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Vision and perception of community on the use of recycled water for household laundry: A case study in Australia

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HIGHLIGHTS

- Community perception of laundry as a new end use of recycled water is analysed.
- Higher number of the respondents supported the new end use.
- The perspective users of recycled water are more reserved towards the new end use.
- The current users are very happy with the current recycled water.

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ABSTRACT

This study investigates the community perception of household laundry as a new end use of recycled water in three different locations of Australia through a face to face questionnaire survey (n = 478). The study areas were selected based on three categories of (1) non-user, (2) perspective user and (3) current user of recycled water. The survey results indicate that significantly higher number (70%) of the respondents supported the use of recycled water for washing machines ($\chi^2 = 527.40$, df = 3; p = 0.000). Significant positive correlation between the overall support for the new end use and the willingness of the respondents to use recycled water for washing machine was observed among all users groups (r = 0.43, p = 0.000). However, they had major concerns regarding the effects of recycled water on the aesthetic appearance of cloth, cloth durability, machine durability, odour of the recycled water and cost along with the health issues. The perspective user group had comparatively more reservations and concerns about the effects of recycled water on washing machines than the non-users and the current users ($\chi^2 = 52.73$, df = 6; p = 0.000). Overall, community from all three study areas are willing to welcome this new end use as long as all their major concerns are addressed and safety is assured.

1. Introduction

Australia targets to increase the water reuse from 16.8% in the year 2009/10 to 30% per year in 2015 (Whiteoak et al., 2012). To meet this aggressive water recycling targets, more recycled water schemes together with new end uses should be further explored and developed. After agriculture, the household sector falls as the second highest water user in Australia (ABS, 2012). Therefore, due consideration should be given for conservation of more household water with recycled water. Recycled water supply in the form of dual reticulation system has already begun in some suburbs of Australia. However, the existing end uses of recycled water in such systems are limited for landscape irrigation, car washing and toilet flushing. Hence, adding up new end uses of recycled water to the existing end uses is a must for system optimisation and sustainability. Washing machine as a new end use of recycled water in dual reticulation system is well recognised for its great potential benefits. The influence of laundry water consumption is significant (almost 20%) on household water consumption of different states of Australia (ABS, 2004; Mainali et al., 2011a) and most of the countries of the world (Pakula and Stamminger, 2010). Few studies on the use of recycled water for washing machines (O'Toole et al., 2008; Storey, 2009; Mainali et al., 2011a, 2013; Chen et al., 2012) were carried out. However, studies investigating on social aspects to analyse public's acceptance and their concerns on this new end use are sparse.

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It is a fact that successful implementation of a wastewater reuse project depends not only on its technical and environmental feasibility, but primarily on the support and the acceptance from the general public. Dishman et al. (1989) concluded that "the technical aspects of potable water reuse can be resolved, but the issue of public acceptance could kill the proposal". There are evidences of many recycled water projects which have failed due to lack of community support (Mainali et al., 2011b). These projects include not only the (indirect) potable reuse schemes but also the non-potable reuse projects including one in the Netherlands (Hurlimann and Dolnicar, 2010). To introduce any new end use of recycled water, it is without doubt a major challenge to achieve the public acceptance and support, especially when the use is with more personal contacts. Many researchers (Hartley, 2003; Po et al., 2003; Marks et al., 2006; Hurlimann and Dolnicar, 2010; Mainali et al., 2011b) advocate that no program using recycled water can be initiated without public acceptance. It is therefore very crucial to identify the nature of public response regarding the use of recycled water in washing machines. Since then, majority of studies have investigated public acceptance of recycled water for various uses. Pioneers in this field (Bruvold and Ward, 1970; Bruvold, 1972) and many others (Stone and Company Incorporated, 1974; Sims and Baumann, 1974; Olson et al., 1979; Bruvold et al., 1981; Milliken and Lohman, 1983; Lohman and Milliken, 1985; Ahmad, 1991; Madany et al., 1992; Sydney water, 1999; Jeffrey, 2002; Hills et al., 2002; ARCWIS, 2002; Friendler et al., 2006; Marks et al., 2006; Hurlimann, 2006a, 2006b; Hurlimann and McKay, 2007; Roseth, 2008; Alhumoud and Madzikanda, 2010; Pham et al., 2011) are some of the studies conducted basically in

Table 1
Percentage of respondents opposing the specific uses of recycled water — various international studies.

Relevant studies	Various uses							
	Drinking (%)	Cooking (%)	Showering (%)	Swimming (%)	Cloth washing (%)	Car washing (%)	Garden irrigation (%)	Toilet flushing (%)
Pham et al. (2011); n = 223 Australia (Sydney)	–	–	94	81	40	27	22	4
Alhumoud and Madzikanda (2010); n = 2200 Kuwait	78	78	60	–	53	17	–	–
Roseth (2008); n = 3050 Australia (five major cities)	82	77	64	51	45	14	14	10
Hurlimann and McKay (2007); n = 305 Australia (Bendigo)	58	–	38	–	28	–	1	1
Hurlimann (2006a, 2006b); n = 197 Australia (Melbourne)	56	–	41	–	35	–	1	1
Friedler et al. (2006); n = 256 Israel	89	–	–	69	62	20	22	15
Marks et al. (2006); n = 2504 Australia	68[a]	46[a]	24[a]	–	27	8	4	3
ARCWIS (2002)[b]; n = 685 Australia	74	–	52	–	30	–	4	4
Hills et al. (2002); n = 1055 UK	–	–	–	–	–	–	–	1
Sydney Water (1999); n = 900 Australia	69	62	43	–	22	–	3	4
Madany et al. (1992); n = 500 Bahrain	92	89	80	63	–	–	–	–
Ahmad (1991); n = 100 or 50 Qatar (Doha)	–	–	–	–	–	50	50	60
Lohman and Milliken (1985); n = 403 USA	67	55	38	–	30	–	3	4
Milliken and Lohman (1983); n = 399 USA	63	55	40	–	24	–	1	3
Bruvold et al. (1981); n = 140 USA	58	–	–	–	–	–	5	–
Olson et al. (1979)[c]; n = 244 USA	54	52	37	25	19	–	6	7
Sims and Baumann (1974); n = 400 USA	44	42	–	15	15	–	–	–
Stone and Kahle (1974)[b]; n = 1000 USA								
Stone and Company Incorporated (1974)[d]; n = 549 USA	32	28	17	–	16	–	11	–
Bruvold (1972); n = 972 USA	56	55	37	24	23	–	3	23
Bruvold and Ward (1970); n = 50 USA	54	54	32	28	24	–	10	12

[a] Question phrased 'water mixed with recycled water and treated to drinking water quality'.
[b] Cited in Po et al. (2003).
[c] Cited in Bruvold (1988).
[d] Cited in Hurlimann (2008).