by the United Nations (including: United Nations, 2003). Further, the Intergovernmental Panel on Climate Change (2007) recognises the impact climate change will have on water resources – mainly with increasing variability of rainfall, with the specific impacts depending on location. Details of projected impacts of climate change for water resources are detailed by Arnell (1999).

2.3. Responses to water scarcity

There are many possible management responses to adapt to water scarcity, each having different implications for planning, economies, communities and the environment. Water management strategies can range from restricting the use of water (demand management), through to augmentation of supply with additional sources of water (such as the addition of desalinated seawater or recycled sewage into supplies). In many locations, a suite of options are chosen.

2.3.1. Demand management

Water restrictions are often seen as a temporary action to manage a short term shortage (Bailey et al., 1992), although in some instances (e.g. prolonged water shortage such as that occurring in Melbourne, Australia) the on-going use of restrictions is necessitated. There are various ways by which authorities seek to encourage the conservation of water resources, these include but are not limited to voluntary and mandatory restrictions to water use for both residential and commercial users, the use of pricing mechanisms (such as charging for water; charging using an increasing block tariff), and providing financial incentives for the installation of water efficient fixtures and appliances. Research has demonstrated that members of the public hold very positive attitudes toward water conservation overall (including: Dziegielewski, 1991; Murphy et al., 1991; Rea & Parker Research, 2007; Roseth, 2006).

2.3.2. Water supply augmentation

Popular in many developed nations is the augmentation of supply with desalinated or recycled water. Until recently, the desalination of seawater was largely limited to the Middle East – where water shortages were wide spread, but access to relatively cheap energy was available. However given desalination technology improvements (e.g. increasing energy use efficiency) and increasing water scarcity, augmentation of supplies with desalinated water in areas outside the Middle East is increasing. More recent factors for the increase in seawater desalination include political concerns about community attitudes to the alternative of potable recycled water use.

Recycled water use is both extensive and well established in many locations around the world. The first dual system (delivering lower quality water for non-potable purposes through separate infrastructure) in America was built in 1926 to serve Grand Canyon Village (Okun, 1997). There are now over 200 communities in America that are served by dual systems including San Jose, Los Angeles, St Petersburg and Tuscan (Okun, 2002). However non-potable use of recycled water is not limited to the USA, it is used in many other locations including in Israel, Africa and Australia for agricultural use, and for toilet flushing in Japan and Australia. Augmentation of potable water supplies with highly treated wastewater and desalinated water is also increasingly occurring. Direct potable use of recycled water was first implemented in 1969 in Windhoek, Namibia, a water scarce city (du Pisani, 2005), but is utilised in other locations too. A major portion of Israel's wastewater is treated then used to recharge groundwater, which is drawn upon for the nation's potable distribution (Dishman et al., 1989). Additionally, in 2003 the Singapore government adopted indirect potable reuse of 'NEWater' – highly treated wastewater which is added to their potable supplies (Seah et al., 2003).

These supply side solutions utilise centralised infrastructure and require little behaviour change, yet have been met by public resistance in some circumstances. Due to increasing water scarcity in many locations in Australia, a key policy question at present is whether or not potable reuse of recycled water should occur. This has been closely debated in media outlets following a referendum