CHAPTER TWO

Literature Review

> Because risks are risks in knowledge, perceptions of risks and risks are not different
> things, but one and the same.   (Beck 1992:55)

Introduction

Recycling water within urban society is not yet common practice and possibly for this reason the topic is not found in the sociology literature. University based psychology research in the USA generated several academic papers by Bruvold (for example, 1971; 1975) and two PhD studies in the mid 1980s, some of the findings of which are included in this review. A wider search outside the academic social science literature uncovered two Masters in Engineering studies on social attitudes towards water reuse, and these findings and those of Bruvold's industry based investigations are included in the chapter on previous survey research. Several references in the technical literature briefly acknowledge the importance of public perceptions for the successful implementation of water reuse, but that is the extent of the coverage given to water reuse as a socially negotiated entity.

This review of the literature therefore focuses on the obvious social fact that relates to recycling water sourced from sewage, and that is perceptions of ecological and technologically induced risk. Psychology studies dominate the early literature of psychometric assessments of public acceptance of various types of risk. However, there is synergy between the psychological and social investigations that finally reinforce the centrality of socio-cultural influences. Where possible, studies that deal with water issues are included for reasons of direct relevance, however, there is a limited body of work from which to choose.

Beck's (1989, 1992) thesis of an emerging 'risk society' draws a parallel between the driver of modernity, wealth accumulation through scientific and technological progress, and the insidious side effects emerging from that quest. Risk society characterises the now developing era where once invisible ecological and human

endangerment becomes more visible, inducing technological solutions that again reflex on society. The dynamics of reflexive modernisation lie in the fact that:

> Industrial society systematically produces its own endangerment and a questioning of itself through the multiplication and the economic exploitation of hazards. (1992:57)

Although his macro view has received criticism for ignoring the role of voluntary risk, lacking specificity and empirical foundation (Draper 1993, Leiss 2002, Lupton & Tulloch 2002), not relating his theory to postmodernism and not acknowledging that modernity is intrinsically reflexive (Smart 1994, yet see the above quotation), his views reflect other substantive theoretical conceptualisation and empirical research. Presuppositions of the risk society thesis, also taken up by Giddens (1991, 1994a), organise the approach to this review.

Risk characteristics

The emphasis Beck (1992) places on the invisible dangers of involuntary risk are well founded. A long tradition of psychometric, social and cultural studies confirm that risks defined by invisibility are less acceptable than those that can be seen (Fischhoff et al 1978; Fischhoff, Slovic & Lichtenstein 1982; Otway & von Winterfeldt 1982;[1] Sandman 1986; Marris & Langford 1996; Gould et al 1988). Therefore, whether a risk is voluntarily negotiated or involuntarily imposed or encountered is crucial to societal acceptability (Starr 1969; Fischhoff et al 1978, 1982; Otway & von Winterfeldt 1982; Douglas & Wildavsky 1982; Douglas 1986; Sandman 1986; Marris & Langford 1996). The dichotomous nature of related risk characteristics that define acceptance include whether the risk is familiar or unfamiliar; controllable, controlled by self or by others and whether individual mitigation is possible or not; fair or unfair; forgettable or memorable, dreaded, chronic or acute, diffuse as against focused in time or space; an immediate effect or delayed; and natural or artificial (Fischhoff et al 1978, 1982; Otway & von Winterfeldt 1982; Sandman 1986; Marris & Langford 1996; Gould et al 1988).

Benefits arising from high consequence risks do not define acceptance, instead intercorrelations of the main characteristics shape tolerability. Therefore, dread and

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[1] Harry Otway of the Technology Assessment Sector, Joint Research Centre, Commission of the European Communities, Italy; and Detlof von Winterfeldt: Social Science Research Institute, University of Southern California, Los Angeles.

the severity of catastrophic consequences classifies rejection (Fischhoff et al 1978:140; see also Fischhoff et al 1982; Slovic, Fischhoff & Lichtenstein 1984). However, toleration of high consequence risks is more likely if their effect is immediate, they are voluntarily accepted, precisely known, familiar and controllable (Fischhoff et al 1978:143). Those most dreaded or unacceptable are new, higher technologies experienced involuntarily and have delayed consequences for masses of people (1978:147). Although higher risk levels may be accepted for voluntary risks accruing higher benefits, this will only be secured by more regulation to generally lower current levels of risk (1978:149; Gould et al 1988:232-238). A widely disseminated rough guide to risk acceptability developed by Sandman, Weinstein and Klotz (1987) suggests that any combination of risk characteristics will define the level of public outrage, therefore: Risk = hazard + outrage.[2]

Scientists disagree

Sandman's (1986) focus on the 'outrage' public perception element of his equation assumes that scientific risk assessment represented as 'hazard' is unproblematic. Yet, experts disagree on the assessment of risks (Beck 1992, Douglas and Wildavsky 1982, Giddens 1994a), driving their investigations into parts per trillion, leaving more unexplained than before (Douglas & Wildavsky 1982:49).[3] When risks are noticed, they are reduced to formulations which Beck (1992) argues are "open to social definition and construction" (p.22). The scientific experiment of testing is not an objectified process of confirming scientific truth but a process of argumentation and persuasion involving "human agency in the production of agreement about the content of nature" (Pinch 1993:29-30). However, the disturbing fact is not that the experts do not know, it is that they act as if they do (Beck 1992:69). Assurances of safety therefore attempt to compensate for ambiguity of facts (Pinch & Bijker 1989:44).

Economic rationalism or political expediency also shape the definition of hazards. Because scientists disagree, everything is cause and effect "and thus non cause"

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[2] Promoted as a guide to public risk communication; for example, United States Environmental Protection Agency risk communication courses for risk assessors and managers conducted in the USA and Australia.

[3] Douglas & Wildavsky were concerned that in 1982, a manageable list of contaminants of concern were required to be selected from 4.5 million known chemicals. Today, there are over 18 million in the environment (Giger 2002).

leaving the way clear for economic rationalism to drive technology, perpetuating a risk producing society (Beck 1992:33). Experts think in economic terms (Gould et al 1988), concerned with "how much wealth should be sacrificed for how much health" and therefore risk assessment is biased (Douglas & Wildavsky 1982:89; 67). For Marx, in modernity "being determines consciousness", however, in Beck's risk society "consciousness determines being" (1992:23-24). That is, knowledge creates socio-political positions in the short-term which ultimately determine survival. Pronounced disagreement between scientists pushes the demarcation line between science and politics more towards the political camp (Douglas & Wildavsky 1982, foreshadowing boundary work theory, for example Jakku 2000) causing views to become more polarised.

Socio-cultural influences on risk acceptance

A closer examination of the characteristics of 'outrage' reveals that acceptability is also influenced by a range of other factors. Otway and von Winterfeldt (1982) argue that although the physical risk of a technology may be essentially zero, it may still be judged unacceptable for other social reasons. For example, each risk may be regulated by different agencies which in turn shape the political bargaining process (1982:254). Also, some technologies reflect ideological commitments, and opposition may represent deeper social concerns. Therefore, a risk introduced to facilitate economic growth may be rejected due to the anti-growth stance of the local community, or another risk may be seen to cause unwanted dependence on technical elites (1982:253). Mazur (1987) also stresses that social influences are more important than the cognitive perceptions outlined in the psychological model.

Both Mazur (1987) and Renn (1990) are among those who studied perceptions of risk following nuclear accidents. Mazur (1987) argues that responses to risk are socially influenced and, in some cases, the objective nature of the risk mediated by psychic effects will also determine the response. The recovery of support for nuclear power following accidents is explained by the 'innoculation effect' where positive attitudes and awareness of minor incidents are an immunisation against negative events (Renn 1990:156). Those with only a peripheral interest, will use the incident to determine their stance on the issue. Culture represented as mass media has an overarching influence that leads to the 'social amplification of risk' and

influences the psychological, social, and institutional processes that either heighten or attenuate individual and social perceptions of risk (Renn et al 1992:144-146). The scope of exposure is ascertained from the media and this shapes risk perception to make risk judgments. Behavioural and communication responses to risk information act as 'amplification stations' and will vary according to individual, group or institutional status, or individual roles as either private citizens, employees, or members of social groups or public institutions (Renn et al 1992:140).

Therefore, risk society is "also the science, media and information society" (Beck 1992:46; 2000; also Lash 1994 and Giddens 1994c). The aesthetic dimension of reflexivity (Lash 1994) involves emotion as well as cognitive insight (Giddens 1994c:197). 'Cultural outrage' selection will be guided by both cultural symbols and mass-media information and mobilised by the educated middle classes when they perceive that their lifestyle, the "fruits of their labour", is threatened (Beck 1995:124). However, using the example of hazardous waste, Szasz (1994) agrees with Lash's 'regime of signification' and argues that visual icons are more figurative than discursive and help move the fact of damage to politically salient awareness over time (pp.57-58). When fear and dread are amplified through a range of media, this also mobilises the lower middle-class and working class, particularly women. The driver could be a natural or human-made disaster, or a stakeholder initiative that motivates contending stakeholders to "win public and policy-maker support" (Miller & Parnell Riechert 2000:53). Such environmental populism is reignited by the heuristic of availability when an issue is likely or easy to imagine, underlined by an historic instance (Szasz 1994:56,64). When representativeness and availability are used for judging uncertainty, once uncertainty is interpreted or a scenario is constructed through experience or available images, it is difficult to view it in a different way (Tversky & Kahneman 1973:229-31).

Media reports sometimes boost the newsworthiness of health risk items and therefore ratings by strategies such as scientific alarmism, disinformation and information confusion in the form of 'magic bullets' that are catchy and simple to communicate (Wigand 1994:209). An examination of newspaper reports of four events – drought, salt water intrusion, low water levels and toxic pollution – determined that remote consequences of an event were reported as more severe than

local consequences, and all events were attributed to natural rather than social or technological causes (Spencer & Triche 1994:199). Social constructions of news therefore may reflect economic and political power, local cultural worldviews and monocausal frames of news items. The issue is framed for news media attention and the media, in turn, modifies the framing for their own purposes, capitalising on the conflict between stakeholders (Miller & Parnell Riechert 2000:53). Salience of an issue develops from the cyclical nature of awareness and risk communication where increases in media coverage increase concern (Canter et al 1992; Griffin, Dunwoody & Zabala 1998) and particular events promote generalised concern as in the case of water treatment plant accidents and pollution (Eiser, Reicher & Podpadec 1994).

As a source of risk information, the mass media has the greatest influence at the societal level, but interpersonal channels and self efficacy are also important (Coleman 1993). Griffin and Dunwoody's (2000) study of lead contamination in Milwaukee found no direct association between information broadcast by the mass media and preventative behaviour; personal behaviour correlated strongly with interpersonal communication with health professionals. Social cues are strong predictors of perceptions of seriousness of risk, such as beliefs about the extent of concern by others and how the individual's situation compares with that of others (Sandman et al 1987; Renn 1990) and knowing others who are making preparations to prevent or ameliorate disaster (Mileti & Fitzpatrick 1992). Normative influences such as the opinion of family and peers are important in determining acceptable levels of water quality risk (Canter et al 1992), along with the idea of territory, the obtrusive nature of environmental problems and levels of trust in sources of news (Gooch 1996). Researchers urge that greater emphasis should be placed on local knowledge and the sociological formulations of norms, beliefs, patterns and practices of everyday life (Rinne 1998; Schmuck 1998; Peuhkuri 2000; Beehler, McGuinness & Vena 2001).

Local environmental threats by themselves do not necessarily motivate local concern or action (Turnquist 1994). Those exposed could be in denial of the risks in line with the theory of 'cognitive dissonance' (Gregory 1995:64). The hazard has become known and familiar to them and their experience is that it is not threatening

(1995:66). This appears to be the case for the technically induced hazard of farm chemicals (Tucker & Napier 1998; 2001). Yet, a lack of knowledge may explain the lack of preventive measures which correlates with poor risk communication (Lave & Lave 1991:265-267). Only belief that a problem could exist in one's own home induces action; for example, flood evacuations are more likely when the message is locally delivered by mobile amplifiers (Sandman et al 1987:101-102). However, adverse experiences heighten concerns and motivate precautionary behaviour (Taylor, Stewart & Downton 1988:171; Lichtenberg & Zimmerman 1999). Prior experience as well as knowledge mediate communications of risk, as in the case of groundwater contamination (Fessenden-Raden, Fitchen & Heath 1987).

A more traditional concept of the cultural effect is put forward by Douglas (1966). Society's culturally shared belief that "sacred things and places are to be protected from defilement" has its roots in Judaeo Christian culture (1966:1). Ideas about dirt are not so much a reflection of hygienic values as symbolic systems; it is matter out of place, for example [clean] shoes on the dining table (1966:36). Within the chaos of shifting impressions, we construct a stable world in which objects are located in depth, have permanence; and in perceiving, we are building, taking some cues and rejecting others. Acceptable cues fit easily into the pattern being built; ambiguous ones are liable to be treated as if they harmonise with the rest of the pattern, but discordant cues tend to be rejected. Labelling affects the way they are perceived next time (1966:36). This claim is demonstrated in labelling theory and stigma within the sociology of deviance. In relation to water sourced from sewage, it also resonates with cognitive heuristics, including availability noted earlier. The probability of complex events are assessed through their similarity to the original or memorable one (connotative distance), or the frequency (associative distance) of the event (Tversky & Kahneman 1973:208).

Cultural meanings behind routine practices that may involve water may also be fantasized. With respect to potable water reuse, Campbell's (1987) theory of the romantic ethic of modern consumerism is relevant. Campbell (1987) distinguishes modern hedonism from the traditional form. While traditional hedonism anticipates pleasure through memories, the contemporary hedonist crafts illusion into unique

products where the individual as day-dreamer has the central 'starring' role (1987:61-69;77-79). Campbell observes that "fantasizing would seem to offer an escape not merely from a world of boredom, but also from one of failure" (1987:80). The real nature of things are becoming less important than their dream material potential (1987:89). Therefore, learning that water is partly sourced from sewage or that potable reuse is proposed may destroy or threaten illusions of mountain stream freshness of drinking water, daily showering and occasional spas.

Expert versus lay perceptions of risk

Consequently, for a wide range of reasons, the expert view of risk is liable to differ from that of consumers, or the lay public. Beck (1992) argues that "science determines risks and the population perceives risks", effectively dividing expert calculations from the views of the lay public (p.57). The extent of irrationality and hostility towards technology is determined by the deviation from this pattern (1992:57). Although the potential for 'out of specification' performance always exists in engineered systems (Haas & Trussell 1998), engineers generally assume that once the public are given the facts, they will be convinced of the safety of a proposal (Douglas 1986:21; Beck 1992:58). Scientists and technologists use a narrow definition of risk (Hohenemser et al 1983; Beck 1992), are inclined to think only in economic terms (Gould et al 1988; Beck 1992), and risk assessment[4] ignores the subjective and uncertain nature of the process (Beck 1992; Wartenberg & Chess 1992). Experts place more importance on immediate consequences and have greater trust in the regulatory system than the public (Webler et al 1995), and they tend to stereotype the public in a most unscientific way (Fischhoff et al 1982; Beck 1992; Gregory 1995) as an homogenous group that is ill informed, "epistemically vacuous" with only "emotional wellsprings of culture and ephemeral local knowledges" (Glasner 2000:136).

Some of the consequences of conflictual views, is that the reflexive nature of risk and risk assessments further politicises and democratises science. This is achieved through the grass-roots formation of citizens advisory committees (Reinking & Birkholtz 1982), the rise of 'popular epidemiology' of gathering evidence from the

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[4] The four stage process of hazard identification, exposure assessment, dose-response modelling plus summary estimates from the first three stages (Wartenberg & Chess 1992).

community that includes the effects of structural factors (Brown 1995), with opposing factions using contrasting risk assessment paradigms to support differing claims that reflect and reinforce conflicting core values and interests (McMullan & Eyles 1999), and the rise of counter-experts through self-education employing non scientific forms of argument such as morals and emotions when the issues may have enormous public impact, for example, the human genome project (Glasner 2000:137). It is as Beck (1992) observes: a more comprehensive, scientific elaboration of hazards is being manufactured by the once lay, now risk-aware public to politicise problems sufficiently for traditional science to acknowledge (1992:57-59, 61).

Szasz (1994) observes that politicisation of the problem can lead to regulatory policies that encourage risk prevention. However, the central concern of Douglas and Wildavsky (1982) and Douglas (1986) is that egalitarian lobbyists from the border have become too powerful and voluntary organizations such as public interest groups induce bureaucratic over-regulation of the market sector. Their ethical, social theory derived from anthropology proposes a shift in attitudes from border pessimism towards centre (market, bureaucratic) optimism to accept a higher level of risk. The authors argue that risk taking promotes environmental resilience while alleviating the economic burden of tighter regulatory controls (1982:195-198). Risk assessors embrace this view, claiming that risk aversion may lead to the imposition of risks into less affluent societies and future generations (Renn et al 1998:36). Yet, it is argued that increased regulation may help to avoid irretrievable damage to the environment. Such secondary, ecological consequences not only reflex on the production centre through the boomerang effect (Short 1984, Beck 1992) but, as outlined in the concept of the ecological footprint (Rees 1997), unfettered Western urban production and consumption is ultimately unsustainable.

Additionally, it is confirmed that concern for under-regulation of technological risks cuts across traditional socio-demographic lines (Gardner & Gould 1989); both centre individualists and hierarchists, as well as border egalitarians, condemn risks that are not regulated and evaluated appropriately (Marris & Langford 1996:39). Both experts and lay public agree on the need for strict regulation of most risks, including sewage treatment, effluents, chlorination and water sports (McDaniels et

al 1997:350). Current regulations, for example in the case of the land application of sewage sludge in the USA, fail to take into account some of the concerns of experts and most of the concerns of citizens (Webler et al 1995:432). In Australia, Nancarrow, Jorgensen and Syme (1995) find that the public's high standard for environmental water quality is not being met. And while aesthetic properties deter acceptance of tap water (Dillehay, Bruvold & Jacob 1969; Syme & Williams 1993; Jeffrey, undated; McGuire 1995; Jardine et al 1999; Owen 2000; ABS 2001), it is recommended that water utilities go beyond health-related regulations to meet customers' highest standards for taste (McGuire 1995) and provide credible evidence for causes of odours which may indicate the presence of contaminants (Jardine et al 1999).

Recent ABS (2001) figures report that 27% of Australians are dissatisfied with the quality of tap water for drinking. Although this level of dissatisfaction has declined since 1994, there are more people using bottled water (around 15%) while use of other sources such as mains water, rainwater and bore water has remained static; there is also an increase in the use of water filters (now 21%). As a main source of drinking water, the use of bottled water has increased from 2% in 1994 to 7% (ABS 2001:42). South Australians are the most dissatisfied with tap water, dissatisfaction has increased, 10% do not drink tap water, and the state is the highest user of bottled water and rain water tanks as a main source for drinking water (24% and 33% respectively; ABS 2001:41-42). Nationally, reasons for dissatisfaction of tap-water quality are mainly for taste (52%) and chlorine (32%), followed by 'dirty' water, odour, colour and contamination (16% to 14% respectively; ABS 2001:43). The increased use of bottled water in Australia may be slightly affected by its widespread use in South Australia, as well as its [lack of] taste and perceived overall higher quality.[5]

The role of trust
As these accounts suggest, strict regulatory controls are important factors in theorizing trust. Short (1984) identifies a reflexive relationship between institutions

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[5] Correlations between dissatisfaction and alternative sources of drinking water have not yet been explored by ABS.

and risk and argues that the acceptability of risks "are a function of the degree to which the institutions which are responsible for the assessment and management of risks are trusted" (p.714; also Douglas & Wildavsky 1982:89; Collins & Pinch 1993:148). Either through active engagement or withdrawal, risk alters the social fabric of society (Short 1984; Martin & Halpin 1998 and Lockie 2000 in relation to Australia's Landcare movement). Beck (1992) argues that instead of wealth accumulation, risk society has the potential to produce the "immiseration of civilisation" (pp.53-57); the side effects of the secondary effects materialise as "lost security and broken trust" (p.28). Secondary social or economic consequences include liability, insurance costs, alienation from public participation (Renn et al 1992) or public gridlock (Rosa & Clark 1999) resulting from a loss of institutional trust.

Giddens' (1991) work draws out several important concepts from the risk thesis in relation to trust. He agrees with Beck that no one escapes the unsettling effect of a risk climate (1991:124). In contrast to Douglas (1986), he argues that all individuals are constantly alert to signals that relate the here-and-now to distant events and they are able to go about their daily business, not because of social pressures which train their thoughts to the middle-ground (Douglas 1986:99), or because of institutionalised blindness or apathy (Douglas & Wildavsky 1982:194; Beck 1992:33, 60), but because of 'basic trust' expressed as a "bracketing-out" of issues which could cause alarm (Giddens 1991:127). This protective cocoon of ontological security makes possible Irving Goffman's *Unwelt,* an accomplished normalcy of regularised action, and for today's individual, has broadened to include awareness of high consequence risks (1991:28, 127-8). The ability to 'go on' despite existential anxiety is enabled through reflexive, 'non conscious' monitoring (1991:35-36). This concept is similar to the *habitus* understood as Bourdieu's (1993) system of a 'natural' disposition of non-conscious, learnt thinking and practices and is taken up by Misztal (1996) as one of three forms of trust that builds social capital.

Giddens (1991) argues that the intrusion of abstract systems into everyday life influences the reflexive project of the self. Systems such as water supply and electricity have become part of the taken-for-granted conditions of modernity that

build ontological security (Giddens 1990:113). Statistics show that the biggest advances in overcoming life-threatening diseases occurred between 1907 and 1977 through the provision of safe water and sewage disposal (1991:115). However, threats to established modern lifestyles revive moral and existential questions for public debate (1991:224-225). As Garfinkel (1967) observes, the violation to the rules of everyday social practice may appear unpleasant and threatening. When personally faced with decisions that are highly consequential, Giddens (1991) suggests individuals either revert to safe, traditional beliefs and practices or they may re-skill in order to overcome the problem. Thus, 'fateful moments' mark a break in the normal routine of ontological security and force the individual to "sit up and take notice of new demands as well as new possibilities" (1991:142-143).

Risks are institutionalised within frameworks of trust (Giddens 1990) because "the reflexivity of modernity turns out to confound the expectations of Enlightenment thought - although it is the very product of that thought" (Giddens 1991:21). The promised infallibility of enlightened science-lead development is inherently flawed. Science is only recognised as science if it is falsifiable and hence the effect of risk emerges (Beck 1992:54). Giddens (1994a) contrasts Weber's traditional trust, based on personal loyalty under a guardian master of formulaic truth who held legitimate authority, with its modern equivalent. Now, the individual's relationship to abstract, expert systems is like that towards a stranger; basic trust involves a pragmatic or fatalistic attitude and requires active engagement between the individual and the expert system, because trust can be withdrawn or revised if technical competence waivers (Giddens 1991:121; 1994a:84-89). This form of trust is recognised as system trust whereby trust is invested on the assumption that others trust the system ([Luhmann 1979:75] Lane 1998:16). Giddens (1990) argues that 'access points' strongly influence attitudes of trust through interaction between laypersons and the professional or system representative, and can be sources of vulnerability for the abstract system. 'Active trust' is developed and sustained in association with social reflexivity through educational, regulative and material support to allow individuals and social groups to be proactive rather than "have things happen to them" (Giddens 1994b:15, 155).

Other notable theories of trust include the cross-national comparison by Fukyama (1995) who aligns levels of trust with the capacity to meet the challenges of a global economy. He concludes that the USA is experiencing a crisis of trust and that it will be impossible to imitate the culturally embedded high trust established in societies such as Japan and Germany. As a result, the decline in social capital and emphasis on individualism in the USA will hamper its ability to compete in the global economy and weaken its democratic political institutions (1995:361-2). This direct correlation between trust and economic success is flawed, particularly after the economic collapse of the 'Asian tigers' that includes Japan, and in the recent public exposure of entrenched corruption of big business in the USA. Also, Misztal (2001) points out that because democracy is about controlling, distributing and limiting power, healthy distrust is essential for democratic progress.

Misztal (1996, 2001) appreciates both top-down and bottom-up influences on trust building. Cooperation in civil society is shaped by the state through the role of legal and political institutions in generating trust relations (Misztal 2001:379-380). Legal regulations allow "one to believe that the individuals in the situations are trustworthy" (2001:381). If state support is lacking to secure people's basic rights, goods and services, they will turn to associations that will protect their rights and interests (2001:380). Focusing on social order Misztal (1996) identifies three types of trust as social capital. In addition to trust as a form of Bourdeu's (1993) habitus mentioned above, trust as passion promotes cohesion and is practised within family, between friends and in society as a whole (Misztal 1996:98-101). Trust as policy achieves a collaborative order for "handling the freedom of others" ([Dunn 1988:73] Miztal 1996:100) and promotes solidarity, toleration and legitimacy. The long term survival of democracy depends upon a just and fair institutional order as well as upon a civic culture of trust and personal and social responsibility for others (2001: 381).

Mollering (2001) explains that the trusting process involves interpretation, suspension, followed by expectation, being the outcome of the process. In emphasising the leap of faith involved in suspension, Mollering (2001) refers to the influential work of the original theorists. Luhmann follows Simmel's claim that trust involves a blending of knowledge and ignorance ([1979:26] Mollering

2001:408; Simmel 1950:318). This confidence relies on affect, or a "faith" which rests on limited and not full knowledge (Simmel 1950:318). The "surrender of the ego" that enables this faith may "rest upon particular reasons but is not explained by them" ([Simmel 1990:179] Mollering 2001:405-6). Luhmann argues that the main function of trust is to simplify complexity in the social world ([1979:26-27] 2001:409). Mollering (2001) encourages researchers to adopt a reflexive, hermeneutic approach in studying the leap of faith involved in suspension for, as Luhmann ([1979:26]) suggests, the reasons articulated by those who trust are more to uphold "self-respect" and provide social justification (Mollering 2001:409, 416).

Sztompka (1996, 1999) provides a model based on empirical research in post-Communist Poland that can be used to analyse and explain the process of trust or distrust in a given society or social setting. This is the culmination of his earlier work that reflects Alexander's (1990) observation that although faith in progress has diminished and disappointment permeates the core of modern life, most social theorists "have not given up on science as a hope and none has given up on reason as a possibility" (pp.82-83). Social praxis changes the characteristics of both structure and the actors involved and therefore agency is shaped by the inherited tradition, the 'push of the past' (1990:253). At the same time, the 'pull of the future' influences agency, derived from existing structure and actors' imaginations for the future. This process is in continual motion: inherited, changed agency is the existing phase of a process which becomes involved in a new praxis at some point in the future. The constraining and enabling conditions of the natural environment, such as scarcity of resources, both influence agency and are shaped by social praxis (pp.252-253). Whether the social praxis can be described as a progressive ideal type or regressive, or any combination of the two, depends upon the empirical embodiments of agency (1990:257).

In the 'social becoming of trust' Sztompka (1996) includes recent ideas of trust (particularly Giddens) and posits an ongoing process of transformation where trust is considered as a "cultural resource indispensable for viable agency" to negotiate the future (Sztompka 1996:38). The process involves the background variables of a trust culture which are further shaped by human agency. This develops through the independent variables of structural opportunities for positive or negative

experiences and mediating variables of social mood and collective capital that encourage truth or suspicion (1999:132). The resulting social praxis effects changes in the structure and the endowment of agents "modifying the field of opportunities for future praxis" (1996:38).

This process has the potential for self amplification so that a 'virtuous loop' enhances the inherited trusting culture, while a 'vicious loop' festers from a culture of distrust, where trust is withheld and results in a culture of suspicion (1996:121). Various social objects of trust are: generalised, as in the constancy of the surrounding social and material environment that provides ontological security; institutional, such as science and the economy; and technological, provided in Giddens' abstract systems of technical or professional expertise that organise large tracts of everyday material and social existence (1996:41). All of these objects of trust can be reduced to human actions, because bets of trust are made on the expectation that "we expect certain beneficial actions" (1999:42).

Sztompka (1999:122-125) describes five macro-societal circumstances that provide the opportunities conductive to a trusting culture. These are abbreviated below with the more localised rather than national conditions of water recycling in mind:

1. Normative coherence is the viable enforcement of norms such as law, morality, custom, to ensure social life is unproblematic, secure, orderly, predictable (similar to Giddens' protective cocoon). Norms demanding honesty, loyalty and reciprocity promote existential security.

2. Stability of the social order established from a persistent network of groups, associations, institutions, organisations and regimes that provide reference points for social life, feeling of security, support and comfort. Meeting obligations and reciprocating trust becomes an unproblematic, habitual response. When social change occurs it should proceed gradually, regularly, predictably, in a consistent direction.

3. Transparency of the social organization that provides information about the functioning, efficiency, levels of achievement, as well as failures and pathologies of groups, associations, institutions, organizations and regimes. If these are openly reported and are easy to understand, people are assured of what they may

expect. More importantly, failures and breakdowns will not take anyone by surprise.

4. Familiarity of the environment, the immediate 'life-world' – nature, technology, civilisation – that surrounds people. The environment includes designs, colours, tastes, smells and images. Acceptance of a new environment will depend upon its similarity to the one that has been displaced.

5. Accountability of other people and institutions. Regularity of procedures are safeguarded if there is an accessible, properly functioning set of institutions setting standards and providing checks and controls of conduct. This represents an insurance, a back-up in case obligations are not respected.

The justifications for investing trust are made directly through reputations that build over time due to dependability and efficiency that may be influenced by appearances, such as a business suit, or behaviour and status. Indirectly, accountability derived through regulatory controls and standards builds trust (1999:43). Breaches of trust result in a "disproportionately strong backlash" that has dysfunctional consequences: those that formerly invested trust either become hostile or apathetic, resigned and withdrawn (1999:44). By contrast, enduring trust serves to build a healthy political culture, interpersonal trust, vertical trust in public institutions, the cultural capital of high-status groups, the social capital of networks of spontaneous, voluntary associations (quoting Putnam, Sztompka 1996:15), and postmaterial values for quality of life and subjective well-being (from Inglehart; 1996:15). Of particular relevance, trust is a "prerequisite for political participation, entrepreneurial efforts, readiness to embrace new technologies" (1996:15).

The causal factors of trust are located in the structural factors of the historical dimension of trust and personal endowment of the agents. Therefore, the social conditions may provide the structural opportunities for taking 'bets of trust' but these will only be taken up if actors are aware and are willing to explore such opportunities (1999:121). A systematic examination of these factors will point to implications for policy-making so that societal weaknesses may be strengthened through reshaping institutions to enable positive structural changes that may enhance the level and breadth of education of the actors involved (1999:137). The

type of education recommended by Sztompka includes not only factual knowledge, but information that repairs the social fabric of society. Information that strengthens the family, evokes traditions, promotes moral values and encourages public debate will result in demonstrations through everyday experience where trust is rewarded and breaches of trust are punished (1999:138).

From the literature, a lack of trust in government sources of information is reported at the height of the BSE[6] threat (Marris & Langford 1996), following a serious fire event (Baxter, Eyles & Willms 1992), and during a lead contamination incident at Milwaukee (Griffin & Dunwoody 2000). Generalised distrust towards water companies results when they fail to meet information needs (Owen 2000). People place more trust in information provided by family and friends (Marris & Langford 1996) and health professionals (Marris & Langford 1996, Griffin & Dunwoody 2000; Owen 2000:210-212). Water quality perceptions strongly relate to levels of trust in water authorities (Syme & Williams 1993; Mol & Spaargaren 1993; Roseth 2000; Owen 2000) and when trust is breached, structural modifications are required to restore trust in the system. For example, strict treatment, monitoring, and public reporting requirements following the 1993 Milwaukee *Cryptosporidium* disease outbreak (Griffin & Dunwoody 2000) the 1998 Sydney Water incident (Hogarth 1999) and the Walkerton *E Coli* tragedy when seven people died and 2,000 became ill in 2000 (Holme 2002).

Dismantling the nature:culture divide
To meet the challenge of the dire forecast of risk society and achieve the utopia of a safer society, Beck (1992) visualises a 'community of fate' working together to produce practical solutions (reflecting Short 1984:718). However, the artificial divide between nature and society needs to be recognised precisely because the origins and consequences of environmental problems are social problems (1992:80-81; Latour 1993). As Giddens (1990) explains, the unintended consequences of design faults and human error in socialised nature are also found in social systems, and any one system operates in the context of others (1990:151-153). Therefore, all are affected by reflexivity, or the circularity of social knowledge, because the

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[6] The Bovine Spongiform Encephalopathy (BSE), 'mad cow disease' hazard experience in Britain in the mid-1990s.

transparency gained by new knowledge alters the social world and its institutions as well as socialised nature that includes the technology of abstract systems (1990:153; 1994b:84-100). All branches of science must break through their respective cultural and political constraints[7] in order to collaboratively reassert the primacy of knowledge (Beck 1992:82). Beck and Beck-Gernsheim (1996) echo Giddens' (1994b) concept of utopian realism; sociology should "develop a sense of possible reality" (pp.45-46).

Ecologically sustainable development

At least a partial meeting of the sciences is discerned in the discourse of ecologically sustainable development. Ecological modernisation theory proposes an ecological switchover that marks the end of unspecified economic growth to enable the ecological reconstruction of modernity's institutional organization ([Huber 1985] Mol & Spaargaren 1993). Mol and Spaargaren's (1993) development of the theory focuses on the central institutions of society engaged in solving the ecological crisis. The ecology is being centralised through its 'economisation' involving eco-taxes, valuations of natural resources and other price mechanisms that encourage ecological production and consumption (1993:437-438). Hajer (1996) suggests that the ideal-typical interpretations of the theory of institutional learning, technocratic project and cultural politics cannot be taken on face value and will require further analysis of the social and cultural consequences of their adoption. Beneficial super-industrialisation assumes synergy between environmental protection and economic development (Cohen 1997) and this will depend upon the opening up of policy-making practices (Jokinen 1998).

Empirical research suggests there is little evidence that the theory is being realised in practice in Europe (for example, Reitan 1998; Sonnenfeld 2000) and that it requires reforming to suit industrialising economies (Frijns, Phuong & Mol 2000:257). Its underlying consensual assumptions are threatened by distributional conflicts and strong institutional interests that inhibit an integrative approach (Reitan 1998) and its success in each national context will depend upon available political opportunity structures (Van der Heijden 1999:199). However,

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[7] Reflecting Thomas Kuhn's (1962) scientific paradigm shift.

environmental considerations are being recognised by professionals in planning (Rinkevicius 2000), policy discourse (Jokinen 2000) and in practice (Cohen 2000).

In Australia, the theory is not cited, however, institutional reform is acknowledged by environmental sociology. Environmental issues have become routinised through the Green Party and appropriated by the major parties (Pakulski & Crook 1998). Decline in environmental group membership between 1990 and 1996 supports the routinisation thesis, where mainstreaming of pollution and waste disposal issues are effecting recycling and changes in material consumption (Tranter 1999:342-345). The discourse of sustainable development has "raised awareness of possibilities for promoting development without harming the environment" which has influenced quality of life values, environmental legislation and other widespread initiatives (Papadakis 2000:95).

Levels of concern about the state of the environment fluctuate over time. Some 56% of Australians nominated the environment as a major national issue in 1990, a concern that has persisted since the mid-70s (McAllister & Studlar 1993:356-358). More recent data shows that in 2001, 62% were concerned, dropping from 75% in 1992 (ABS 2003). The proportion of the population nominating the environment as the most important social issue jumped to 26% in 1989 from around 4% in the 1970-80s, levelling to around a fifth of the population in the early '90s (McAllister & Studlar 1993:355; Crook & Pakulski 1995:43), and falling to 9% in 1999, trailing behind health, crime, education and unemployment issues (ABS 2002). This may suggest that the environment is perceived as receiving due attention through sustainable policies in comparison to social issues that appear to remain unresolved.

Beck (1992) predicts active concern from the educated middle classes that embrace postmaterial values while Szasz (1994) suggests that the lower socio-economic groups, particularly women, are also motivated to action through fear and dread. As these views suggest, socio-demographic bases for environmental concern varies. USA environmental sociologists van Liere, Kent and Dunlap (1980) report a negative relationship with age and a positive association with education. However, the weak association with occupational prestige and ambiguous results for income do not suggest a postmaterial worldview. The little research on gender suggests no

substantial association, and although Democrats are more concerned than Republicans, the association is much stronger for liberals (1980:191-192). In Australia, the ABS (2003) reports that since 1992, all age groups show less concern for the environment, with the least indicated by the youngest age group (18-24 yrs) and the most concern (almost 70%) by 45-54 year olds. Higher incomes and education are also associated with concern (ABS 1996).

Attitudes towards ecologically sustainable development can be identified in 'green' and 'brown' concerns. The New Environmental Paradigm (NEP) is replacing the western, anthropocentric Human Exemptionalism Paradigm[8] with the philosophy that humans are part of the natural world, governed by it and face the consequences of violating its rules (Catton & Dunlap [1978]; Dunlap & Van Liere [1984] cited in Arcury & Christianson 1990). The NEP worldview recognises limits to growth, the wise use of natural resources, and that technology can cause new problems while solving others (Arcury & Christianson 1990:389-390). In Australia, Crook and Pakulski (1995) report that environmental concern is dominated by everyday brown issues of pollution control which have no specific cultural, socio-political milieu, while green concerns of the new social movements reflect postmaterial values.

Risk perceptions
Women generally perceive greater risk than men (Pilisuk & Acredolo 1988; Gould et al 1998; Cutter, Tiefenbacher & Solecki 1992; Barke, Jenkins-Smith & Slovic 1997; Kellerhals, Languin & Pattaroni 2000). More concern is demonstrated by women, minorities and the less educated about contaminated drinking water, nuclear war and other technology-induced hazards and this centers on the belief that benefits of technology have not resulted in their improved social status (Pilisuk & Acredolo 1988:17). An explanation for women's concern about environmental risks is suggested in gender-structure (Gustafson 1998) and ecofeminism (Cutter 1993:26). Male decision-makers uphold rational, scientific views isolated from emotion that undervalue the nurturing philosophy of ecocentric views (1993:26). Women's opinions are considered external to the decision-making of technical elites and they are ignored as citizen activists being considered irrational in their attempts

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[8] Human rule over the natural world.

to subvert progress (1993:27). Higher education and income levels are also associated with greater toleration of risk (Kellerhals et al 2000), however, women scientists have been shown to perceive significantly more risk even when controlling for age, training and attitudes toward technology (Barke et al 1997).

Closer scrutiny of why white males have lower ratings of risk perception than females and blacks, reveals significant correlations with political conservativism, trust in institutions and authorities and anti-egalitarian attitudes; for example they are inclined not to allow citizens' decision-making in areas of risk management (Slovic 1996:17-18). Risk takers see less risk in the world because they can create, manage, control and benefit from many major technical risks and activities, therefore the role of power, status, alienation, trust, perceived government responsiveness and other sociopolitical factors are important (Slovic 1996:19). Blacks are more willing than whites to be involved in pollution reduction measures such as recycling and it is suggested that the motivation may lie in the fact that blacks may be more at risk than whites due to the siting of hazards in their neighbourhood (Cutter 1993:28).

Environmental behaviours
Influences on recycling and conservation have been explored. Non recyclers require financial incentives to recycle and personal inconvenience is also a factor (Vining & Ebreo 1990; Almanzar, Sullivan & Deane 1998). Recycling is associated with greater familiarity and knowledge about what is recyclable, learned through sources of information such as the radio and friends (Vining & Ebreo 1990:67). Environmental concern is the same for both recyclers and non recyclers and the self reported category "social reasons" has the least power to motivate (1990:67). Recyclers are more likely to be older and report higher income levels (1990:66). Conversely, lower socio-economic level participants conserved more water than all other groups in Thompson and Stoutemyer's (1991) study of the effects of 'the tragedy of the commons' education.[9] Awareness of the consequences of not conserving water was effective in Sherrod's (2000) study along with ascription of

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[9] The longer term consequences of overuse of water.

responsibility. In the UK, water metering promotes greater conservation when perceived water shortages are severe (Van Vugt & Samuelson 1999).

Predictors of taking action to combat water pollution suggest the influence of knowledge and acceptance of responsibility. Knowledge mediated by emotive arousal and assessment promote environmental activity (Syme, Beven & Sumner 1993). However, knowledge of the sources of stormwater is low and, along with recreational benefits, is not a predictor of community action in Australia (Nancarrow, Jorgensen & Syme 1995). Responsible feelings for the environment and 'good citizen' attitudes are more important (1995:166). A total of 52% are willing to pay for stormwater pollution abatement measures with only 55% agreeing with the 'polluter pays' principle (1995:164). In South Carolina, respondents are knowledgeable about causes of pollution and are also willing to pay to clean up their watershed environment (Redburn, Bundy & Feindt 2001). Whereas, weak knowledge in the upstate New York watershed correlates with unwillingness to make sacrifices to protect the environment and preference is shown for litigation against the city (Stycos & Pfeffer 1999).

Water reuse

Greater support for potable reuse[10] correlates with higher education and belief that science provides superior methods of purifying sewage in comparison to natural methods in Bruvold's (1972) study. Belief of the need for additional water supplies and frequency of visits to facilities irrigated with reclaimed water were weak predictors of higher contact uses (1972:24-27). Ecological and environmental considerations including pollution abatement, as well as cost, were also insignificant (1972:31). In Rao's (1985) study, information on purification technology had a strong positive impact, while wastewater and raw water composition were inconsequential. Sample bias may explain the result[11] because psychological repugnance, purity and disease risk concerns explained most of the opposition to uses of reclaimed water in Bruvold's (1972) research. And in Fathaddin's (1985) study, reliability of the technology, professionalism in management and improved

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[10] In this case, water recycling for laundry, swimming and drinking.
[11] For this USA PhD study, interviewees comprised 234 undergraduate psychology students.

quality control concerns determine uncertainty; inferring a lack of trust in the proposed system.

When respondents were given details of four alternative new sources of water, imported and desalinated water were preferred over reclaimed and demineralised water (Bruvold 1972:17). Because opposition to potable reuse was consistently over 50%, Bruvold (1972) advised that its introduction would meet with public opposition and would likely "terminate such innovative use" (1972:29). Beneficial reuse was acceptable as an alternative to disposal of sewage effluent only for low contact, remote uses such as road construction, golf course and park irrigation (0.8% to 2.6% opposition; 1972:20, 33). Low human contact recycled water for general, commercial, recreational, food production and domestic uses would be tolerated, including residential lawn irrigation and home toilet flushing (2.7% and 3.8% opposition). Bruvold (1972) recommended that introduction of new low contact uses be accompanied by public information and educational programs, including tours of treatment plants, to overcome the repugnance factor that deters acceptance of potable reuse.

Adopting innovative technology

Adoption of new technology relies on other factors in addition to risk perception. Innovations to prevent future hazard in farming often require more time and effort for implementation than maintaining current practices and rely on limited advantages to the adopter conditioned by high initial costs, low economic profitability, increases in discomfort and low immediacy of rewards, as well as high perceived risks (Nowak & Korsching 1979). Besides economic considerations, water quality, pre-adoption attitudes towards the innovation and opportunity for control are factors that explain initial adoption (Casey 1997:4055). Resource back-up including labour, family or other socio-economic support are important (for example, Filho, Young & Burton 1999) as well as access to information and availability of the technology (Wilkie 1986; Audirac & Beaulieu 1986). In relation to greywater systems for flushing toilets in Australia, personal inconvenience has

been found to be a deterrent for maintaining individual units[12] and, in adopting greywater irrigation, a return on investment is expected within a few years (Christova-Boal, Eden & McFarlane 1996:392).

Concerning the ongoing household management of water reuse, Pinch's observations are pertinent. Regardless of whether the technology is 'black boxed' - when its content and behaviour is assumed to be unproblematic, common knowledge - the user must still be able to use it properly in the correct context (Pinch 1993:35). Controlling the appropriate use of new technology is therefore attempted through the process of "black boxing the user", a situation difficult to achieve in the case of children and others unfamiliar with the technology (Pinch 1993:36-37). Until user competence is an established culture, failures can be attributed to the technology, but once the correct use is taken for granted, enshrined in cultural conventions, blame is more likely to be attributed to the user (Pinch 1993:37).

Public participation in risk assessments

A final consideration for an emerging risk society is that collaboration within the 'community of fate' where 'consciousness determines being' will require meaningful public participation. Beck (1992) suggests that a reorganisation of power and authority may avert and manage risks. Reflexivity of modernisation may or may not result in reflection on the self-dissolution and self-endangerment of industrial society (Beck 1994:177). Rather than denigrating lay perceptions, or packaging knowledge for public consumption "so that it does not say what it really means" (1992:54), the political space of risk assessment needs to open up to include socio-cultural values.

Slovic (1996) agrees that risk is an "exercise in power" and because of the limitations of risk science and the importance and difficulty of maintaining trust, greater public participation in risk assessment and risk decision making is required. While technical literacy and public education are important, "they are not central to

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[12] Trial results were not finalised in 1996 and further enquiries with Eden (2001) revealed that the system filters required cleaning twice-weekly and when the trial ended all but one of the four householders asked to be reconnected to the sewerage system; they were not prepared to handle the clearing of hair, lint, body fats and soaps.

risk controversies" (1996:39). Like others, he is alert to a strengthening of the resolve of policy makers to base risk assessments wholly on "sound science" which ignores evidence of the social construction of risk and the views of affected communities (Slovic 1996; Alario 1997; Renn et al 1998). Slovic recommends serious attention to democratic processes of negotiation and mediation so that citizens are recognised as "legitimate partners in the exercise of risk assessment" (1996:40).

A main route to this end is provided in Habermas's (1990) approach to discourse ethics where he differentiates between communicative action and strategic action. Interactions between persons are communicative when plans of action are coordinated consensually. Actors seek to rationally motivate one another to agreement of the definitions of the situation and prospective outcomes through speech acts (1990:58; 139). Discursive claims are made with respect to truth in the objective world, rightness in the social world, or truthfulness of the person's subjective world. Normative statements, emotive utterances, such as "this is the right thing to do" can be valid or invalid (1990:52). The validity of the moral truth of claims is recognised because each speaker guarantees to make good the claims made (1990:58). Reasons can be offered for validating truth or rightness and consistency of behaviour can establish a person's truthfulness (1990:59). Consensus is achieved through argumentation, an intersubjective procedure to coordinate individual intentions (1990:71). This prevents one or the few prescribing what is good for the others and thus promotes impartiality of judgment and freedom from influence (1990:71).

By contrast, strategic action occurs when an actor "seeks to influence the behaviour of another" through the threat of sanctions or the prospect of gratification "in order to cause the interaction to continue as the first actor desires" (Habermas 1990:58). Success or the consequences of outcomes of actions is the sole objective, and is attempted by influencing the other's definition of the situation, and subsequent decision and motives (1990:133). This is achieved through the use of external means of weapons, goods, threats or enticements (1990:133). Actors treat each other strategically so that coordination of their actions is dependent upon "the extent to which their egocentric utility calculations mesh" (1990:133). Success oriented,

conflict behaviour is guided by self interest (190:140). Therefore, cooperation and social stability is determined by the particular interest positions of the participants (1990:134). The social significance of this theory points to the different social institutions that legitimate one or another way of acting (Eriksen & Weigard 1992:485).

Opening up rather than channelling discursive practices is effective for controversial issues. The credible public communications from Sybron Chemicals, Chess et al (1992) argue, is due to their organisational approach which contrasts with those that construct barriers, artificial public relations campaigns, and perceive the media and public as being detached from their business. Uncertainty of how to use the media arose in Webler et al's (1995) consultative study on the impacts of land application of sewage sludge where the aim was:

> To produce agreement on action based on mutual understandings of each party's expectations, beliefs fears, interests and concerns.   (Webler et al 1995:423)

Several experts were sceptical about gaining public approval and blamed the media for conveying distorted views of risks, yet they acknowledged that uncertainties in concentration levels and toxic effects would hinder the construction of unambiguous messages (1995:426). Some believed these uncertainties should not be published while others argued that public discussion would generate trust in science and regulatory institutions (1995:426). Citizens' concerns for future consequences lead to the withdrawal of the proposal to apply the sludge and the recommendation that citizens be involved in a revision of the regulations (1995:424).

Evaluation of methods of public participation report varying success. Referenda involve the greatest number of people but lacks opportunity for negotiation; non-binding direct involvement is ambiguous about the role of the public in decision making; and binding direct involvement using non government representatives is preferred because decision making rules are clear and it enables discussion and revision (Steelman & Ascher 1997:71). Citizens' advisory groups are highly political (Miller 1985) and citizens' juries highlight the difficulty of providing representation of a population by around sixteen people, neutrality of expert witnesses, and a guarantee that jury decisions will be carried through (Glasner

2000:137). Consensus conferences have demonstrated a measure of fairness allowing lay panels to choose experts and counter-experts from pre-selected lists, however, arriving at consensus necessarily involves suppression of dissenting voices (Glasner 2000:138). Attempts to involve the public in sustainable development in the UK are characterized by peripheral new rules and roles rather than broadening the ownership of the process (Selman & Wragg 1998) which is dominated by scientific and technical modes of analysis rather than diverse, contextual knowledges emphasizing social and cultural values (Fordham 1998).

The institutionalization of public consultation since USA environmental legislation mandated it in the 1970s (Miller 1985) lacks coherence and effectiveness and is considered a mere symbolic gesture in response to public activism (Thibault 1986). Delayed access to information and power limitations effectively excludes input (Ham 1980). The domination of bureaucratic organization, ideology and discourse marginalizes public participation in the USA (Tauxe 1995). In the UK, local planning involvement depends on the respective authority's commitment to public consultation, but has allowed community identification of problems (Berkeley et al 1995). In Australia, limitations to the Brisbane development plan revealed that the process of consultation served to legitimise the local state (Caulfield & Minnery 1994). However, public consultation is valued as a site for social and political representation in Ontario and as a learning process that strengthens group organization (Laforest 2000). A clear definition of public power, procedural rules and an informed public leads to success (Thibault 1986) and consensus is more readily achieved when goals are specific, they relate to people's experience and carry an emotional charge to attract wider participation (Mortimore & Doe 2000).

Public involvement in the development of long term wastewater treatment and disposal strategies was organised and evaluated by Syme and Nancarrow (2002) in Western Australia. The three principles of justice that the authors apply to the design and evaluation of the consultation resonate with Habermas's (1990) moral ethics of communicative action and Rawls' (1967) concept of social justice as distributive justice and fairness. Interactive justice of the process is achieved if participants are given sufficient information, the opportunity for input, and experience a dignified and pleasant interaction with planners (Syme & Nancarrow

2002:18). Procedural justice is evident if the program of participation is unbiased and participants are given "voice" (for example, Koch, Webb & Williams 1995). Thirdly, distributive justice is realized if participants are satisfied with the decisions made (Syme & Nancarrow 2002:18). For Rawls (1967) this will be a reflection that institutions return compensating advantages for any required sacrifices. Recommended improvement to this process is the inclusion of planners in the evaluation, particularly to ascertain whether public involvement provides useful input (Syme & Nancarrow 2002:24).

Acknowledging the value of Habermas's (1990) theory of communicative action, Webler and Tuler (2000) report on an evaluation, that used a grounded theory approach, for public participation in a forest policy-making process. It was established through feedback from experts, stakeholders and lay people that involvement can be respectful, effective and rewarding. Democratic expectations were met through open public meetings, outreach efforts, and citizen advisory committees, that achieved inclusivity, self regulation and policy outputs. Analysis and deliberation was integrated in a cyclical learning process demonstrating fairness and competence. The study identified seven principles of public participation to be experienced as a continuing process in which the three codes of justice used by Syme and Nancarrow (2002) can be identified, as follows:

Interactive justice:

1. Access to the process linked to attendance, decision making and fairness.
2. Power to influence the process which facilitates constructive interaction.
3. Agreed meeting structure: time, location, availability, seating arrangements.
4. Personal behaviour: respect, openness, honesty, understanding, listening and trust, representing quality of the discourse space and quality of the talk.
5. Access to information both from the lay public and expert community for local knowledge and experience as well as technical and economic analyses; a two way process of communication described as learning or education.

Procedural justice:

6. Adequate analysis and accountability, including the people's interpretation of the data.

Distributive justice:

7. Enabling of social conditions necessary for future processes: normative principles involved in managing conflict, building better relationships with interest groups in the region, promoting a sense of place, and being sensitive to issues of cost incurred through participation.

Some of these principles are reflected in industry efforts. Comprehensive processes are outlined for the water industry based on the Landcare movement which promotes community ownership of the process (Cullen 1996); considerations for water sharing arrangements in Victoria that placed equal importance on technical and consultative work (Adamski 2002); community acceptance of the process to provide input into planning for a rural recycled water irrigation scheme (Hamlyn-Harris & Cole-Edelstein 2000) and a degree of influence on decision making for river water quality in south east Queensland (Robinson, Clouston & Suh 2002). An experienced facilitator warns that processes that put chosen consultant groups ahead of wider stakeholder participation will generate distrust regardless of whether the final decision is 'right' or 'best' (Williams 2002:8).

Conclusion

Shaped in outline and approach by Beck's (1992) argument for an approaching risk society, this review has identified some of the main influences that may be associated with the acceptance and use of recycled water. The essential nature of high consequential risks in late modernity is marked by their invisibility and acceptance of such risk is conditioned by a number of factors. Besides risk characteristics, socio-political and cultural concerns determine public tolerance. Salience of issues is promoted by mass media, however, preventative action is more likely to arise from interpersonal channels of communication.

The different types of trust support ontological security and impinge on negotiations in the management of risk. Trust is an ongoing process in reflexive modernisation that can strengthen democratic practices. Awareness of environmental pollution is widespread and there are signs that sustainable practice and policy are becoming more institutionalised. Acceptance of technological risk is greater amongst males,

those with a higher education and belief in the technology. Opening up the political space of risk assessment for effective public consultation presents an opportunity to alleviate environmental risk while preventing or managing risks from reflexive technological fixes.

CHAPTER THREE

Research Design and Methodology

Introduction

As the literature review confirms, there has been very little published research on the subject of acceptance or perceptions of water reuse. Several early psychology papers on attitudinal and belief scales in relation to acceptance of recycled water have been generated, but there are no publications from sociology. Residential reuse - recycling water for domestic uses such as watering gardens and flushing toilets - has recently been introduced in Australia and therefore it is expected that the prevalence of water reuse will attract interest from the social sciences. This study sought to identify and explain the incidence and acceptability of non potable and potable reuse as well as the drivers behind its implementation. A triangulation of methods and measures were chosen to explore the field and collect sufficient explanatory data. Qualitative methods include multiple case studies with embedded data collection (Yin 1989), ethnographic research and an audit of documentation and archival (survey) data. The lack of previous social research was addressed by adopting a grounded theory approach (Glaser & Strauss 1967, Glaser 2002) to identify germane sociological theory to explain the experience of water reuse.

Background

Water reuse has the potential to effect the goal of ecologically sustainable development for urban centres with respect to water supply and the curbing of water pollution. It is used extensively for municipal public space irrigation in California, Florida and other states in the USA and is currently being introduced for residential uses in Australia. Conceptually, water sourced from sewage suggests, on the one hand, technological mastery over nature and, on the other, a technologically induced risk. Water scarcity and pollution already correspond to the side-effects of modern urban development elaborated in Beck's (1992) risk society. Is water recycling seen as a solution to this problem or is it viewed as having the potential to reflex on society, increasing the

public health risk and causing public concern? Giddens (1991) explains that people invest basic trust in expert systems such as water supply. Therefore, what is the role of trust when this taken-for-granted system is radically changed?

Definitions

For this study, the water industry refers to water utilities, their engineers and public relations managers and consultants. Key stakeholders are people that hold those positions. Potable reuse is the use of highly treated water recycled from sewage effluent for showering, cooking and drinking. Recycled water for non potable reuse covers all other uses of water. A full glossary of terms is provided on pages xii-xiii.

Research questions

The sociological imagination of Mills (1959) calls for a critical examination of historical, anthropological, cultural and socio-economic forces to enable a better understanding of the shapers of future possibilities. Therefore, the general aim of this study is to investigate the experience of water reuse as a supplementary water supply for urban areas and to ascertain the sociological influences determining its safe and confident use and, in the case of potable reuse, the socio-cultural influences that may determine its level of acceptability. Two sets of empirical and theoretical research questions guide this study:

1. What shapes the industry's claims in relation to urban water reuse?
    a. What are the drivers behind water recycling?
    b. How is reclaimed water presented to the public as a solution to problems of water supply?

2. What is the public response to water reuse?
    a. To what extent is the response influenced by concerns about environmental and public health risk?
    b. What is the function of trust in the acceptance of reclaimed water?

Research Objectives

Based on the limited literature available, the incidence of water reuse in Australia, and extensive USA experience, the following overall objectives informed the methodology chosen for this research:

1. To explore the water industry's claims and concerns relating to non potable and potable reuse.

2. To conduct case studies of urban water reuse in order to develop an understanding of the experience of recycling water.

3. To generate or identify social theory that explains the experience of water reuse.

4. To propose factors that influence sustainable residential water reuse and public acceptability of higher uses.

The triangulation of methods used to collect and analyse data to meet these research objectives was guided by the inductive approach of grounded theory (Glaser & Strauss 1967; Glaser 2002)[1] and Yin's (1989; 1998) explanation building. The study utilised ethnographic and case study research as detailed below.

Ethnographic research

To gain an understanding of the industry's perspective of the social acceptance of water recycling for non potable and potable uses an ethnographic approach was adopted which captured the contextual data for the study as a whole.

Multiple sources of data

The field of water reuse was investigated in Adelaide, Sydney, Wagga, Florida and California (see Appendix 3.1). Research methods include:

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[1] Grounded theory is a marked departure from the traditional scientific deductive approach. The latter relies on conceptual deduction from established theory to arrive at an hypothesis, or suggested approach in the case of qualitative work, to define the range of data to be collected and tested or described. Theory that is grounded involves a flexible approach, keeping potentially relevant theory in mind but allowing the data to literally speak for itself. The categories that emerge will either resonate with established theory or suggest new theory; either way, the theory is grounded or inductively 'discovered' in the data.

- the role of participant observer in a range of water industry seminars and conferences in the USA and Australia
- observation of public space irrigation, methods used for public identification of non potable reuse, and application of recycled water in the gardens of residents at non potable reuse sites
- face to face interviews with key stakeholders in the USA, and in relation to three New South Wales and two South Australian sites
- participation in water industry email discussion lists.

Archival data obtained through industry contacts and during visits to key sites in the USA mainly consists of industry survey reports on public acceptance of potable reuse. Other industry documentation sourced in Australia and the USA includes conference papers, articles on public acceptance, public relations information, industry guidelines, reports and sample documents.

All industry stakeholder interviews were of an informal nature consisting of discussions held either in the person's office or on guided tours of treatment plants, growers' fields, residential developments, municipal parks, gardens and wetlands. All notes of interviews and attendance at seminars were mainly taken in shorthand and transcribed with automatic numbering of paragraphs generated for referencing. These data complemented archival and documented records on the history of attempts to introduce potable reuse at several sites, the scale and scope of non potable reuse undertaken and the positioning and extent of public consultation in relation to water issues.

Data analysis
Data were coded, categorised and analysed in relation to the theory generated from the case study analysis as discussed below.

Data presentation and ethical considerations
Findings relating to attitudes voiced during interviews or during seminars are presented in the form of direct quotations or in statements based on collated data from more than

one voice. Direct quotations used are referenced to the original, numbered data to maintain a chain of evidence and in a way that preserves anonymity of the speaker and, in some cases, the site.

Previous surveys were audited and reviewed in relation to the conceptual background to this study, including Bruvold's (1972-1988) findings, and the emerging theoretical framework from the New Haven residential reuse case study completed in 2000.

Case Studies

The open and iterative approach of grounded theory informed the case study design and analysis of all research data. The initial approach is exploratory in order to develop grounded theory that transcends individual cases to conceptualise a general explanation (Glaser 2002:788). Two sets of multiple case studies were undertaken with their own replication logic and embedded units of analysis (Yin 1989:50-51); one set focusing on the experience of residential reuse and the attitude of participants towards non potable and potable uses of recycled water, and the other on the experience of potable reuse.

Non potable reuse case studies

To allow appropriate theory to emerge, the data for the first case study was collected, coded and patterns identified using the constant comparative method of grounded theory (Glaser & Strauss 1967:101-115). The results reflected the theoretical framework for 'the social becoming of trust' developed by Sztompka (1996, 1999). With this framework in mind and while allowing for complementary extensions and alternative interpretations, subsequent case studies were selected using replication logic for explanation building. Each set of case study data were collected, coded and analysed separately using the constant comparative method so that the three operations were undertaken co-jointly as much as possible without forcing the data to fit the theory (Glaser & Strauss 1967:43). In this way, 'conceptual abstraction' was maintained to allow theory to emerge from diverse data (Glaser 2002:787). Cross-case analysis completed the explanation building process for this particular set of multiple-case

studies. Methods are detailed below and comprise the base for the overall design model for this research as illustrated in Figure 3.1 at the end of this chapter.

Case study selection

Replication logic was used for selection of multiple-case studies to strengthen the analytic generalisations to the theory (Yin 1989:44, Glaser & Strauss 1967:49). Thus, following data collection and analysis for the New Haven study, subsequent cases were selected on the basis of theoretical replication, whereby different results were expected for predictable reasons (Yin 1989:53).

New Haven Village is a dual pipe reticulation residential development of 65 houses located in a semi-industrial area north of the Port of Adelaide. Preliminary findings from ethnographic investigations identified the uniqueness of New Haven Village. It was the only site in Australia where residents had up to four years' experience of using recycled water in a purposefully built dual-pipe reticulation development. Later, it was further established that, at the time, it was the only residential development in the world where householders used recycled water for toilet flushing.[2] Therefore, New Haven was chosen as the first case study.

Theoretical sampling suggested another case be selected with similar contextual background but where the experience differed. Therefore, Mawson Lakes, north of Adelaide was chosen. This is the only other purposefully designed development in Adelaide and because the reclaimed water was not yet on line, the expectations rather than experience of non potable reuse comprised the main variation between the two case studies. Next, the aim was to include sites where residential reuse is well established. Therefore, a cross-national comparator was required and the third case selected was the City of Altamonte Springs in Florida, USA, for its established municipal system where recycled water has been used for residential garden irrigation

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[2] From the commencement of research in March 2000 up until April 2001, the only other site in Australia where urban residents used recycled water sourced from sewage effluent was situated in Wagga Wagga, New South Wales. However, the water was for garden irrigation only, similar to the Florida experience, and provided through an above-ground system of black irrigation pipes. Another two sites located at Rouse Hill and Sydney Olympic Park, New South Wales, were large dual pipe systems but the distribution of the recycled water was not yet on line.

for around twelve years. The fourth study was located in Melbourne, Brevard County, Florida, where a similar centrally managed system to Altamonte Springs has been on line for approximately the same period of time as New Haven.

Embedded design

Multiple sources of evidence were collected for each case study to enhance construct validity (Yin 1989:41). Data were collected for each unit of analysis relating to the study community as a whole through to the experience of individual residents. The type of project and intermediate level data included in Table 3.1 varied according to availability and application to each case study. Additionally, at New Haven, interviews were also conducted with key informants: the engineering contractor, the accountant for the local council, a non government welfare housing manager, one of the original project developers, and an engineer for the recycled water permitting authority.

Table 3.1 Embedded design: non potable reuse case studies

Unit of analysis	Data sources	Project level data	End-users
Main unit Project	policy and information documents, provider website, observations	historical context and indications of structural supports	background; familiarity and compliance with policies
Sub units Intermediate	archival data: media reports, invoices, previous surveys, industry literature	aspects of project such as charges, notices, findings of previous research	awareness of billing, notices, event coping procedures
Individual Managers	interviews with managers	attitude towards policy, economic & technical issues, communication	quality of communications, service
Householders	interviews with residents, field observations	experience of non potable reuse	knowledge, beliefs, attitudes, behaviour

Table 3.1 illustrates the type of data collected and the interrelation between householders and (a) the project as a whole, (b) the intermediate levels of contact, and (c) managers of the recycled water systems.

Research ethics

Application was made to Flinders University Adelaide Social and Behavioural Research Ethics Committee in March 2000 for approval to conduct interviews with residents of New Haven and Mawson Lakes housing developments. Approval was granted on 23 May 2000 after additional information was supplied for the consideration of the Committee (Appendix 3.2). Ethics clearance to conduct interviews at the sites at Altamonte Springs and Brevard County, Florida was obtained in June 2001 (Appendix 3.3).

Documentation relating to ethical considerations is appended (Appendix 3.4 to 3.15) and includes:

- Letters to managers of recycled water systems at New Haven and Mawson Lakes and statements of permission granted to access a list of residents (Appendix 3.4, 3.5).
- Approval from managers to access lists of residents (Appendix 3.6, 3.7).
- Confirmation of interview arrangements (Appendix 3.8).
- Letter from research supervisor, Department of Sociology, confirming identification of researcher and nature of research project (Appendix 3.9).
- Information relating to the research project: community and water reuse (Appendix 3.10).
- Consent form for interview (Appendix 3.11).
- Letter to respondent enclosing copy of transcript (Appendix 3.12).
- Signed statement by respondent that transcript is approved (Appendix 3.13).
- Introductory letter from supervisor, Department of Sociology, for sites to be visited in USA (Appendix 3.14).
- Introductory letter from supervisor, Department of Environmental Health, USA study tour (Appendix 3.15).

Selection of research participants

Twenty residents were selected at each site for in-depth, semi-structured interviews. Variations to a simple random sampling selection were necessary and in Adelaide, some partners of the main respondents, being male heads of households except in one case, also took part in the discussion.

Eight residents at New Haven had participated in a Flinders University Department of Environmental Health study on the quantity and quality aspects of recycled water used in the village (Thomas 1999). Variation in quality of the Class A recycled water was detected and some residents had complained of events that had occurred, confirming that the system was not operating efficiently. These eight residents were invited to participate in the social research because (a) it was considered that their feedback on water use practices would assist in verifying water consumption data, and (b) most had expressed an interest in taking part. Six agreed to be enrolled in the study; one was unavailable and another declined. In addition, another resident had been outspoken during the environmental research and it was considered prudent to allow him to voice his opinions. The remaining 13 participants were randomly selected using a table of random numbers (following de Vaus 1991:63) from a sampling frame that comprised the names and addresses of all other residents provided by the local council. Prospective participants were contacted by telephone and three declined, giving an overall response rate of 80%.

Names and addresses of residents at Mawson Lakes were supplied by the development managers and were stratified in the sampling frame according to three specific land value levels within the development: lake side housing, the linear park area, and housing by the railway line end of these first few stages of the development. Every third householder was contacted by telephone. Of 23 successfully contacted, three declined due to ill health or busy schedules, yielding a response rate of 87%.

At Altamonte Springs, permission was given to access the water reclamation department's computer customer database to arrange telephone interviews with twenty residents. During a period of computer failure, four staff, who are customers of the city's recycled water service, were interviewed in person following the same format for telephone interviews. A further 80 customers were randomly selected, including homeowners' association presidents, and 26 householders were successfully contacted. Ten refused to participate, resulting in an overall response rate of 66.7%. At Brevard County, recycled water customers were randomly selected from the computer database

including home owners association presidents. Over 111 calls were made and of 25 people contacted by telephone, only five declined because they were too busy to participate, yielding a high response rate of 80%.

Interviews with participants

Interviews with research participants were conducted in the following time frames:

New Haven	Mawson Lakes	Altamonte Springs	Brevard County
31 July – 1 Dec 00	15 Mar – 9 Jun 01	8 – 10 August 01	13 – 14 August 01

During the Adelaide field work and either side of the Florida dates, interviews were held with managers of the recycled water system for each site with additional interviews conducted for the New Haven study as detailed above.

A tape recorder was used for interviews with research participants in Adelaide and only two respondents at New Haven disapproved of audio recording and the interview was noted by hand. All interviews with managers and the telephone interviews at Altamonte Springs and Brevard County were noted in long and shorthand. All interview data were transcribed and each statement was automatically numbered. None of the respondents in Florida were personally addressed during the telephone interview and are identified against quoted data using the interview number and short description of the respondent. In Adelaide, fictitious names were allocated to each respondent and partner who participated in the face-to-face discussion and these are referred to in the presentation of findings. Transcripts of the Adelaide interviews were provided to the forty households to verify the data and to allow participants to add further comments.

Interview questions

To gain a meaningful representation of everyday experience from the point of view of the users of recycled water, interview methods were partly oriented by a phenomenological approach (for example, Colaizzi 1978) recommended by Beck (1995) and employed by others such as Rinne (1998) and Schmuck (1998) to gain

insight into local knowledge, values and practices. In this way, the strength or salience of an individual respondent's beliefs or concerns were also ascertained. A case study protocol guided the semi-structured interviews to generate standardised data that could be used for cross-case analysis and comparison with secondary sources of data.

The interview protocol for New Haven was framed by general theoretical linkages between knowledge and beliefs that motivate environmental behaviour; experiences with recycled water that either emphasise benefits or raise public health concerns; trust in water agencies and the local council as sources of information on the environment and trust in different levels of water reuse. Data generated from these questions proved sufficient for identifying appropriate explanatory theories and the protocol was therefore used and adapted for the Mawson Lakes site (Appendix 3.16). At Altamonte Springs and Brevard, 16 main questions were asked compared to approximately 38 for the Adelaide sites, and these were similarly organised (Appendix 3.17). Six levels of investigation were therefore undertaken with all 80 participants as follows:

1. Interest in conserving water/the environment placed in context.
2. Personal engagement with water; water values.
3. Trust in sources of information, salience of environment and water issues.
4. Experience of recycling water (for Mawson Lakes, expectations): benefits, risk awareness, concerns, water conservation behaviour.
5. Attitudes towards levels of water recycling and demand management.
6. Demographic data, including main source of drinking water.

Data Analysis

Data were analysed to reflect the principles of iterative data collection, coding, and analysis of emerging grounded theory. Through constant comparative analysis of the data, a social process emerged in the first case study and subsequent cases were conducted and analysed following the process of explanation building for cross-case analysis design outlined by Yin (1989:56; 113-115).

Data coding generally followed the interview protocol which also guided the data into basic categories as well as those that reflected the open theoretical and empirical research questions in relation to the environment, public health risk and trust. Journal notes on observations and researcher intuitions following each interview supplemented the data along with memos created during coding and categorising of data. A case study database was developed for each of the four studies using SPSS (Statistical Package for Social Sciences). For the Adelaide studies, differences of opinion between partners interviewed were noted with the response from the male head of household being used in the main data analysis. Text entries (string variables) were made in addition to numerical coding of attributes of demographic and Likert scale responses to standardised questions. Case study analysis and reports were generated using constant comparative analysis with the emergent theory (Glaser and Strauss 1967; Glaser 2002). Gradual explanation building proceeded through the process of cross-case analysis (Yin 1989) that involved qualitative as well as simple quantitative data.

Potable reuse case studies

A multiple case study design seeks to illustrate the experience of potable reuse in relation to the first research question and on the role of trust. Existing indirect and direct systems, abandoned proposals and one currently planned for implementation were included in the selection. The study design followed that for the residential reuse case studies except that the conceptual phase was informed by the emergent theory arising from the New Haven case study and the cross-study analysis of previous surveys. The constant comparative method of analysis used for the first case identified the relevance of the theory of communicative action (Habermas 1990) which, for this study, is conceptualised as a product of the type of trust building structure outlined in Sztompka's (1999) framework.

Multiple sources of data

Ethnographic research techniques included the collection of primary data through interviews with staff of four of the sites and with key informants in the water industry in the USA and visits to two sites. Documentation includes industry articles, reports,

public relations literature, websites and personal correspondence, and archival records include media articles and surveys. These are considered to be 'minor case studies' because there was no intention to conduct interviews with householders at these sites.

Case study selection

On the international level, there are relatively few instances of potable reuse or attempts to implement potable reuse. Recent efforts to introduce this highest level of reuse have either been abandoned or are pending further legal or regulatory developments, with the exception of one site where implementation is scheduled for 2006. Therefore, as acknowledged above, the conceptual approach focused on the trust-building opportunities that were developed or under-developed during this experience.

Two case studies were initially selected because of potential theoretical replication of the data: one is a well established system and another is one that has been abandoned and both are prominent in the industry literature (Whittier Narrows, LA and San Diego). Following data collection and comparative method analysis, subsequent case studies were selected for either literal or theoretical replication of either type, as listed in Table 3.2 below. Literal replications are indirect potable reuse systems located or proposed in the same region; theoretical replications are those situated elsewhere or, in the case of Orange County, still proposed for implementation. Therefore, two sets of multiple case studies were developed with holistic or embedded units of analysis, the latter being the goal for each leader study and Orange County.

Table 3.2 Case study selection and design: potable reuse

Case study	Selection criteria	Units and sources of analysis
Existing systems		
Whittier, LA, California (CA)	well established indirect potable reuse system	project: reports, industry literature, website intermediate: survey, LA area individual: interview with manager
Water Factory 21, Orange County, CA	literal: indirect potable CA	holistic: industry literature, site observation, website.
Carson, CA	literal: indirect potable CA	holistic: conference paper, website.

Table 3.2 continued …

Case study	Selection criteria	Units and sources of analysis
El Paso, Texas	theoretical: indirect potable, Texas	holistic: industry literature, website, public relations literature
Upper Occoquan Northern Virginia	theoretical: indirect potable, Virginia	holistic: reports, documents, personal correspondence, website.
Windhoek, Namibia	theoretical: direct potable, Africa	holistic: industry literature
Not implemented		
San Diego, CA	theoretical: abandoned implementation of indirect potable, CA	project: industry literature, website, conference papers intermediate: surveys, media articles individual: interview with manager, correspondence with staff and local environmental journalist
San Gabriel, CA	literal: indirect potable CA	holistic: industry literature, media articles
Dublin San Ramon, CA	literal: indirect potable CA	holistic: industry literature, media articles, personal correspondence with staff
East Valley LA, CA	literal: indirect potable CA	holistic: industry literature, survey, media articles
Denver, Colorado	theoretical: indirect potable COL	project: industry literature, website intermediate: surveys individual: personal correspondence
Tampa, FL	theoretical: indirect potable, FL	project: industry report, documentation, conference paper, intermediate: surveys individual: personal communication with public relations manager, industry representatives
Noosa, Australia	theoretical: direct potable, Australia	holistic: industry literature
Orange County, CA	theoretical: proposed indirect potable, CA	holistic: reports, media articles, documents, website, public relations literature intermediate: surveys individual: interview with staff members, personal communications

Interviews

Managers or staff and industry representatives were interviewed or contacted through personal correspondence as key informants for the historical and/or current experience at a particular site. Interviews were conversational style to allow the person to put

forward their views and particular concerns or aspirations in relation to potable reuse. Interview data were created through long or shorthand notes, and transcribed with statements numbered to track the chain of evidence.

Data analysis

Data were analysed following the procedure for non potable reuse case studies. Due to the focused nature of the investigation, a case study database was not necessary for the comparative data and cross-case analysis for explanation building relied on the narrative reports for each case.

Overall design model for comparative analysis

By way of a summary of the triangulated approach, which includes a review of previous surveys on acceptance of water reuse collected during ethnographic research, and the inclusion of data from key informants, the model of research undertaken is depicted in Figure 3.1, on the following page.

Non potable reuse case studies

| conceptual framework | First case study: analyse, write up, emerging theory | Emerging theoretical framework: select next case study, analyse, write up | Iterative process continued for subsequent case selection: analysis, write up |

design protocol

Cross-case analysis, write up, conclusions, modify theory, develop policy implications

Review of industry surveys

| conceptual framework | Review Bruvold, write up; modify conceptual framework | Audit Californian studies, write up | Audit surveys from other locations, write up |

collect surveys

Cross-study analysis, write up, conclusions, theoretical and policy implications

Potable reuse case studies

| conceptual framework | Existing example of potable reuse case study: analyse, write up | select subsequent cases on the basis of literal and theoretical replication |

Cross-case analysis, write up, conclusions, modify theory, develop policy implications

Final cross-study analysis, discussion, conclusions, modify theory, policy implications

| potable reuse proposed, not implemented case study: analyse, write up | select subsequent cases on the basis of literal and theoretical replication |

Cross-case analysis, write up, conclusions, modify theory, develop policy implications
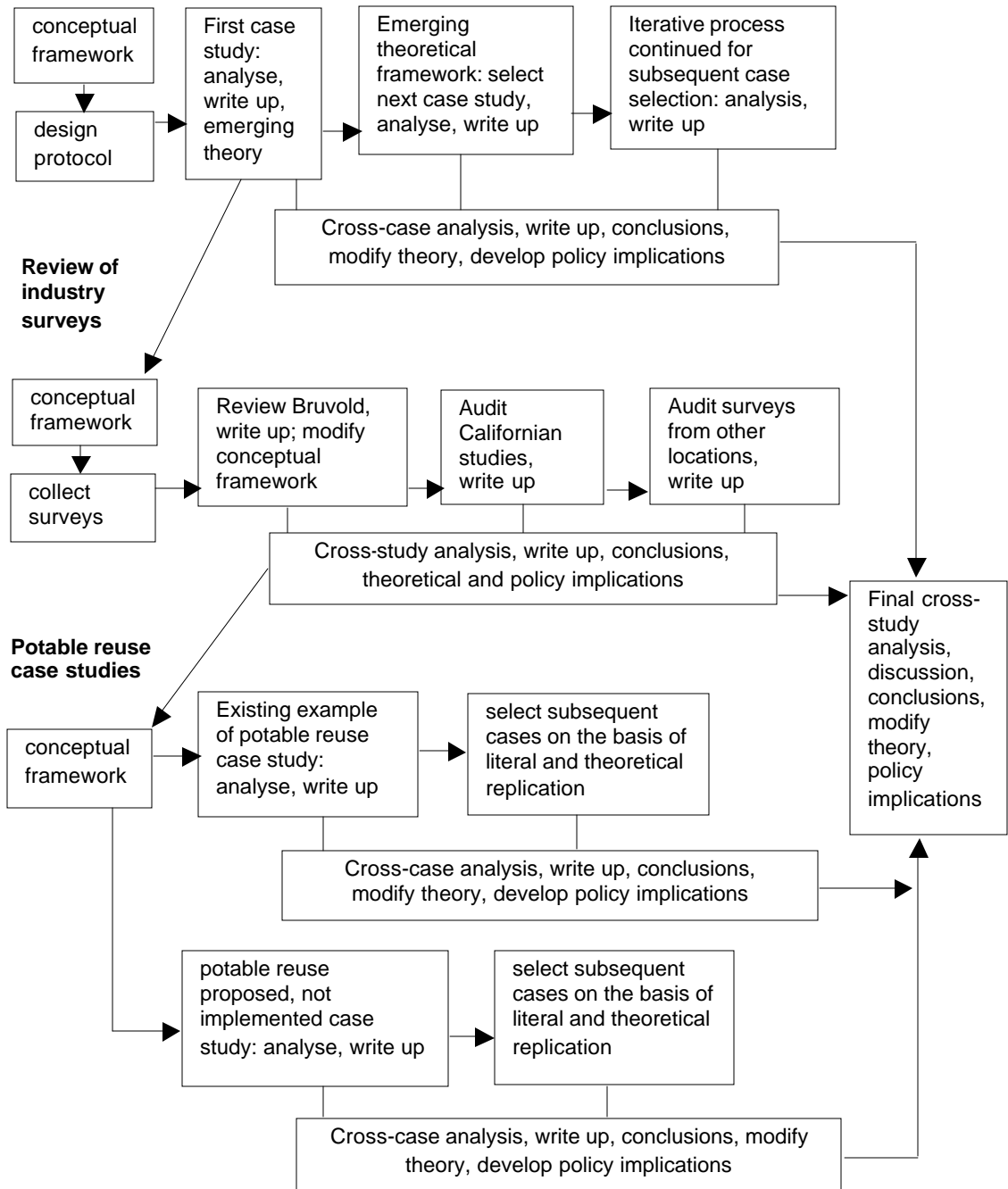
Figure 3.1 Research design

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CHAPTER FOUR

Industry research: evaluating social influences

Introduction

This chapter reports findings from an audit of surveys conducted from 1988 through to 2001 to gauge public opinion of water reuse in Australia, USA and the UK. The bulk of the surveys comprise the efforts of marketing research supplemented by a few studies that involved university-industry collaborations. The conceptual framework for this analysis is guided by the research questions, a close review of Bruvold's (1972-1988) industry publications and studies, and relevant theory in relation to the industry's approach to public outreach efforts and the community response. The presentation of results from the cross-study analysis of California surveys and those generated elsewhere are compared to Bruvold's earlier findings and hypotheses. Further influences on acceptance of water reuse are explored, focusing on the significance of trust.

Conceptual framework

This audit of findings is guided by most of the research questions, namely 1b and 2:

1. What shapes the industry's claims in relation to urban water reuse?

    b. How is reclaimed water presented to the public as a solution to problems of water supply?

2. What is the public response to water reuse?

    a. To what extent is the response influenced by concerns about environmental and public health risk?

    b. What is the function of trust in the acceptance of reclaimed water?

The historical underpinnings for this analysis rest on Bruvold's (1972-1988) findings which are relevant to both questions. As discussed in the literature review, Bruvold (1972) recommended that the industry induce public acceptance of higher levels of water reuse through implementing non potable reuse which was more widely accepted. Strategic 'education' based on technical assumptions and his predictors of acceptability was also recommended:

> … it should aim to convince persons that the proposed high-contact use of reclaimed wastewater (1) will not threaten the health of those consuming it (2) will produce economic benefits for the community, (3) is favoured by other people in the community, and (4) will alleviate present or future water supply shortages.
>
> (Bruvold 1985:77)

This exemplifies the strategic action approaches to public consultation outlined by Habermas (1992), whereby the aim of the outreach is to produce certain predetermined goals rather than to understand and appreciate the opinion of the 'other'. The general view emerging from the literature criticises the narrow view of experts and this is well articulated by Douglas (1985) and others who observe, for example, that engineers assume that once the public are given the facts they will be convinced of the safety of a proposal. Evidence of this approach will be sought in survey content and wording of questions.

In exploring evidence to answer the second research question, Bruvold's findings and hypotheses, based on ten studies detailed in Appendix 4.1, will be compared to these secondary sources of data. However, Bruvold did not specifically acknowledge the role of trust as an influence on acceptability. This rival explanation for acceptance of water reuse emerges from the grounded theory approach to the residential reuse case studies in this current research, which recognises the significance of Sztompka's (1999) theoretical framework for trust as an ongoing process.

Methodology

Because of the historical nature of this review which relies on secondary sources of data, this audit aims for an indication of trends relating to acceptability of water reuse rather than empirical detail. While recognising that validity of survey results rests on robust methodology, because of the difficulty in obtaining research relating to water reuse, all available findings are included with one or two exceptions and qualifications. The source and methodology for each survey are detailed in Appendices 4.2 and 4.3. All results shown in figure illustrations reflect percentages that take into account all responses including 'don't know' or no response data. In some cases where sufficient data were obtained, results were recalculated to achieve this objective. In the case of Orange County, results were extracted from the 1997

and 2000 reports to present acceptance of potable reuse as a function of demographic variables. Only the 1997 data explored relationships between belief, behaviour and attitude variables, and these required recalculation to ascertain their influence on the dependent variable. More detail regarding sources and referencing are given below.

California

All eleven surveys or reports on the surveys were obtained directly from the water authority or public relations consultant concerned (Appendix 4.2). They are identified throughout by the main city or county location of the study. The report furnished by the San Francisco Department of Public Works (1995 SF) and the document from the Santa Clara Water District (1999 SJ [San Jose]) provide analytical depth of results through cross-tabulation analysis on the relevant questions. The Orange County Water District supplied frequency data on all responses and some descriptive cross and group tabulation statistics for their surveys (1997 OC; 2000 OC) which allowed closer scrutiny of the findings, particularly for the 1997 data. The 1993 San Diego survey report refers to tests of significance (no details available) and includes frequencies reported for all responses. The Monterey Water Pollution Control and Sanitation District of Los Angeles County surveys report only response frequencies (1996 Mtry; 2000 Mtry; 2000 LA). In addition, responses on non potable reuse and pre and post tour surveys were supplied by the Irvine Ranch Water District.

Surveys from locations other than California

Survey reports or results (a total of eleven) were collected from other parts of the USA, the United Kingdom (1999 UK) and Australia (see Appendix 4.3). In the 1995 Tampa research (Hammond 1996:9-10), 1997 San Antonio (Foss 1997), 1995 and 1999 Sydney (Sydney Water 1995; Roseth 2000) studies, negative and unsure responses were not included in the reported findings. Research for Tampa in 1996 was conducted under the auspices of Katz and Associates who managed the San Diego public relations campaign. Both surveys for Tampa have a substantial sample base (n=1093 and 1002 respectively) as does the research in Noosa (n=1,632), Sydney Water (n=1000; 1300), Perth (n=666; Australian Research Centre for Water in Society 1999) and in the UK for Thames Water Utilities

(n=1086; Sample Surveys 1999). Hamilton and Greenfield (1991) cite details of the Gold Coast research (n=1508) in their paper which also summarises Hamilton's (1991) Queensland/New South Wales study results from seven locations (n=1066).

<u>Presentation format</u>

Results for California and elsewhere are presented following Bruvold's findings, beginning with overall acceptance of potable reuse, possible influences on acceptance, overall acceptance of non potable reuse; other alternatives and further consideration of the role of trust.

Acceptability of recycled water for drinking

The trend indicating the level of acceptance of potable reuse for drinking is indicated in Figure 4.1 below. These data represent findings from Bruvold's studies and his review of contemporary research, summarised in Appendix 4.1. Plus and minus signs shown in brackets reflect Bruvold's evaluation of whether the question posed was negatively or positively biased.
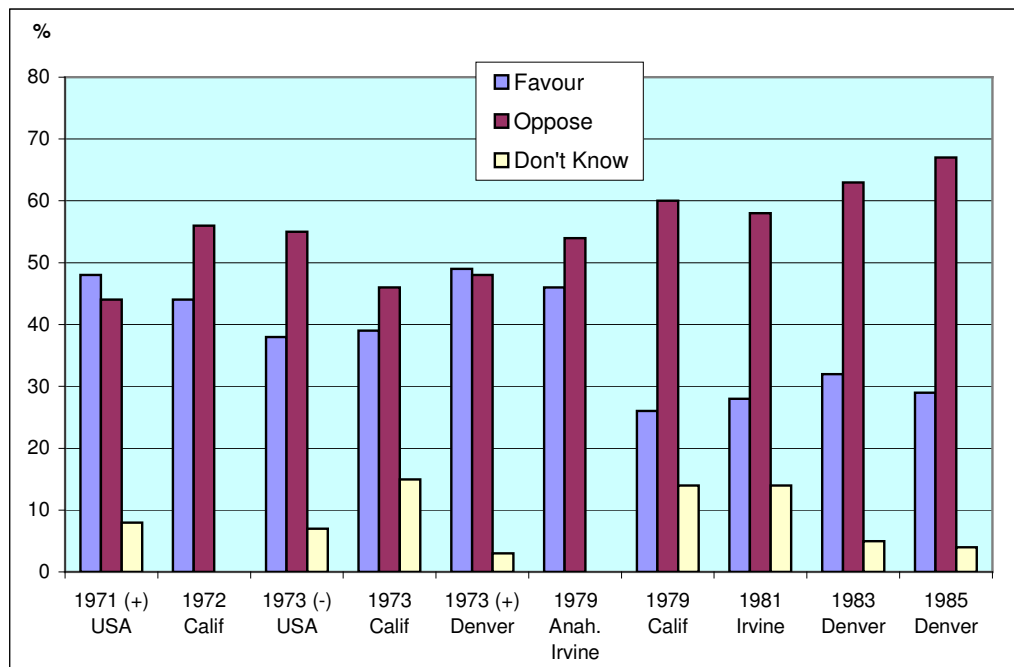

Figure 4.1 Research reviewed by Bruvold (1985, 1988): acceptance of using recycled water for drinking - California and other USA studies

Over the period 1971 to 1985, less than 50% of respondents were willing to drink recycled water sourced from sewage effluent. There is a marked decline in acceptance in the 1979 Californian result and in the 1980s compared to the 1970s. The prominent fall in support in Denver may be partly explained by the positive bias of the question asked in 1973. Additionally, issue salience contributes to the explanation. The 1983 and 1985 surveys were conducted at a time when it was publicly known that authorities were planning its implementation. Decline in support is also evident in California falling from 44% in 1972 to 26% in 1979 and 28% for the 1981 Irvine result where a range of uses for recycled water were already established. Responses to acceptance of recycled water considered as an abstract concept are likely to be different to those judging whether an actual system should be introduced for a local community. Bruvold acknowledges this influence in his hypothesis on salient options, presented further in this chapter.

Two sets of questions were identified in recent research. Some studies pose only 'policy' questions, seeking responses to acceptance of the concept of potable reuse, whereas either the same survey or different studies pose 'drink' questions, following Bruvold. This brings the issue squarely in front of the respondent, personalising what is proposed, and leaves no uncertainty of the implications of their response, particularly if the respondent is aware that a system is actually being considered for their region.

California

Indirect potable reuse findings for the general policy of potable reuse are illustrated in Figure 4.2 (following page), with details of each question listed in Appendix 4.4 and tabulated data in Appendix 4.5. The word 'sewer' or 'sewage', indicating the source of the water, was included in questions posed in half of the surveys: 1995 San Francisco, 1996 and 2000 Monterey, 1997 Orange County (long descriptive question) and 2000 Orange County (both short and long questions). Other surveys referred to the source as 'used water' or 'wastewater'.
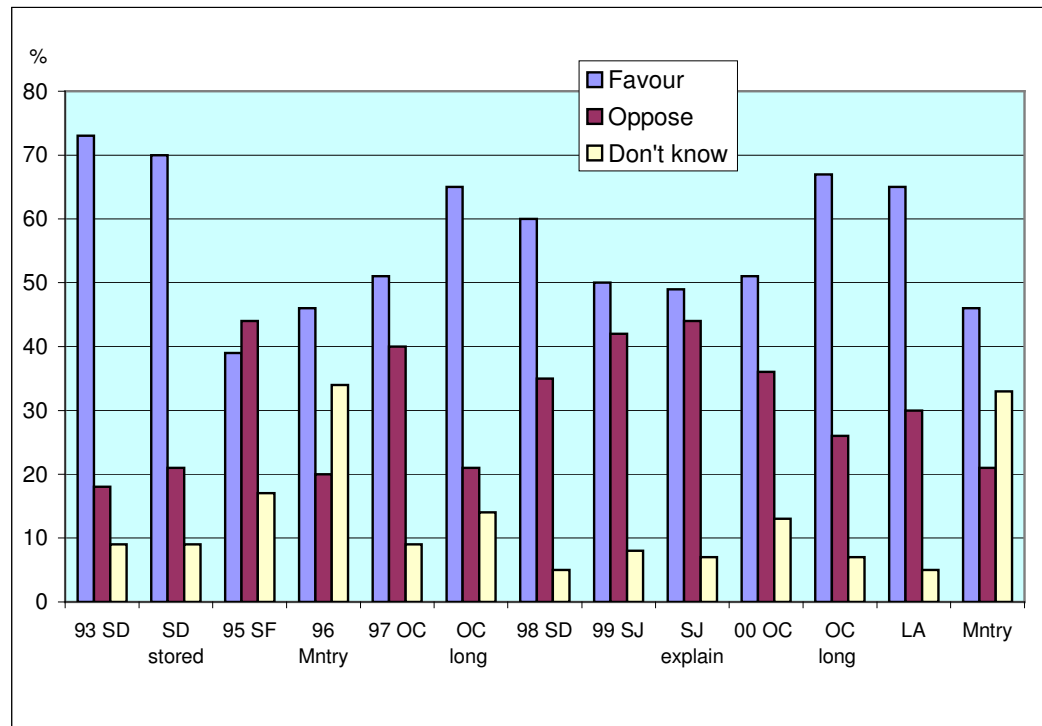
Figure 4.2 Support for potable reuse policy: California 1993-2000

Highest support is indicated at the beginning of the decade in 1993 for the first response in the San Diego survey (73%) and the lower result for the second option. In this survey, nine people withdrew their policy support after learning of the different potable uses of the water produced by the first option and the additional process of blending and storing the water. Possible bias of the term 'used water' may have encouraged this high level of acceptance. The detailed description by Orange County in 2000 is favoured by 67%, followed by the 1997 response for Orange County's long description and also Los Angeles in 2000. Note that all these results relate to full descriptions of the process, with the first result for San Diego giving the least detail. This high acceptance also arises from the smallest sample sizes and the results are therefore subject to a greater possibility of sampling error. For example, at the 95% confidence level, the 65% result for Los Angeles ranges between 59% to 71%.

Support declines when respondents are asked if they would drink the water (Figure 4.3). The questions asked are listed in Appendix 4.6. Orange County and LA

included toilet-to-tap statements (t-t) rather than directly posing a 'drink' question and only the 1995 San Francisco and Orange County results nominate sewage or sewer water as the source.
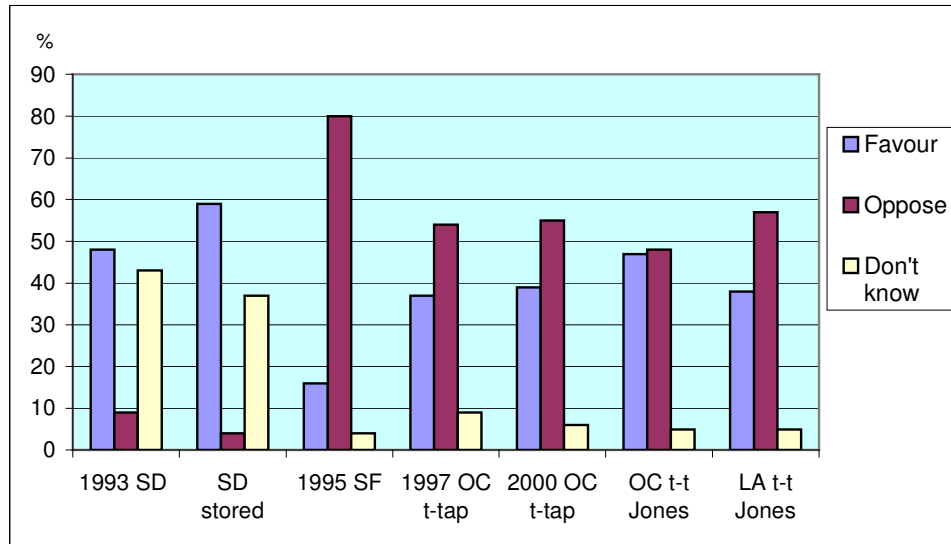

Figure 4.3 Approval of drinking recycled water: California 1993-2000

The comparatively positively biased questions in the San Diego survey again reap the highest level of acceptance followed by the 2000 Orange County result of 47%. Where a comparison can be made, the effect of the more personalised 'drink' question is clear, as illustrated below in Table 4.1:

Table 4.1 Difference between responses to potable reuse policy compared to drink questions: California surveys (percentage in favour)

Question	1993 SD	1995 SF	1997 OC	2000 OC	2000 LA
Policy	73	39	65	67	65
Drink	59	16	37	47	38
Difference	14	23	28	20	27

Note: Where more than one response is involved, the most favourable results on policy and most favourable on intentions to drink recycled water are compared.

Outside California

Details of the questions asked to gauge support for a general or specific policy of potable reuse are detailed in Appendix 4.7 and responses in Appendix 4.8. The word sewage is included in the UK questions and Noosa refers to 'effluent'. Research in Noosa, San Antonio and the UK investigated support for direct potable

reuse (higher treatment process prior to distribution with usual water supply) as well as indirect.
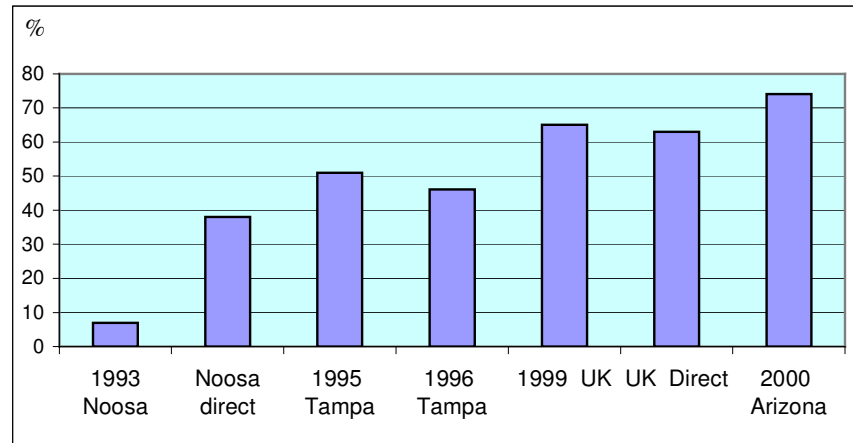
Figure 4.4 Support for potable reuse policy: locations external to California 1993-2000

With the exception of the first, negatively biased response for Noosa, acceptance for the policy of potable reuse illustrated in Figure 4.4 ranges from 38% in Noosa, where direct potable reuse was a new concept, to 74% in Arizona. It is suggested that the arid climate of Arizona where water conservation is a way of life for this 'desert community' may be an influencing factor.

Three of the surveys considered above – 1996 Tampa, UK and Arizona – asked the drink question and these are considered along with results from another six surveys, depicted in Figure 4.5 below.
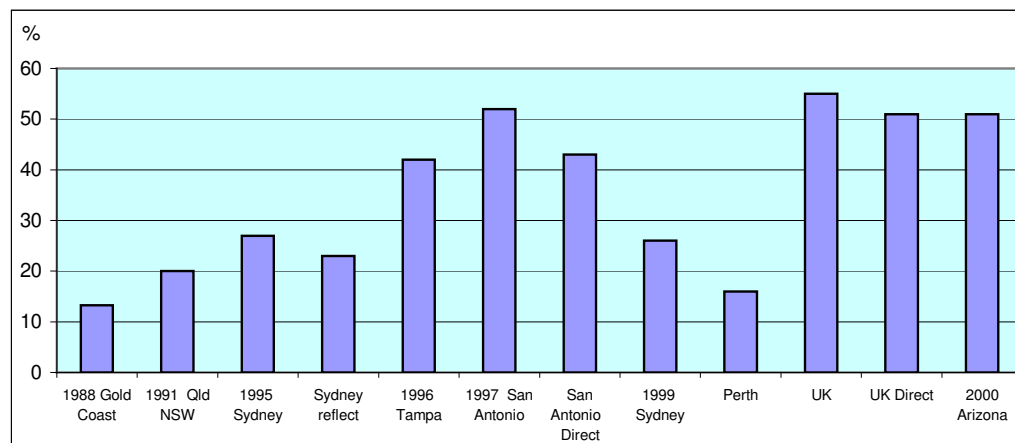
Figure 4.5 Approval of drinking recycled water: locations external to California 1988-2000

The question that suggests acceptance of drinking the water in the Arizona 2000 study is the same toilet-to-tap statement put to the Los Angeles and 2000 Orange County respondents. Details of all questions are listed in Appendix 4.9.

This comparison suggests that Australians are less receptive to potable reuse than respondents in the UK and USA. For those results that could be compared, the differences between support for policy and drinking the water are less than that found for California, as shown in Table 4.2 below:

Table 4.2 Difference between responses to potable reuse policy compared to drink questions: outside California (percentage in favour)

Question	1996 Tampa	1999 UK	UK Direct	2000 Arizona
Policy	46	65	63	74
Drink	42	55	51	51
Difference	04	10	12	23

Compared to Bruvold's findings, these more recent survey results for drinking water supplemented by potable reuse depict a wider range of acceptance. However, the medians are similar. Across all survey results, policy support in California rests at 51% compared to 56% elsewhere, and to the question of drinking, it falls to 39% for California and 35% elsewhere, compared to 39% for Bruvold's results.

Factors influencing acceptance

Bruvold predicted that several demographic, belief and attitudinal variables would affect acceptance of potable reuse. These will be considered along with other factors, with the results summarised in simple table form.

Social demographics

> Opposition to potable reuse is more likely to come from people of a lower socio-economic level (education, occupation, income), older people, women, long-term residents and those who are unaware of the practice of recycling water.

> (Bruvold 1985:77)

Five of the Californian studies tested some of these relationships and the results are given in Table 4.3 with more detail provided in Appendix 4.10.

Table 4.3 Correlations between demographics, awareness and
acceptance of potable reuse: California

	1993 SD	1995 SF[1]	1997 OC[2]	2000 OC	1999 SJ[2]
Gender	males[1,2]	both opposed	males[1,2]	males[1,2]	males
Age	< 40 yrs[2]	all opposed	< 24 yrs[2] 55-64[1]	< 24 yrs[2] 55-64[1]	< 34 yrs
Education	higher[1]	lower more opposed	college grad.[1,2] post grad.[1]	college grad.[2] post grad.[1]	post graduate level
Occupation	blue collar[2]				
Income	none	none	$30-50K then 75K+ [2] $50-75K[1]	$30-50K [1,2]	$50-70K
Prior awareness	none		purifying effluent [2]		non potable
Aware: more information	policy: *less* drink: *more*		longer process description		arguments *less*

Note: none = tested and no relationship found
[1] Correlates with drink question   [2] Correlates with policy support

Men are more receptive to the idea of potable reuse. There is evidence that younger people give more support for the policy, but not that older people are more opposed. In fact, middle to older ages are more willing to drink the water in Orange County. Higher education tends to correlate; there is insufficient evidence for occupation; and correlations with income levels vary in three of five studies where a relationship is found.

Awareness in the 1993 San Diego study was explored through agreement to three questions: that it was used in "other cities" (20%) that respondents were already drinking recycled water (34%), and drinking reclaimed water (20% agree), the last two questions referring to 'unplanned potable reuse'. In the 1997 Orange County study, only a quarter of the respondents had previously heard of 'purifying effluent' and were more in agreement than those who had not been aware. By 2000, 42% were aware of the specific proposal, however, the relationship with acceptance was not tested. Instead, a preliminary question on acceptance indicates that 51% of the previously aware in 1997 gave support, and this declined to 46% in 2000.

In San Jose, awareness of non potable reuse has a positive influence. However, arguments in favour, for example, "purification has been done in LA/Orange Counties and elsewhere for 20 years" and against, such as "too many unknowns

about disease transmission" result in slightly less support. In the 1998 San Diego study, 67% agreed that knowing water repurification has been successful "in Orange County, Northern Virginia and other cities across America for twenty years without negative health impacts" would make them more likely to support the project, but the actual relationship with the 60% who agree with the policy was not tested.

Looking at the evidence in other studies, the 1991 Perth survey found no relationships with any demographic variables. The studies represented in Table 4.4 verify the influence of male gender, but older people give greater support, not less. Higher education as a predictor of acceptance is less clear, and there is little evidence that higher socio economic status and length of residency correlates with support. For the NSW/Qld study, people in Coffs Harbour and the Gold Coast who were aware of a specific proposal for their area were the least supportive, while awareness correlated with higher acceptance in other areas. The same study found support for Bruvold's proposition that term of residence correlates with resistance to change; those residing at their address for four years or less are twice as likely to support potable reuse than longer term residents. The effect of time and awareness was investigated in the 1995 Sydney study with the result that after a two week reflection period respondents were 11% less inclined to accept potable reuse. In the UK, only 4% of respondents were aware of a controversial potable reuse scheme planned by Essex and Suffolk Water and, understandably, the effect is not reported.

Table 4.4 Correlations between demographics, awareness and acceptance of potable reuse: elsewhere

	Qld/NSW[1]	1995 Sydney[1]	1999 Sydney[1]	1996 Tampa[2]	UK indirect[2]	UK direct[2]
Gender	males	males	males	males	none	none
Age	> 55 yrs	none	none	none	> 55 yrs	> 55 yrs
Education	University	higher	none	none	socio econ: highest level and second lowest	second lowest level
Occupation				none		
Income	none			none		
Length res.	< 4 yrs					
Prior awareness	abstract; least for salience			none		
Aware: more information		*less* support				

Note: none = tested and no relationship found
[1] Correlates with drink question   [2] Correlates with policy support

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Demographic variables other than those suggested by Bruvold together with behavioural variables represent possible influences of environmental, health risk, trust and economic concerns on support for potable reuse.

In California, three of four studies find differences between localities and, significantly, in both Orange County studies respondents from the two areas that will be affected by the proposed scheme (north and central) are less supportive. Conflicting results are found for ethnicity and political affiliation, although these findings remain important ones for each region concerned. One of only two studies that tested the presence of children in households, found more opposition to potable reuse. (Further detail is found in Appendix 4.11.)

Table 4.5 Correlations between other demographics and
acceptance of potable reuse: California

	1993 SD	1995 SF[1]	1997 OC	2000 OC	1999 SJ [2]
Locale		all opposed	south [1,2]	south [2]	outer area
Ethnicity		Asians & Islndrs more opposed			Asians least: Latinos
Children	none	opposed			
Political	Republicans[1] [2] Democrats opposed [2]		Democrats [2] Republicans [1]	none [2]	not registered to vote

Note: none = tested and no relationship found
[1] Correlates with drink question   [2] Correlates with policy support

Results for surveys conducted elsewhere (Table 4.6) show that residential location has some influence, but in only two of five tests conducted. No evidence is found for the effect of ethnicity, and children in the household only correlate with lower support for direct potable reuse in the UK.

Table 4.6 Correlations between other demographics and
acceptance of potable reuse: elsewhere

	Qld/NSW[1]	1999 Sydney[1]	1996 Tampa[2]	UK indirect[2]	UK direct[2]
Locale	Not Coffs Harbour	none	none	provinces	none
Ethnicity		none		none	none
Children		none		none	*less*

Note: none = tested and no relationship found
[1] Correlates with drink question   [2] Correlates with policy support

Therefore, from this review, support for only part of Bruvold's hypothesis is confirmed and additional demographic variables such as locality and the presence of children suggest evidence to address his further proposition (below) in relation to health risks. Location of residence may also identify socio-economic status but in three of the five studies where this was investigated and a relationship was found, salience of the proposal is the defining issue.

Beliefs, values and concerns

The second proposition to be explored is that:

> Support for potable reuse is more likely to arise from beliefs that the water supply is polluted, there is a water shortage, the technology is effective, health risks are not substantial, there are economic benefits and public opinion favours it.

(Bruvold 1985:75)

Relevant results from the California studies are shown in Table 4.7 below, which summarises the positive correlations, unless otherwise stated. Details for the Orange County results are given in Appendix 4.12.

Table 4.7 Correlations between beliefs, attitudes and acceptance of potable reuse: California

	1993 SD	1997 OC[2]	1999 SJ [2]
Water polluted		safety/health concerns current water *less*	*less*
Water shortage	none	growth in population will force us to rely on it whether we like it or not	none
Technology is effective	can make safe [1][2]	technology OK worried about administers; removes impurities; its like Mother Nature; system won't deteriorate, reverse osmosis	
Health risks not substantial	as above[1][2]	technology not perfect but best way to increase supply (strongly agree)	

Note: none = tested and no relationship found
[1] Correlates with drink question   [2] Correlates with policy support

Both the San Diego and Orange County studies confirm that belief in the effectiveness and safety of the technology correlates with higher support for potable reuse. Less support, not more, is indicated by those who believe the water is polluted. However, although tests were not conducted, other statements relating to water pollution suggest respondents are more likely to support potable reuse. For example, in the 1993 San Diego study, agreement that "recycling water helps the

environment" correlates with more support (policy and drink questions) and in the 1998 San Diego study, 52% agree that if it were true that "more than 200 agencies already discharge treated wastewater into our main source of imported water" (unplanned potable reuse), they would be more likely to support the proposal. The Orange County 2000 study shows that 69% had not heard that "most natural water sources contain some part highly treated sewer water" and 63% of the whole sample agree that it is believable; however, relationships with potable reuse support were not explored.

Elsewhere, as for the California research, few tests were run or correlations reported (Table 4.8 below). The 1995 Sydney results do not reflect cross-tabulated analysis but because the frequencies given relate specifically to drinking the product water and overshadow the 27% who agree to potable reuse, an influence is suggested for water shortage (77%), and technology statements (87% and 81% respectively). A direct relationship with the technology is also suggested in the San Antonio results. In relation to the environment, only the benefit of avoiding the building of a new dam was queried with 74% stating this was an important factor. In both the 1995 and 1999 studies those who agree (54% and 53%) that "the thought of drinking recycled water is disgusting" are more opposed, suggesting that no technology would be effective in erasing this characteristic, and disgust rose to 58% after the 1995 study reflection period. The belief that there are no substantial health risks correlates with support in Tampa and is suggested in San Antonio.

Table 4.8 Correlations between beliefs, attitudes and acceptance of potable reuse: elsewhere

	1997 S.Anton.[1]	1995 Sydney[1]	1999 Sydney[1]	1996 Tampa[2]
Water shortage		if drink never run out	none	
Technology effective	concerns for quality and reliability *less*	if carefully treated & monitored; works elsewhere		
Health risks not substantial	concerned *less*			safe for drinking

Note: none = tested and no relationship found
[1] Correlates with drink question   [2] Correlates with policy support

Economic benefits accruing from potable reuse and public opinion suggested by Bruvold were not explored in any of the studies. However, the influence of

willingness to pay for the higher costs involved in implementing potable reuse was investigated. The effect of an interest in the environment was also tested which may partly suggest a concern for water pollution identified by Bruvold.

Active interest in the environment was only explored in the 1993 San Diego study and correlates with acceptance for potable reuse (Table 4.9 below). The results are mixed for the economic influence. In the 1998 San Diego survey, little support is forthcoming (only 36%) when respondents are advised that the proposed indirect potable reuse project "could raise sewer rates by approximately three-quarters of one percent" of current rates. A similar proportion (34%) object by indicating it would make them less likely to support the project. Being willing to pay correlates with higher support in Orange County (1997), although the amount involved falls in relation to the drink question. (Further detail is provided in Appendix 4.11.)

Table 4.9 Correlations between behaviour and
acceptance of potable reuse: California

	SD	1997 OC
Environmental concern	1993 active [1]	
Willing to pay	1998 SD: off-putting	$10 most then $5 [2] $2 [1]

[1] Correlates with drink question   [2] Correlates with policy support

In other study results, summarised in Table 4.10, while environmental group membership correlates in the Sydney surveys, those with an active interest are the least supportive in the UK, in part, due to a concern for the depletion of environmental flows. There is some suggestion that respondents are willing to pay to introduce water recycling in general but in both the Sydney and UK studies, this decreases (by half in the UK) for potable reuse. In the NSW/Qld study, 28% of respondents are prepared to accept potable reuse if it is 10% cheaper than current mains water supply compared to the 8% through to 20% who either want higher reductions or refuse at any price.

Table 4.10 Correlations between behaviour and acceptance
of potable reuse: elsewhere

	NSW/ Qld	1995 Sydney[1]	1999 Sydney[1]	1996 Tampa[2]	UK indirect[2]	UK direct[2]
Environmental concern		m/ship of group	m/ship of group	active or interested: least		
Willing to pay	If $10 cheaper	to invest & *less* so	to invest & *less* so	willing	*less* willing	*less* willing

[1] Correlates with drink question   [2] Correlates with policy support

Additional evidence in relation to beliefs is found in open-ended questions, summarised in Table 4.11 below. Three Californian surveys asked why people support or oppose potable reuse. Further details of the statistics are given in Appendix 4.13, pp.1-2. Responses reported for Orange County were re-categorised and an example of the allocation process is found in Appendix 4.14, while Appendix 4.15 provides a sample from the category of source.

Table 4.11 Reasons for supporting or opposing potable reuse:
San Jose and Orange County

Category	% of reasons in Favour			% of reasons that Oppose		
	99 SJ	97 OC	00 OC	99 SJ	97 OC	00 OC
Total reasons given:		n=377	n=355		n=174	n=187
Environment		6	17			
Recycle value		4	5			
Will contaminate		1				1
Water supply	42	23	26			
Conserves water		17	6			
Not needed		2	3		4	2
Technology	15	20	19		1	1
Good idea		2	2			
Improves tap water		5	2			
If really effective	18	6	1			
Not effective				26	36	35
Other alternatives		3	1		6	5
Health risks				32		
Sewage source		1	3		28	43
If meets govt. standard - strict tests required	12	1	1		1	1
Need research/info.		2	4	16	3	6
Trust authorities		1	1			
Can't trust authorities			1	14	3	3
Economic		3	4			
Cost too much		2	1		12	4

Table 4.11 illustrates both the strength and weaknesses of beliefs in support of potable reuse. The benefit to the environment is recognised in 10% and 22% of reasons given in the Orange County surveys. Its value for supplementing the water supply explains the majority of reasons in favour (32-42%) while just over a quarter or less (15-27%) of the reasons express trust in the technology. In San Jose, this trust is neutralised by the proviso that the technology meets expectations which also moderates support in the 1997 Orange County study. By contrast, both technological and health risk concerns underline opposition, explaining 70% of opposition in San Jose and 1997 Orange County, and 90% of rejection in the more recent Orange County survey. In the 1998 San Diego survey, when respondents were asked what further information they would need to support the project, 13% stated that nothing would convince them compared to 5% who were convinced, and the majority of reasons relate to assurances of safety.

By itself, trust invested in authorities or those responsible for the system is not a strong factor in support of potable reuse, but rises in importance when reasons relating to the need for strict guidelines, tests and further research are taken into account (3% to 12% of reasons in favour). It is argued that trust in authorities, negative trust in the technology and concern about health risks represent a lack of basic trust in the proposed expert system of potable reuse. Therefore, while it can be said that distrust accounts for the bulk of opposition to potable reuse, trust in the system is not confirmed for those who agree to the concept. Significantly, some Orange County respondents raise the question of alternatives and the only alternative presented in these three studies is to maintain the status quo. Beneficial reuse can also be achieved through non potable uses and other strategies can supplement the water supply while maintaining environmental flows.

Studies conducted in other regions also included open ended questions, but focused on concerns in relation to potable reuse. Proper treatment and purity were raised in Tampa and priorities for judging acceptability identified water treatment, ownership and responsibility for the system, and the cost. In San Antonio, the risk of waterborne diseases was the issue raised by most respondents when considering indirect potable reuse, followed by the reliability of testing, quality of water, and excessive pollutants in the raw water. In the UK, over a quarter of all respondents

nominate concerns relating to the effectiveness of indirect potable reuse technology. With respect to the direct potable reuse option, almost a third raise doubts about the technology. Adverse effects to the environment, due to the curbing of discharges of effluent that constitute environmental flows, are considered by 14% in relation to indirect potable reuse and 9% for direct potable reuse (details found in Appendix 4.13, page 3).

Of the beliefs identified by Bruvold, these data suggest that belief or trust in the technology is the most important predictor of support for potable reuse. Opposition is explained by distrust in the technology associated with rejection of the source water - which is the reason for the higher treatment required - and concern for health risks.

Alternatives to potable reuse

Three final propositions derived from Bruvold's studies refer to the higher public acceptance of non potable reuse and salient potable and non potable options:

1. Where reuse options are not specifically planned, opposition to uses of recycled water decreases as the degree of likely human contact decreases.   (1988:46, 48)

2. People will readily accept recycled water for ornamental lakes, and irrigation for golf courses, orchards and food crops, parks and playgrounds, and common areas in residential developments.   (1981:490)

3. In surveys of salient reuse options, five factors will be more important than the likelihood of human contact: health, environment, conservation, and costs of treatment and distribution.   (1988:48)

In California, very few studies explored acceptance of alternatives to potable reuse and none of the surveys where potable reuse has salience (San Diego, Orange County, Los Angeles) offered alternative options. A review of responses (Table 4.12), following Bruvold's schema for the degree of contact, includes an Irvine study and a pre-tour and post-tour survey conducted at the Irvine Ranch Water District Michelson Plant, part of the system that has supplied non potable reuse for over twenty years in that area. While a comparison cannot be made between these visitors to the plant and respondents who are randomly selected in general

populations, the results confirm that Bruvold's assertion regarding closeness of contact still applies where water reuse has salience and not just where these uses are considered in the abstract.[1]

Table 4.12 Acceptance of 18 uses of reclaimed water:
California studies 1993-2001

Degree of contact	93 SD	95 SF	99 SJ	96 Mtry	00 Mtry	98 Irv	01 Irv Pre-T	01 Irv Post-T
n =	315	600	400	602	584	400	104	104
Type of reuse	%	%	-10:+10	%	%	%	%	%
Very High								
Drinking water	48/59	16	-2.9					
Cooking in the home	62							
Wash dishes	69							
High								
Replenish aquifers		39		46	46		60[3]	90[3]
Moderate								
Irrigation of vegetable crops			2.4	47	43	64	67	92
Low								
Pleasure boating/recreational lakes		51						
Reduce rationing during drought		55						
Industrial processes/cleaning			5.8	74	61	76		
Commercial building toilet flushing		85					79	96
Residential lawn irrigation		77[1]				40[2]		
Irrigation of school grounds and playing fields			4.1	64	55			
Irrigation of recreational parks		89	6.5	81	52	78	84	98
Golf course irrigation				87	69			
Irrigation of median strips				94	74			
Cleaning streets		84						
Fire fighting		92						
Very low								
Environmental						64		
Bay or ocean discharge				6	6			

[1] Common lawn and garden areas of residential developments, not householders' lawns.
[2] Respondents were asked if they would use reclaimed water if it were available to them; lawn and garden irrigation is assumed because toilet flushing in residential housing is not permitted in California.
[3] Note: In Irvine, groundwater is unsuitable for drinking; all potable water is imported.

At the time of these surveys, non potable reuse was not underway to any great extent in San Diego. While it was virtually confined in San Francisco to certain demonstration areas in the Golden Gate Park, expansion of the city's existing dual pipe fire protection system was under consideration for non potable reuse. Water

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[1] This is also observed when Bruvold (1981) compares salient options results with his review of general survey findings. Additionally, it is noted that Bruvold does not draw attention to the fact that there is less support for water recycling where water reuse has salience.

recycling was being actively developed in San Jose for non potable uses and at Monterey for agricultural reuse.

These results confirm that opposition decreases as the degree of likely human contact decreases and suggests that clearly identifiable municipal uses with low contact are more acceptable. However, irrigation of orchards, food crops, playgrounds and common areas in residential developments are not "readily accepted". Instead, closeness of contact is suggested through exposure via ingestion in the case of food and where children are found playing. The lower level of acceptance for agricultural reuse in Monterey compared to Irvine may be explained by the newness of this scheme compared to well established crop and orchard irrigation in Irvine. There is a marked decrease in support for all uses over time in Monterey when awareness of local recycling rose from 41% in 1996 to 70% in 2000. Although the relationship was not tested, these figures support the observation in the potable reuse data: prior awareness does not necessarily build greater support. However, support is promoted in Irvine when treatment plant visitors witness the transformation of sewage effluent to crystal clear water (presented in a drinking glass for inspection at the end of the tour).[2]

Non potable reuse explored elsewhere confirms the pattern of acceptance relating to closeness of contact (Table 4.13). While the San Antonio research data to hand does not include percentage results, respondents ranked agricultural, golf course, park, lawn and landscape irrigation and industrial reuse highly. Non potable domestic uses were the least preferred after environmental flows (maintaining stream flows) and public recreational uses (Foss 1997:69).

Residential garden watering, which was only explored in the 1998 Irvine study in California (Table 4.12 above), has high acceptance in these studies. The UK and Perth respondents are slightly more reluctant when higher contact is suggested for garden irrigation and on-site, self maintained units. When comparing these results to those for California the issue of salience again arises. Respondents in California are likely to be more familiar with water reuse than Sydney, Perth or UK

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[2] The researcher completed the same tour a few months later in August 2001.

respondents due to its longer history in that region. Yet while higher acceptance is suggested when these uses are considered in the abstract, this only applies to non potable reuse in Australia, which is readily accepted as Bruvold predicts.

Table 4.13 Acceptance of 19 uses of reclaimed water:
Sydney, Perth, UK studies 1995-1999

Degree of contact	95 Sydney	95 Sydney reflection	99 Sydney	99 UK	99 Perth
n =	1000	500	1300	1086	662
Type of reuse	%	%	%	%	%
Very High					
Drinking water (frame of question equivalent to direct potable reuse)	27	23	26	63	16
Cooking in the home	33	30	34		
Personal showering, washing	55	49	52		31
Personal laundry	77	73	75		51
Moderate					
Irrigation of vegetable crops	96	94	94	63[1]	
Low					
Factories (industrial reuse)	92	93	90		
Home toilet flushing	96	98	96	96	95
Washing cars	96	-	96	88	
Washing windows				81	
Household garden irrigation	95	98	97		88
on site treatment - self maintained:				86	72
- maintained by authorities					71
Irrigation of recreational parks	94	99	97		89[2]
Golf course, sports oval irrigation					95
Fire fighting					95
Environmental flow	82	85			
Wetlands storage, later recovery					71

[1] Home garden vegetables.
[2] Neighbourhood wastewater treatment plant for irrigation of public parks and gardens.

Analyses of demographic influences on non-potable uses were conducted in the San Francisco, Sydney, Perth and UK studies. No statistically significant relationships ($p>0.01$) were found in the Perth study. It is suggested that the lack of evidence for demographic influences, illustrated in Table 4.14, is explained by the higher overall acceptance of non potable reuse as well as the minimal research into possible correlations. The Sydney studies suggest that women are more accepting than men and higher education correlates in the 1995 results. Varying evidence is found for the influence of age, income, additional information and the presence of children in the home. There is some suggestion that people with a non English speaking

background may be less accepting and that an interest in the environment correlates with higher support.

Table 4.14 Correlations between demographics, awareness,
interest in the environment and acceptance of non potable reuse

	1996 SF	1995 Sydney	1999 Sydney	1999 Perth	1999 UK
Gender	none	women	women	none	none
Age	30-39 yrs*	none	none	none	younger
Education	none	higher	none	none	
Occupation					socio econ: highest level
Income	$25-$40K*			none	
Prior awareness			none		
Aware: more information	Income, age, locale	*less* support			
Locale	one of 4 areas*			none	
Ethnicity	white race		NESB *less*		
Children/at risk in hslds	none	53% concerned	92% concerned		more accepting
Environment		group m'ship	interest in		
Willing to pay	69% who agree: $2 extra/mth				

* When more information provided

In relation to beliefs, the 1999 Sydney respondents were asked to comment on benefits of water recycling. Two main themes that emerge from the reasons given by 86% are water conservation and prevention of building another dam; reduction of effluent discharges is mentioned by only a few. Further comments volunteered by 56% relate to health concerns and the safety of recycled water, with less concern expressed in relation to the economic viability of implementation.

Considering the third proposition relating to salient uses: that health, environment, conservation and economic considerations will be more important than contact, as noted, close proximity to the water still determines the level of acceptance. Keeping the water environment clear of effluent discharges by reusing this water is preferred

in Monterey (Table 4.12). However, maintaining environmental flows is as important as agricultural reuse in Irvine (1998) and preferred to residential common area irrigation. In the San Francisco study where non potable municipal uses are proposed, the relevance of Bruvold's influential factors are confirmed: conservation of water is considered the main benefit (39%) followed by cost efficiency (14%) and environmental protection (10%). Reasons for 'disliking' the idea centre on health risk concerns (35%), cost (12%) and distrust of government agencies (6%; see Appendix 4.13, p.4).

Based on these findings, it is suggested that the likelihood of contact, particularly ingestion, remains the most important factor where potable reuse has salience. For example in San Diego, beliefs that more water recycling should be undertaken and that it helps the environment are directly associated with support, however, 'water recycling' is a general term and degree of contact still explains levels of acceptance (Table 4.12 above). Likely human contact presupposes concerns about health. As demonstrated in responses to open ended questions in the San Jose and Orange County studies, the level of trust compared to distrust in the technological system of potable reuse is of major importance. It is suggested that benefits to the environment, conservation of water and economic efficiencies can all be realised in alternatives such as non potable reuse and, more recently, desalination.

Other alternatives were also considered in studies outside California and further contextualise salience. In Tampa, acceptance for desalination (75%) is comparable to the current practice of relying on groundwater which is 20% more acceptable than maintaining another current source of water (surface water). Potable reuse trails at least 33 percentage points behind the desalination option. In the Noosa study, the higher treatment involved in direct potable reuse is preferred over indirect methods, maintaining the current discharge to surface waters, and the allocation of reclaimed water for irrigation of pastures. Concern for the local water environment and full explanations of potable reuse technology explain this choice made by 38% of survey respondents. In the case of Tampa, where Tampa Bay is now revitalised, new water supply was the focus while at Noosa, the problem to be overcome is pollution of inland water resources caused by effluent discharge and rural run-off.

Preference for alternatives is also confirmed where water reuse is not salient. In Perth, stormwater reuse has higher acceptance than non potable reuse. Only around a third of the sample approves of composting toilets maintained by authorities, and other alternatives – domestic urinals, water restrictions on garden irrigation or laundry, and buying bottled water to allow a lower quality of water to be used for all other purposes – attract lower acceptance than recycling water for drinking. High acceptance for potable reuse in the UK is relegated to the lowest level (12%) when all alternatives are ranked. Non potable reuse is given priority along with building a new reservoir (37% and 35% respectively).

Alternatives were in fact explored by Bruvold in one of his earliest reports (1972:17-18). Californians were presented with four alternative sources of additional water and asked to choose one or more. Recycled water was one of the least preferred options, as shown below:

Imported surface water	36.0%
Desalinised water	35.6%
Reclaimed wastewater	10.5%
Demineralised ground water	6.9%
No preference	11.0%

Therefore, while overwhelming support is confirmed for Bruvold's hypothesis relating to degree of contact, the strength of avoidance of ingestion overrides all other considerations. For example, males may support potable reuse, but to what extent is this support held when other alternatives are recognised? And because women generally comprise 50% or more of most populations, their opposition to potable reuse must have some influence as suggested by the high overall preference for non potable reuse and other alternatives. A similar argument applies to younger or older age groups that correlate with potable reuse support along with groups with higher educational status. Even where agreement remains relatively high in response to the drink question, for example 42% for Tampa, once alternatives are presented, potable reuse support weakens. This suggests that the consideration of alternatives early in the consultation process to arrive at an acceptable solution will secure a more meaningful guide to planning while building trust in water supply authorities.

Trust

Giddens' (1991) concept of 'basic trust' in the expert system of water supply is highly relevant when considering the structural changes required to introduce water sourced from sewage. Trust theorised by Sztompka (1999) associates Giddens' theoretical concept with trust in technological systems, one of the many types of trust invested in modernity. Sztompka sees trust as an ongoing process and the framework he provides can be operationalised for the analysis of trust in water reuse. An inherited culture of trust provides the background level of trust. Structural opportunities for building trust and the collective capital of agents interact through social praxis which results in a revised trust culture. For water reuse, the background level of trust in water supply is indicated by the proportion of respondents who drink tap water. Current trust in water and sewage providers will reflect the strength of trust building opportunities afforded by the agencies through the quality of their service delivery and interactions with the public. A revised culture of trust can be suggested by agreement to potable reuse as a function of trust in water and sewage providers.

Data on the main drinking water source was collected in eight studies. Results are shown in Table 4.15 below:

Table 4.15 Drinking water preference and quality of water (percentage results)

	1993 SD	1995 SF	1997 OC	2000 OC	2000 LA	1996 Tampa	2000 Arizn.	1999 UK
Tap	33	45	25	21	28	38	31	77
Filtered	18		34	34	27		33	10
Tap source	51	45	59	55	55	38	64	87
Bottled	43	55	38	43	45	58	36	9
Quality tap excel/good	31	58				57 Taste		89 safe
Poor/fair	64							
Tastes bad	35		28			43		
Taste/unsafe	18							
Unsafe	6		37					9
Contaminated	28		40		60	40		

In the USA, only around a fifth to a third of respondents drink water straight from the tap, compared to 77% in the UK results. In California, around half source their water from the tap, with filter systems in higher use in Orange County compared to

Los Angeles and San Diego. These results suggest that Tampa respondents are the least satisfied with their tap water and Arizona has the highest use of tap water amongst the USA studies. Bottled water and filter systems have not made as large an impact in the UK where 89% of respondents are confident that the water companies supply safe water. Comparisons for quality and taste are problematic due to the different questions asked, however, these data indicate highest concern in LA for water supply contamination.

Unfortunately, few surveys explore the relationship between acceptance of potable reuse with drinking water preference or trust in agencies. Where it was tested in California, in the 1993 San Diego and both Orange County studies, those who drink tap water are significantly more supportive of potable reuse (see Appendix 4.11). Elsewhere, only San Antonio and Tampa looked at this relationship and found none. The high level of drinking water from the tap in the UK and Arizona studies coincides with high support for potable reuse. In the UK study, 55% of the sample are still prepared to drink water straight from the tap for the indirect potable reuse option, falling slightly to 51% for direct potable reuse.

The current level of trust in water supply and sewerage agencies is indicated by proportions of populations who agree at the highest end of various scales (e.g. very trustworthy; Orange County: strongly favour; Sydney: a rating of 8 and more out of 10) that they can be trusted or are a trusted source of information in relation to water and/or the environment. A range of agencies are investigated and can be ranked for comparison between studies as shown in Table 4.16.

Where five or more key agencies are presented to respondents, the most trusted are medical practitioners, or public health authorities and science agencies. The EPA (environmental protection authority or agency) and environmental groups follow with the least trust being placed in water and sewage agencies. By contrast, in the LA and Arizona surveys, water engineers rank highly alongside other science organisations. In addition to these results, the UK study reports that 38% of respondents are very confident that the water companies supply safe drinking water.

The cross national comparison suggests little difference in the status of water and sewerage authorities. The UK result mentioned above suggests greater trust in the UK water companies than that indicated for the Sydney Water Corporation which aligns with trust placed in the San Diego Water agencies. Strong favour of the Orange County Water District, which is not as secure a measure of trust, increases between 1997 and 2000. For sewerage agencies, Sydney again fares slightly better than authorities in the USA and this may be linked to its joint responsibility for both water and sewerage as opposed to the differentiation made elsewhere.

Table 4.16 Level of trust in water and sewerage authorities compared to other agencies (percentage results and/or ranking)

	93 SD	98 SD	95 SF	97 OC	00 OC	00 LA	96 Tampa	95 Syd.	99 Syd	00 Ariz
	very trusted	most trusted	great conf.	strong favour	strong favour	ranked	most trusted	rated 1 to 10	rated 1 to 10	ranked
Medical	1st 51	4th				1st Dr 7th	2nd Dr	2nd 45	3rd 57	4th Dr 6th
Health	2nd 38	2nd	2nd 13			4th		1st 41	5th 44	2nd
Science		1st				5th Uni	3rd Uni	3rd 44 7th Uni 27*	1st 65 2nd Uni 62*	3rd Uni
EPA	3rd 36	3rd	2nd 13			6th		4th 41	4th 53	5th
Environ	4th 31	5th		22	27	2nd		5th 34	6th 38	8th
Water	6th 24	6th	3rd 12	19	23	8th	4th	6th 28	7th 24	7th
Sewrge		7th	4th 9	13	19	9th				
Other	Water Auth 5th	Water Auth. 6th	1st 38 Fire	9 Board	11 Board	3rd water engr	1st natnl 3rd local 5th state			1st water engr

Note: Water Auth = Water Authority
    * Sydney question 1995: "university academics"; 1999: "university scientists".

Only the 1997 Orange County study explores acceptance of potable reuse as a function of trust as shown in Table 4.17 below.

Table 4.17 Orange County 1997: acceptance of potable reuse policy
as a function of opinion of agencies (percentages, n=500)

	OC Water District		OC Sanitation District		Sierra Club		OC Board of Supervisors	
	Fav	Opp	Fav	Opp	Fav	Opp	Fav	Opp
strongly favour	69	20	75	16	66	26	72	16
somewhat favour	62	28	68	23	63	26	62	28
some/w unfavourable	41	55	62	38	56	31	64	30
strongly unfavourable	27	47	27	40	53	35	54	33
heard & no opinion	49	40	43	42	47	41	51	36
not heard	58	28	48	36	56	31	45	38

While trust, represented as 'strongly favour', in each agency correlates with higher acceptance, only responses 'somewhat and strongly unfavourable' relating to the Orange County Water District, result in relatively high opposition to the potable reuse proposal. Opposition correlating with a negative impression of the Sanitation District is also distinct from the other two agencies. In addition, responses considered under belief in the technology above (Table 4.7, Appendix 4.12) suggest that trust in the technology correlates with more support than trust in the 'administers' and those who lack trust in both are the least in favour of potable reuse.

Revision of trust in the light of water reuse proposals emerges in several studies. In Table 4.16 above the slight diminishment of trust in the San Diego Water Authority in 1998 (from 5th to 6th ranking) was at the height of awareness of the proposed potable reuse system. In addition, trust is very low in the Metropolitan Wastewater Department that assumed responsibility for the proposed system from the City Water Department.

In the 2000 Orange County study, another measure of trust is used relating directly to potable reuse, as follows:

> Do you feel the water district should try to send information explaining this project to every household, or do you just trust the engineers and scientists to do what they are trained to do to make sure we have clean water?

Only 13% think the agencies should be trusted to go ahead with the project "to make sure we have clean water" instead of informing constituents; 83% want information sent to every householder.

Revised trust is also illustrated in the 1999 Sydney study which followed the 1998 "Sydney Water incident".[3] Agreement with the statement that "the authorities can be trusted to manage recycled water responsibly" was indicated by 60% of respondents in 1995 and this fell to 41% in 1999. For the 1997 San Antonio research, qualitative interview data showed that many respondents concerned about the current inadequacy of testing procedures in detecting human or mechanical error in the water treatment process:

> … communicated an underlying mistrust of the technology used to provide recycled water or of the motives of the municipal water supplier. (Foss 1997:52).

Foss (1997) reports that trust in technology and trust in the provider are not separate issues, they become enmeshed, as another respondent explains:

> Until current problems are resolved, I can't trust water and wastewater treatments to provide good-quality, safe drinking water as part of a recycling scheme. (p.53)

In the UK, there is a marked decrease in respondents' confidence in the agency to deliver safe water when they are asked to consider recycled water as a drinking water source through either indirect or direct processes. There is a 20% fall in confidence in the agency to deliver safe water so that only 18% trust (very confident) the water company to supply safe water in this way. Higher trust is shown for non potable reuse where the 'very' confident level falls by only 12% to 26%. In the San Francisco study, the relationship between general trust in government agencies as a whole and non potable reuse was explored, and only 20% of respondents strongly agree that those responsible will ensure that recycled water is safe.

From discussions with key industry representatives, the results of individual surveys have been used as a guide to policy. Several managers place high value on these

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[3] Sydney Water released "boil water" alerts on three separate occasions throughout 1998 when high counts of *Cryptosporidium* were detected in the water distribution system.

findings. However, as this review shows, key data can be overlooked or possibly avoided, as in the case of 'drink' questions and the offer of alternatives. Few studies have undertaken meaningful statistical analysis to explore relationships between independent and dependent variables.

Conclusion

The data considered in this chapter represent the best available secondary sources collected on the topic of acceptance of water reuse. The single focus on potable reuse where it has salience in San Diego, Orange County and Los Angeles generated a range of data, but was only statistically analysed in the 1993 San Diego study. The cross tabulated results for 1997 Orange County were not repeated to the same extent in the 2000 study, disabling any attempt at comparison in several key areas. However, the open ended responses included in both reports provided the qualitative backbone for reasons why people favour or oppose the potable reuse system proposed for that region. Among surveys that explored non potable reuse, the San Francisco and Sydney studies generated useful analysis, however, both omitted the influence of drinking water preference on acceptance and while trust data were collected in the Sydney studies, correlations with acceptance of reclaimed water were not reported.

Therefore, in comparing the evidence drawn together here against Bruvold's findings and in addressing the research questions, allowance should be made for the gaps in the data. Nevertheless, trends are, in some cases, quite strongly indicated. Despite relatively high acceptance for the general policy of potable reuse, support for actually consuming water sourced from the proposed system remains at the same level in California, as found in Bruvold's review; a median of 39% of target populations. A slightly lower level of acceptance is found elsewhere (35%). Although variations in acceptance are acknowledged, the comparatively high level for drinking such as for 1993 San Diego and 1999 UK need to be considered in the light of alternatives. It is argued that the result will be as the UK study found, which confirms Bruvold's earliest work, that potable reuse will be the least preferred option.

Because alternatives were rarely offered to respondents in these studies, the strategic nature of the industry approach is evident, particularly where potable reuse has salience. The studies appear to follow Bruvold's guide in establishing demographic predictors and providing questions that will help convince respondents of the viability of potable reuse. Among demographic influences on acceptance of potable reuse, male gender stands, followed by higher education, prior awareness for abstract considerations, and length of residency is also suggested. In contrast to Bruvold's (1985) findings, correlations, especially inverse relationships, cannot be assumed for age and socio-economic status. It is also observed that the influence of prior awareness rests on the quality or nature of that awareness and provision of additional information does not necessarily garner higher support.

Support is found for Bruvold's proposition relating to beliefs, values and concerns. The strongest positive correlation is found for trust that the technology is effective (four of four studies). Concern that the current water supply is polluted results in less support, however, environmental awareness tends to correlate with more support. Strong agreement that there will be a water shortage induces greater support in only two of five studies. Low concern about health risks correlates as Bruvold predicts with two results proving the relationship through negatively framed questions. When considered with open ended responses, the reasons given for supporting potable reuse represent Bruvold's belief predictors except public opinion, and they also acknowledge the benefit to the environment. However, measured uncertainty relating to the technology, sewage source and the need for strict controls erodes trust in the technology. The lack of trust in potable reuse technology sourced from sewage is the main reason for the opposition wherever open ended questions invited reasons for disagreement, in San Jose, Orange County, 1998 San Diego, 1996 Tampa, San Antonio and the UK.

Of all Bruvold's findings, his hypothesis relating degree of contact to level of acceptance has strongest support, overriding special considerations he suggests for salience of potable reuse or water reuse generally. His earliest finding that alternatives to potable reuse are preferred is also significant. It is argued that the benefits acknowledged as predictors for acceptance of potable reuse can in fact be applied to alternatives such as non potable reuse. While the level of agreement to

non potable reuse in California cannot be described as 'ready acceptance' as Bruvold suggests, this is evident in Australia and the UK where it has less salience. Additionally, residential reuse, not explored in California, is as acceptable as other uses suggested by Bruvold. Non potable reuse is related to fewer demographic indicators. Women may be more supportive as are those interested in the environment and less support may be forthcoming from those with a non English speaking background.

The role of trust, not highlighted in Bruvold's propositions, emerges as a pivotal concept as Giddens (1991) and Sztompka (1999) suggest. The background level of trust is indicated in the USA and UK studies. These survey data suggest that less than a third of respondents drink water straight from the tap in the USA compared to 77% in the UK study. Concern that the water supply is contaminated is highest in LA compared to San Diego, Orange Count and Arizona. Across a wider range of studies, current levels of trust in water and sewerage authorities is low compared to other agencies that provide information or share responsibility for maintaining water quality. Levels of trust in UK and Sydney authorities compare to those for 1993 San Diego which are higher than results elsewhere. And the importance of trust in relation to potable reuse is confirmed in the 1997 Orange County analysis. A downwards revision of trust in providers in relation to the safe implementation of water reuse emerges wherever this is explored, in San Diego, Orange County, San Antonio, Sydney and the UK.

Therefore, the importance of transparency in trust building structure outlined in Sztompka's framework emerges as a central concept in public communication. A strategic approach to consulting on acceptability of potable reuse that avoids consideration of alternatives in its search for demographic and belief predictors fails to adequately hear the concerns of the public. When alternatives are posed, closeness of contact of recycled water is a pivotal consideration with benefits to the environment and water supply being achieved at arguably less risk to public health. In the interests of building trust in providers and water reuse technology, both of which have a positive relationship with acceptance of water reuse, it is suggested that transparency in the style of Habermas's (1990) communicative action be used to guide public consultation efforts. For example, consideration should be given to

include the following key information in survey research which will also secure meaningful guidance for future policies:

1. A clear description of the source of water for higher treatment as 'sewage effluent' or 'sewage'.

2. Statements that confirm that water supplies are historically and currently supplemented by unplanned potable reuse.

3. Questions exploring acceptability of a range of uses including drinking, if potable reuse is an option.

4. Alternatives other than potable and non potable reuse.

The role of trust in potable reuse is further explored in a series of minor case studies that outline the experience of potable reuse, presented in the following chapter.