Consumer Perceptions of Recycled and Reclaimed Water

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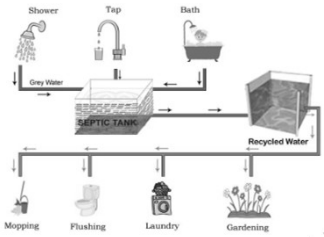
Consumer perceptions are a reality with which we must work.


We want people to use water again and perceive that it is safe for certain uses.



Perceptions about what we call this water will affect its use.

Yuck, disgust, "poop" factor

- The revulsion to recycled water negatively influences a person's willingness to use recycled water for both potable and non-potable uses (Dolnicar and Hurlimann, 2010).
- Disgust was the most commonly cited factor determining the use of recycled water (Po et al., 2003, Schmidt, 2008). The false perception that recycled water contains feces or other toxins (yuck factor) consistently appears as a barrier to reuse of water.
- 70% of Australian respondents believed recycled water was purified sewage and 60% of them believed it contained human waste (Dolnicar and Schafer, 2009).
- While only 2% identified disgust as an important factor in their decision to use (or not) recycled water, the psychometric measure of disgust was the strongest predictor of their decision to not use it (Wester et al., 2016).

Methods

- Our goal was to see which was the more preferred term (recycled or reclaimed) and to quantify the effects of priming messages. We wanted to determine which word and priming message yielded the most favorable perceptions.
- Data were collected from 12-18 September 2017.
- We conducted an online survey (IRB X17-1129e).
- First, we asked about their water source and how risky they perceived their water source to be (1=extremely risky and 5=extremely safe).

Methods

- Then, we gave them one of two terms (recycled or reclaimed). What was in the water (free response)?
- Next, given a list of contents, asked them whether that item was in the water. We also asked how safe the water was for a variety of uses.
- Then, we used priming messages. For each word, one-third of the subjects were primed with the (a) "re-x from a plant production nursery or greenhouse" and one third were primed with (b) "re-x from residential use". One third received no priming message. We asked about safe/risk for the water uses (again).
- Obtained 1259 completed responses (passing four quality assurance checks to be sure each subject was reading every question) or approximately 200 persons per word/prime condition.

Results: Demographic Characteristics

Characteristic	Reclaimed	Recycled	p value
Number	n=632	n=627	
Age	46.8 years	43.9 years	0.003*
Household Income	$77,485	$81,374	0.166
Percent Caucasian	82.9%	84.1%	0.249
Education	3.86 (some college)	3.81 (some college)	0.501
Number of adults	2.25	2.34	0.090
Number of children	0.64	0.69	0.387

Two samples (recycled/reclaimed) were similar, demographically, except for age. Subjects who saw "recycled" were 3 years older, on average.

Wordle of terms used to describe reclaimed water.

Wordle of terms used to describe recycled water.

What words would you use to describe what is in recycled/reclaimed water?

Results: What is in water? (percent who agreed)

Found in water	Reclaimed	Recycled	p value	Significant difference?
Animal waste	**29.4 a**	23.5 b	0.01	Yes
Chlorine	44.4	43.6	0.41	No
Composted plants	17.2	14.1	0.07	No
Disinfectant	26.5	24.4	0.21	No
Dyes	**20.1 a**	14.6 b	0.01	Yes
Harmful bacteria	36.3	31.9	0.05	No
Harmful chemicals	**34.2 a**	26.6 b	0.01	Yes
Heavy metals	**27.6 a**	22.7 b	0.02	Yes
Helpful bacteria	15.5	14.4	0.33	No
Herbicides	**33.8 a**	26.1 b	0.01	Yes
Hormones	**18.6 a**	14.6 b	0.03	Yes

P value from Chi-square test; Bonferroni method used to adjust p values (significant at $p \leq 0.05$).

Results: What is in water (percent who agreed)?

Found in water	Reclaimed	Recycled	p value	Significant difference?
Human waste	**31.8 a**	26.5 b	0.02	Yes
Insecticides	**29.2 a**	24.1 b	0.02	Yes
Minerals	30.8	34.2	0.11	No
Nothing harmful	12.3 b	**18.4 a**	0.01	Yes
Pathogens	22.4	19.7	0.13	No
Pesticides	**33.2 a**	25.7 b	0.01	Yes
Plant nutrients	17.1	15.5	0.25	No
Prescription drugs	**17.9 a**	15.2 b	0.02	Yes
Salts	29.7	28.7	0.37	No
Sanitizers	22.4	23.1	0.41	No
Vitamins	10.6	10.0	0.40	No

P value from Chi-square test; Bonferroni method used to adjust p values (significant at $p \leq 0.05$.

Conclusion: What is in water?

- For the items listed, a higher percentage of respondents perceived harmful substances were in reclaimed water compared to recycled water.
- Here, 31% of the participants believed human waste was in reclaimed water (compared to 26.5% in recycled water).
- The "yuck" factor is alive in the minds of many Americans.

Results: How risky do you believe it is to use re-x water for the following uses?

Type of use	Water Use
Personal direct	Cooking
Personal direct	Drinking
Personal indirect	Bathing/showering
Personal indirect	Flushing toilet
Personal indirect	Watering lawn
Personal indirect	Washing car
Public	Fire fighting
Public	Irrigate public park

Results: How risky do you believe it is to use re-x water for the following uses?

Type of use	Water Use	Reclaimed	Recycled	p value	Significant difference?
		n=632	n=627		
Personal direct	Cooking	2.61	**2.77**	0.009	Yes
Personal direct	Drinking	2.44	2.52	0.179	No
Personal indirect	Bathing/showering	2.99	**3.14**	0.016	Yes
Personal indirect	Flushing toilet	3.97	**4.10**	0.020	Yes
Personal indirect	Watering lawn	3.77	**3.92**	0.003	Yes
Personal indirect	Washing car	3.86	**3.97**	0.049	Yes
Public	Fire fighting	3.93	4.02	0.079	No
Public	Irrigate public park	3.72	**3.85**	0.016	Yes

Extremely safe = 5, Safe = 4, Not Sure = 3, Risky = 2, Extremely Risky = 1. Higher mean value indicates "safer" perceived water.

Conclusion: Recycled water had a lower perceived risk (was perceived to be safer) compared to reclaimed water.

- For 6 of 8 listed uses, recycled water was perceived as safer (less risky) compared to reclaimed water.
- For the remaining 2 (drinking/personal direct) and (fire-fighting/public) the risk level perception was similar to reclaimed water.
- For all of the personal indirect uses in this study (e.g. bathing, showering, flush toilet, water lawn), recycled water was perceived as safer (less risky) compared to reclaimed water.
- We conclude that generally this sample of 1259 Americans perceived recycled water as safe as (less risky) or similar to reclaimed water.

Effects of priming messages

- Priming messages are like priming a water pump. The message is intended to make you think (differently?) about a situation.
- One third received a nursery priming message, one third received a residential priming message, and one third received no priming message (control) and all three groups answered subsequent questions.
- Our hypothesis was that the nursery priming message would be better (perceived as safer/less risky) compared to the residential message. Also, the nursery priming message would be as safe as, or better than, no message.

Effects of priming messages

- What did we tell them?
- "Depending on where you live, recycled/reclaimed water is regulated to be of a certain quality when it is ready for reuse. Here, we use the word recycled/reclaimed water to mean that the water is recycled/reclaimed from **a plant production nursery or farm/residential use** and meets the state standard for safe use to grow more plants. Using this definition, how risky do you believe it is to use recycled water for the following uses?"

Results: Effects of priming messages overall

Type Use	Water Use	No prime (control)	Primer 1 (nursery)	Primer 2 (residential)	p value	Sig?
PD	Cooking	2.01 a	2.66 b	2.02 a	0.001	Yes
PD	Drinking	1.90 a	2.39 b	1.86 a	0.001	Yes
PD	Water edible plants	2.93 a	3.45 b	3.07 a	0.001	Yes
PI	Bathing/Showering	2.42 a	3.01 b	2.45 a	0.001	Yes
PI	Watering lawn	4.05	4.04	4.10	0.583	No
PI	Flushing toilet	4.13	4.12	4.20	0.285	No
PI	Washing car	4.15 b	4.01 a	4.13 b	0.034	Yes
PI	Watering orn. plants	3.97 a	3.98 a	3.85 b	0.046	Yes
P	Fire fighting	4.11	4.04	4.11	0.333	No
P	Water public park	3.94	3.95	3.94	0.996	No

Conclusion: Nursery priming message reduced risk compared to residential/no priming

- Compared to no priming message, indicating the recycled water was from **a plant production nursery or farm** and met the state standards for safe use to grow more plants" was perceived as safer over no priming message, especially for personal direct uses (e.g. cooking, drinking).
- For personal indirect uses (e.g. watering ornamental plants) we found either a similar level of risk or reduced risk (improved safety) with the nursery priming message (except for car-washing).
- For public use (e.g. watering park, fire-fighting), we found no change in relative risk or perceived safety when a priming message was used.
- The nursery primer improved perceived safety (reduced perceived risk) for several water uses compared to the residential primer.

Implications

- The ignorance (in this sample of respondents) about the contents of recycled/reclaimed water can be used as an educational opportunity.
- Words mater. Research regarding climate change, for example, has found the usage of **global warming** and **climate change** to produce significantly different perceptions of the issue (Schuldt, Konrath, & Schwarz, 2011; Whitmarsh, 2009).
- The horticulture industry and individual firms could take action to improve the perception of recycled water, and by using it, improve the perception of their own business.

Implications

- Prior research has produced evidence to support the notion that some consumers are willing to pay a price premium for horticultural products produced in an environmentally-friendly or sustainable manner (Behe et al., 2010; Behe et al., 2013; Khachatryan et al., 2014).
- Evidence of consumers' willingness to pay more for eco-friendly products outside the horticulture industry is abundant.
- Nurseries recycling water from their facilities should indicate this sustainable practice and also **indicate that the water is recycled from the nursery itself,** used for additional plant production.
- When all other product characteristics are perceived as similar/equal, the water conservation message may tip purchases in favor of the nursery that promotes that message.

Is it the time now (or never) to talk about recycling water?

Next steps for this research:

- Findings are being prepared to submit to the Journal of Environmental Psychology.
- We believe these results can influence policy, especially with regard to terminology and marketing efforts to encourage water reuse. Our evidence suggests recycled is a better term, perhaps because consumers recycle other things and perceive recycling to be a positive practice.
- We also plant to examine perceptions with regard to their own water source.

Thank you for your attention! Any questions?

For more information on horticultural marketing, sign up and listen to my podcast series at

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