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46. Public Acceptability of Water Supply Innovations

Drought, climate change and growing demands have led to the adoption of various water supply innovations including desalination, wastewater reuse and rainwater harvesting. In general, the degree of penetration of these innovations depends less on technical constraints and more on assurances that they are safe, secure, affordable and responsibly managed. Concerns over potential impacts on public and environmental health and well-being are raised wherever innovations are introduced. Proponents are called upon to address end-user costs and energy consumption (particularly salient for desalination), as well as social equity in siting. Assurance that those who manage these innovations are competent and trustworthy is also essential (Asano and Bahri, 2011; Dolnicar et al., 2011, Fielding et al., 2019).

Public acceptance is determined by a constellation of factors. For instance, anxiety over recycled wastewater use varies by age, income, degree of environmental concern, views about water scarcity and trust in the process by which adoption decisions are made (Ross et al., 2014; Ormerod and Scott, 2012). Three major factors in determining acceptability are trust and confidence, public contact with the water innovations, and governance (Adewumi et al., 2014; Menegaki et al., 2007; Rogers et al., 2016).

Trust and confidence hinge in part on messaging: the benefits of an innovation must be articulated in publicly accessible language. Case studies suggest that supporters must articulate the practical economic and community development benefits of indirect potable reuse. Good messaging also requires actions that validate the message. Competence displayed by managers, coupled with public perceptions regarding assurances of water security, help validate positive messaging (Harris-Lovett, 2015). Messages conveyed by decision-makers regarding the safety and security of water innovations are more likely to positively influence public perceptions if reinforced by family, peers and colleagues deemed trustworthy, and whose familiarity with certain technologies are

viewed positively. Public engagement efforts in Orange County, California, Melbourne, Australia, Crete and Israel illustrate this.

In Orange County, messages regarding the safety of potable reuse conveyed by the local water district were reinforced by community groups and public health as well as local government agencies. In Melbourne, citizen engagement processes designed by local water agencies enabled residents to deliberate and discuss the pros and cons of various innovations. In Crete, confidence in wastewater reuse by local farmers led to wider social acceptance over time. In Israel, farmers and consumers embrace fruits and vegetables irrigated with reclaimed water, despite very small risks from minute amounts of pharmaceuticals. Messaging also reinforces the economic, water-saving and environmental benefits of reuse (Menegaki et al., 2007; Dolnicar et al., 2011; Friedler et al., 2006; Paltiel et al., 2016).

Concerns regarding public contact are especially challenging. Some observers argue that psychological explanations for public support of water innovations too often assume that differences between expert and lay views of reclaimed water (or other innovations) are synonymous with 'real versus perceived risk' or 'objective versus subjective risk'. Such distinctions are misguided responses by decision-makers intended to bring public opinion in line with expert judgment. Instead, the distinction may reinforce distrust by ignoring the difference between public confidence in a technology per se and trust in the process that leads to its adoption (Ormerod and Scott, 2012). Building confidence in direct contact with water generated by innovations requires trust in decisions, something best generated by public engagement. Case studies from Tucson, Arizona, Queensland, Australia and elsewhere illustrate this. Greater levels of trust in public authorities charged with basic community services are also associated with lower perceptions of risk. Conversely, risk perceptions tend to be amplified by distrust in agencies (Ross et al., 2014; Pidgeon and Henwood, 2010; Mehan, 2019; Mosher and Vartanian, 2015).

End uses entailing direct means of contact such as ingestion, bathing, swimming or other bodily interactions with water can generate serious apprehensions when the water source is recycled effluent. By contrast, end uses for recycled wastewater entailing indirect contact (e.g. landscape and crop irrigation) may

also generate concerns, but are generally viewed as more publicly acceptable (Alcon et al., 2010). Moreover, the documented presence of pathogens in reclaimed wastewater generates legitimate concerns and points to the need for rigorous risk assessment, strong regulation, a clear demonstration that recycled wastewater is safe chemically and microbiologically, and – most of all – the provision of buffers between treated wastewater and end users. The latter can be done through injecting treated wastewater into groundwater basins, thereby permitting a spatial and temporal distance between treatment and consumption (Fawell et al., 2005; Saldot and Huertas, 2006).

Direct contact issues also arise for desalination and harvested storm water but tend to be less serious. Two explanations for this comparatively lower level of concern may be conjectured for desalination. First, the levels of contaminants potentially present are closely monitored and the quality of desalinated product water can be fairly easily adjusted. Second, other public acceptance concerns, such as ecological and aesthetic impacts, partially obscure other concerns (Voutchkov, 2013). The comparatively lower levels of concern over storm water contact may be attributable to the perception that it poses less direct risk to users. In most applications, storm water undergoes treatment before potable and non-potable uses. Wetlands and bio-retention systems that filter water through soil or sand-based media can remove sediment, nutrients and heavy metals. However, contact-related concerns are more often expressed by public health officials rather than by the general public (Grant et al., 2013).

For all water innovations, governance – which encompasses law, regulation and stakeholder–public official relations – is essential for public acceptance. Governance tends to reflect power relationships shaped by demographic influences. For example, higher levels of income and education are positively associated with acceptance of recycled water – unsurprisingly, since better educated and wealthier people often have a greater voice in community decisions over its adoption. People of color, on the other hand, have lower levels of acceptance as do persons having lower income and education levels.

While education can play a role in changing perceptions, some factors deterring acceptability are more difficult to overcome.

In places that have traditionally relied on fresh water, a higher resistance to recycled water including rainwater may arise (Goonetilleke et al., 2017; Tortajada and Ong, 2016). The acceptance of recycled water is also influenced by age (younger people are generally better educated and thus more accepting), while low levels of trust in government officials' ability to mediate potential risks can negatively impact acceptability (Ross et al., 2014; Fielding et al., 2019).

Disadvantaged communities remain disproportionately affected by environmental pollution and other hazards that can lead to negative public health effects and environmental degradation. Because these communities have a large proportion of people of low income, high unemployment, low levels of home ownership, high rent burdens, sensitive health and low levels of educational attainment, they also face distinct governance disadvantages with respect to innovation adoption. These include legacies of environmental injustice and mistreatment strongly connected to the race, income and education levels of a community. The ability of these groups to attend public meetings or procedural hearings is low, as is their efficacy in bringing compelling counter-arguments to bear when decisions to establish a desalination plant or wastewater reuse facility are being weighed. Studies of the role of under-represented communities in the context of drinking water safety have documented this phenomenon: exemplified by the Flint, Michigan, lead contamination crisis (Shonkoff et al., 2009; Olson, 2016; Sze et al., 2009). Under-represented group disparities are exacerbated, further affecting the acceptability of innovations, when decision-makers adopt policies designed to 'streamline' or expedite permitting, licensing and/or approval of new water infrastructure (Farrelly and Brown 2011; Keremane et al., 2011).

In sum, the social acceptability of water innovations is 'socially constructed'. Public perceptions of a community's – and a society's – water needs, problems and appropriate solutions are filtered through citizens' views of the causes and severity of water problems. These views limit what constitute appropriate remedies. In addition, citizens' collective aspirations toward the type of society they find desirable shape how water needs, problems and appropriate solutions – including water innovations – are perceived. These attitudes also constrain

Table 46.1 Achieving public acceptance of desalination, wastewater reuse and rainwater harvesting

	Principal objectives	How to strengthen legitimacy
Prescribed activity – desalination (1)		
Pilot test technologies	Provide public outreach opportunity	Display advantages compared to other sources
Environmental assessment reports	Opportunity for public scoping meetings to identify concerns	Leads to partnership with community; develops trust
Invite community members to participate in planning, implementation	Assuage environmental impact concerns, effects on community growth	Conform the project to community aspirations; minimize injustice
Prescribed activity – wastewater reuse (2)		
Conduct planning and values-based decision-making at the community level	Involve key stakeholders; facilitate dialog, social learning	Situate reuse into discussion of water supply and quality, and health concerns
Conduct opinion surveys of reuse and its sources of public support	Demonstrate underlying fears of drought and water shortages, public confidence in technology	Demonstrate economic, environmental and household security advantages of reuse
Conduct public outreach program	Increase confidence and support	Gain experience in effective outreach throughout project life
Prescribed activity – rainwater harvesting (3)		
Introduce projects on a small scale	Demonstrate feasibility	Demonstrate appropriate application

the choices decision-makers are able to make with regard to the levels of financial or other risk considered appropriate for an innovation's adoption; what constitutes acceptable solutions to chronic drought or water shortages; and what makes a set of options appropriate to ensure water security (Buchs, 2010; Aguilera-Klink et al., 2000; Kalof, 1997; Lukasiewicz et al., 2013; Liberatore, 1995). Public acceptability requires that innovations resonate with a society's shared belief systems, ethical standards and cultural norms. As Table 46.1 suggests, different measures must be utilized to ensure this resonance.

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References

- Adewumi, J.R., A.A. Ilemobade and J.E. Van Zyl. 2014. "Factors predicting the intention to accept treated wastewater reuse for non-potable uses amongst domestic and non-domestic respondents," *Journal of the South African Institution of Civil Engineering* 56 (1) April. <https://journals.co.za/doi/abs/10.10520/EJC154143>
- Aguilera-Klink, F., E. Perez-Moriana and J. Sanchez-Garcia. 2000. "The social construction of scarcity. The case of water in Tenerife (Canary Islands)," *Ecological Economics* 34 (2): 233–245. <https://EconPapers.repec.org/RePEc:eee:ecolec:v:34:y:2000:i:2:p:233-245>
- Alcon, F., F. Pedrero, J. Martin Ortega, N. Arcas, J.J. Alarcon, M.D. Miguel. 2010. "The non-market value of reclaimed wastewater for use in agriculture: A contingent valuation approach," *Spanish Journal of Agricultural Research* 8 (S2): S187–S196. ISSN 1695-971-X
- Asano, T. and A. Bahri. 2011. *Global Challenges to Wastewater Reclamation and Reuse, On the Water Front*, January.
- Buchs, A. 2010. "Water crisis and water scarcity as social constructions. The case of water use in Almeria (Andalusia, Spain)," *Options Méditerranéennes* 207–211: halshs-00565223.
- Dolnicar, S., A. Hurlimann and B. Grün. 2011. What affects public acceptance of recycled and desalinated water? *Water Research* 45: 933–943 doi:10.1016/j.watres.2010.09.030.

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- Farrelly, M. K. and R. Brown 2011. "Rethinking urban water management: experimentation as a way forward?" *Global Environmental Change* 21: 721–732.
- Fawell, J., L. Fewtrell, O. Hydes, J. Watkins, P. WynJones. 2005. *A Protocol for Developing Water Reuse Criteria with Reference to Drinking Water Supplies*. London, UK: UK Water Industry Research Limited. Report ref. No.5/WR/29/1/ https://www.waterboards.ca.gov/water_issues/programs/grants_loans/water_recycling/research/02_011.pdf
- Fielding, K.S., S. Dolnicar & T. Schultz 2019. "Public acceptance of recycled water," *International Journal of Water Resources Development* 35 (4): 551–586. <https://doi.org/10.1080/07900627.2017.1419125>
- Friedler, E., O. Lahava, H. Jizhakib, T. Lahavc. 2006. "Study of urban population attitudes towards various wastewater reuse options: Israel as a case study," *Journal of Environmental Management* 81 (2006): 360–370. <https://doi.org/10.1016/j.jenvman.2005.11.013>
- Goonetilleke, A., A. Liu, S. Managi, C. Wilson, T. Gardner, E.R. Bandala, L. Walker, J. Holden, M.A. Wibowo, S. Suripin, H. Joshi, D.M. Bonotto, D. Rajapaksa. 2017. "Stormwater reuse, a viable option: Fact or fiction?" *Economic Analysis and Policy* 56: 14–17. ISSN 0313-5926. <https://doi.org/10.1016/j.eap.2017.08.001>
- Grant, S.B., T.D. Fletcher, D. Feldman, J.D. Saphores, P.L. Cook, M. Stewardson, K. Low, K. Burry, A.J. Hamilton. 2013. "Adapting urban water systems to a changing climate: Lessons from the millennium drought in southeast Australia," *Environmental Science and Technology* Oct 1; 47(19): 10727–10734. <https://doi.org/10.1021/es400618z>
- Harris-Lovett, S.R., C. Binz, D.L. Sedlak, M. Kiparsky and B. Truffer. 2015. "Beyond user acceptance: A legitimacy framework for potable water reuse in California," *Environmental Science & Technology* 49: 7552–7561. <https://doi.org/10.1021/acs.est.5b00504>
- Kalof, L. 1997. "Understanding the social construction of environmental concern," *Human Ecology Review* 4 (2): 101–105. <http://www.jstor.org/stable/24707033>
- Keremane, G., J. McKay and Z. Wu. 2011. "Not stormwater in my teacup: An internet survey of residents in three Australian cities," *Water* (April), 118–124.
- Liberatore, A. 1995. "The social construction of environmental problems, pp. 59–83, in P. Glasbergen and A. Blowers (eds.), *Environmental Policy in an International Context*, volume 1. Butterworth-Heinemann. [https://doi.org/10.1016/S1874-7043\(06\)80006-5](https://doi.org/10.1016/S1874-7043(06)80006-5)
- Lukasiewicz, A., P. Davidson, G.J. Syme and K.H. Bowmer. 2013. "How the social construction of the environment affects people's reactions to water policy," *Australasian Journal of Environmental Management* 20 (3): 179–192. <https://doi.org/10.1080/14486563.2013.816641>
- Mehan III, G.T. 2019. "Found water: Reuse and the deconstruction of 'Wastewater,'" *Water Finance & Management* December 10. <https://waterfm.com/found-water-reuse-and-the-deconstruction-of-wastewater/>
- Menegaki, A.N., N. Hanley and K. Tsagarakis. 2007. "The social acceptability and valuation of recycled water in Crete: A study of consumers' and farmers' attitudes," *Ecological Economics* 62(1): 7–18. <https://EconPapers.repec.org/RePEc:eee:ecolec:v:62:y:2007:i:1:p:7-18>
- Mosher, J.J. and G.M. Vartanian, editors. 2015. *Framework for Direct Potable Reuse*. Alexandria, VA: WateReuse Research Foundation.
- Olson, T. 2016. "The science behind the Flint water crisis: Corrosion of pipes, erosion of trust," *The Conversation*, January 28. <https://theconversation.com/the-science-behind-the-flint-water-crisis-corrosion-of-pipes-erosion-of-trust-53776>
- Ormerod, K.J. and C.A. Scott. 2012. "Drinking wastewater: Public trust in potable reuse," *Science, Technology, & Human Values* 1–23. <https://doi.org/10.1177/0162243912444736>. <http://sthv.sagepub.com>
- Paltiel, O., G. Fedorova, G. Tadmor, G. Kleinstern, Y. Maor and B. Chefetz. 2016. "Human exposure to wastewater-derived pharmaceuticals in fresh produce: A randomized controlled trial focusing on carbamazepine," *Environmental Science & Technology* 50 (8): 4476–4482 <https://doi.org/10.1021/acs.est.5b06256>
- Pidgeon, N. and K. Henwood. 2010. "The social amplification of risk framework (SARF): Theory, critiques, and policy implications," pp. 53–68, in P. Bennett,

- K. Calman, S. Curtis, and D. Fischbacher-Smith (eds.) *Risk Communication and Public Health*. London: Oxford University Press. ISBN-13: 9780199562848/10.1093/acprof:oso/9780199562848.003.04.
- Ross, V.L., K.S. Fielding and W.R. Louis. 2014. "Social trust, risk perceptions and public acceptance of recycled water: Testing a social-psychological model," *Journal of Environmental Management* 137: 61–68. <https://doi.org/10.1016/j.jenvman.2014.01.039>
- Rogers, S., J. Barnett, M. Webber, B. Finlayson and M. Wang. 2016. "Governmentality and the conduct of water: China's South–North Water Transfer Project," *Transactions of the Institute of British Geographers*, 41 (4): 429–441.
- Saldot, M. and E. Huertas. 2006. *Integrated Concepts for Reuse of Upgraded Wastewater: Guidelines for Water Reuse in Europe*. AQUAREC EVK1-CT-2002-00130 Work package 2 Deliverable D15, May. https://www.susana.org/_resources/documents/default/2-550-salgot-huertas-2006-d15-integrated-reuse-aquarec-en.pdf
- Shonkoff, S.B., R. Morello-Frosch, M. Pastor and J. Sadd. 2009. "Minding the climate gap: Environmental health and equity implications of climate change mitigation policies in California," *Environmental Justice* 2. <https://doi.org/10.1089=env.2009.0030>.
- Sze, et al. 2009. "Defining and contesting environmental justice: Socio-natures and the Politics of Scale in the Delta," *Antipode: A Radical Journal of Geography*. September. <https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1467-8330.2009.00698.x>
- Tortajada, C. and C.N. Ong. 2016. "Reused water policies for potable use," *International Journal of Water Resources Development* 32 (4): 500–502. <https://doi.org/10.1080/07900627.2016.1179177>
- Voutchkov, N. 2013. *Desalination Engineering Planning and Design*. New York: McGraw-Hill.