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Common sense principles governing potable water recycling in the southwestern US: Examining subjectivity of water stewards using Q methodology

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ABSTRACT

The potential to supplement potable water supplies with highly treated municipal wastewater, or sewage, is of increasing interest to water planners in many parts of the world. Most of the current social science focuses on public acceptance, however there is a relative lack of research that explores the subjectivity of people who are involved with water recycling or water planning. This study draws on Gramscian theories of governance and Q Methodology to analyze common sense principles that are held by water stewards who currently govern potable water reuse in the southwestern United States. Two competing perspectives emerged from the analyses, which I label neosanitarian and ecosanitarian. Drawing upon tenets established in the Progressive Era, neosanitarians believe that use of recycled water is an appropriate way to expand urban drinking water supplies. Drawing upon tenets established in ecology, ecosanitarians are not opposed to potable water recycling, however they are also interested in radical alternatives to the sanitary status quo. For example, neosanitarians favor advanced wastewater treatment, while ecosanitarians prefer composting toilets and preventative actions. Differences between the common sense views pivot on ideas about the most appropriate technology but also reflect contested visions of ideal society.

1. Introduction

Potable water recycling involves intentionally using highly treated wastewater to augment drinking water supplies. Planned potable water recycling is distinct from unplanned, or *de facto* potable reuse. Normally wastewater treatment facilities release effluent into surface waters that also serve as the water supplies for downstream communities, which results in so-called unplanned potable reuse. This practice is so widespread that the extent of unplanned reuse is largely unknown (NRC, 2012). While most people are wholly unaware of this everyday occurrence, survey research suggests individuals who are familiar with unplanned potable reuse are significantly more accepting of planned potable reuse (Rice et al., 2016). Planned potable reuse projects are *intentional*, local, and, importantly, apply advanced wastewater treatment processes that are not used in cases of unplanned reuse (e.g., microfiltration, reverse osmosis, and advanced oxidation).

Although water industry professionals (e.g., engineers, managers, planners) typically endorse recycling wastewater for potable purposes as a safe and sustainable water management strategy, the general public, when queried, are often uncomfortable with the prospect (Po et al., 2003). Vocal public opposition has previously proven capable of stopping potable recycling projects in their tracks, destabilizing local power relations, and challenging the status quo of municipal water management in the U.S. and Australia (Meehan et al., 2013; Price et al., 2012; Lejano and Leong, 2012). As previous scholarship demonstrates, successful potable water recycling projects are a result of a determined political struggle, which is necessary to win over the water sector, local politicians, the media, as well as the general public (Binz et al., 2016; Harris-Lovett et al., 2015; Kiparsky et al., 2016). In this respect, recycling water for potable purposes is not *yet* a taken for granted practice. Indeed, the possibility of public opposition is a specter that haunts long-term water planners.

The role of psychological disgust, known as the 'yuck factor,' has long remained the primary focus for social scientific explanation of public objections to drinking recycled water (Wester et al., 2015; Christen, 2005; Tennyson et al., 2015; Russell and Lux, 2009). While most studies implicitly or explicitly question the subjective rationality of the public, few studies explore the rationality of scientists, experts, or related water stewards (Beveridge et al., 2017). Studies of water steward's perspectives regarding water reuse typically seek to identify

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the drivers or institutional barriers to implementing or expanding water recycling (Kiparsky et al., 2016; Browning-Aiken et al., 2011; Burgess et al., 2015; Bischel et al., 2012; Binz et al., 2016), however comparatively little is known about the subjective views those who make, shape, and operate potable water recycling projects (exceptions to Browne et al., 2007, 2008; Leong, 2016, 2015).

While acknowledging that the prospect of potable water reuse increasingly involves public dialog to garner tacit acceptance, it is primarily water stewards who make and shape plans for potable reuse (Farrelly and Brown, 2014; Binz et al., 2016). Strickert et al. (2016: 56) define water stewards as "people who self-identify as being engaged in the management of water or who had livelihoods connected to water," which includes public officials, academics, consultants, and others. This study explores the common sense views of water stewards in the Southwest.

Gramcian common sense is "the incoherent set of generally held assumptions and beliefs" (Gramsci, 1971: 323) that are shared by a particular social group, not all of society. For Gramsci, common sense is informed by shared practice and everyday lived experience and is therefore geographically and historically specific (Waterstone, 2010; Loftus and Lumsden, 2008). I use the term common sense to signal a Gramscian form of subjectivity, which is to say that geography and history contribute to a number of distinct collective truisms that govern daily activities. Gramsci posits that an individual person is an ensemble of social relations. Discussing the "concept of man" [sic], he argues "[m]an is to be conceived as an historical bloc of purely individual and subjective elements and of mass and objective material elements with which the individual is in active relationship" (Gramsci, 1971: 360). These material elements include waterworks. Subsequently, from "a Gramscian perspective, water infrastructure can be considered part of the hegemonic apparatus through which forms of 'common sense', in support of a specific group's interests, come to be constituted" (Ekers and Loftus, 2008: 706).

While most social scientific studies have historically concentrated on promoting public acceptance and/or overcoming public opposition (see reviews in Ormerod, 2016; Po et al., 2003), my primary contribution is to combine Gramscian concepts with Q Methodology to illuminate the unconscious and taken for granted principles that routinize, internalize, and concretize the prospect of potable water reuse. As officials make plans to expand or construct potable water reuse facilities, I employed Q methodology to identify and characterize the different common sense views of water stewards in relation to potable water recycling in the southwestern U.S. (the Southwest), a region where rapid demographic growth and impacts of climate change (e.g., decreased average annual precipitation, increased drought severity, decreased snowpack) predict greater competition for increasingly scarce supplies (Garfin et al., 2014). As water stewards, the study participants represent the individual members of society whose collective labor shapes the discursive and material waterscape (Ekers and Loftus, 2013; Loftus and Lumsden, 2008).

In the sections that follow, I first provide a brief overview of using recycled water supplies for potable purposes. Next, I highlight links between Gramscian governance and urban political ecology of water. The following section provides an explanation of the research methods. I then identify and describe the distinct perspectives that emerged from the analyses, which I labeled neosanitarian and ecosanitarian. In the penultimate section, I discuss additional details that clarify the implications for water governance given these differing perspectives. Finally, I summarize the contributions of this study and benefit of using Q methodology to explore the common sense of everyday lived experience.

2. Possibility of planned potable water recycling

While rare, potable water recycling projects are not new or revolutionary. The earliest potable reuse facilities arose with little fanfare in the U.S. and abroad. The first permanent project in the U.S. began in 1962 by using recycled water to recharge groundwater in Los Angeles County, California. Neighboring Orange County began injecting recycled water into aquifers at risk of saltwater intrusion in 1976. Currently a number of projects are in operation in select cities across the world, from Singapore to South Africa, however the largest concentration of potable water recycling projects are located in the Southwest – and specifically southern California (NRC, 2012).

Proposals to deliberately recycle water for potable purposes are typically divided into two categories: indirect and direct. Indirect potable reuse (IPR) blends highly treated wastewater with conventional water sources in rivers, lakes, reservoirs, or aquifers. The blended water is later extracted, treated to drinking water standards, and delivered to customers. Direct potable reuse (DPR) dispenses with the intermediate 'indirect' step by adding highly treated recycled water directly to the water distribution system (NRC, 2012).

Professionals working in the water sector have expressed interest in finding uses for recycled water, including potable reuse, for several decades. In 1998 a committee of the U.S. National Research Council (NRC) concluded that IPR is " a solution of last resort, to be adopted only when all other alternatives for nonpotable reuse, conservation, and demand management have been evaluated and rejected as technically or economically infeasible" (NRC, 1998: 15). The committee further concluded that DPR was not "a viable option for public water supplies" in the U.S., suggesting that 'environmental buffers' (i.e., indirect blending and storage) play an important protective role (NRC, 1998: 2).

Traditionally municipal drinking water is supplied by the 'best available source.' Based on this maxim the 1998 NRC committee recommended IPR as a source of last resort. However the report recognized that "in some instances the best available source of additional water to augment natural sources of supply may be reclaimed water" (NRC, 1998: 42). At the time, the NRC (1998: 70) reported the "risks posed by unknown or unidentifiable chemicals" could not be precisely determined, and thus, "it will never be possible to definitively say the risk they pose has been reduced to acceptable levels."

A decade and half later, another NRC panel gathered to address the potential to expand the nation's water supply through water reuse. The committee noted again that the best available source for water might, in some circumstances, be recycled water. Unlike the previous committee, the 2012 NRC determined that given technically innovative treatment processes (such as membrane filtration, reverse osmosis, and advanced oxidation) water treated for potable purposes can be as safe as, *if not safer than*, conventionally sourced water supplies. The NRC further declared, "the historical distinction between direct and indirect potable reuse is not meaningful to the assessment of the quality of water delivered to consumers" (NRC, 2012: 54). Although endorsed by the NRC, currently the only permanent (i.e., non-emergency) DPR facility in the U.S. is in Texas, however it is a prospect that is gaining support in the U.S. and abroad (Leverenz et al., 2011; Burgess et al., 2015).

3. Political ecology, gramscian governance, and common sense

Political ecologists have previously emphasized how hegemony is cultivated through the construction and production of both nature and the city (Loftus and Lumsden, 2008; Robbins, 2007; Heynen et al., 2006). Urban political ecologists draw upon the Marxist notion of "metabolism" as the primary metaphor to explain urban environmental change (Gandy, 2002; Heynen et al., 2006; Swyngedouw, 2004). This view stresses socially mediated 'natural' metabolism, or the ways in which culture, people, and technology mediate materials in the interest of capital (Gandy, 2014, 2002; Swyngedouw, 2015; Birkenholtz, 2016).

Metabolism in urban political ecology is often viewed through the lens of infrastructure: the materially necessary conduit for metabolic circulatory processes. For example, examining how water and sewage connect the city to distant places, bodies, and environments (Heynen et al., 2006; Swyngedouw, 2015). Specifically 'urban metabolism' puts