

REPORT

Title: Benefits and Costs of Water Reuse Programs in Texas

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Abstract

As Texas's population is expected to reach approximately 46 million by 2060, water managers will need to find more sustainable water supplies to accommodate this increase. Overallocation of many of the state's rivers, as well as overpumping of aquifers, makes these resources less reliable for meeting growing water demands. For this reason, many decision-makers are turning toward creative water reuse initiatives to augment dwindling supplies, as water use for municipal purposes has already increased exponentially over the last several years. This research focuses on Potter, Midland, Lubbock, and Collin counties since each report more than ten million gallons per day of municipal water supply reuse, according to the Texas Water Development Board. The first portion of this study examines similarities and differences between these counties to determine how each community incorporates reuse into their municipal water supply. Additionally, for a reuse project to be effective and successful, the local community must be onboard, and therefore should be included in the planning and implementation process. The second portion reports on the results of a survey of residents of these counties. We analyze and assess their perceptions regarding reuse to evaluate the extent to which they are willing to accept various reuse initiatives.

Problem and Research Objectives

Diminishing water supplies are of growing concern in many Texas communities. Water managers struggle to find sustainable water resources to meet growing municipal demands. One consideration is implementing more aggressive water reuse initiatives, but in order to plan and employ successful reuse programs, it is imperative to first document and consider the social and environmental benefits and costs of water reuse.

Water agencies have used reclaimed and reuse water for many years as non-potable water resources. Water reuse saves clean, potable water resources by providing additional supplies for irrigation, industrial, and other uses (Hartley 2005). However, water reuse can also serve a critical role in meeting growing potable water demands (TWDB 2007). In many regions of the United States, a common practice includes releasing wastewater effluent into waterways to be reused directly downstream (Stephens 2005). Indirect reuse such as this is an accepted water supply resource. If not managed and promoted effectively, however, public reaction to more direct uses of reuse water can hinder projects and create increasing challenges for water managers (Po et al. 2003; Stephens 2005).

Texas lacks firm, available water supplies to meet currently experienced population growth rates. Additionally, large portions of the state are drought-prone, which further depletes existing supplies. To be able to meet growing demands, water managers need to incorporate a number of strategies to achieve sustainable water resources, including water reuse. Texas contains a diversity of climatic regions and varied community perspectives, which will therefore require different strategies and priorities for water management.

Having a better understanding of each region's water priorities, and the community's perceptions regarding potable reuse water supply, will provide information for water managers and stakeholders to more effectively plan and utilize various types of water reuse initiatives. Further, including the public in the planning process will increase the likelihood of acceptance of the chosen reuse programs. Inclusionary practices, incorporating community feedback in terms of both their perceptions and ideas, will provide frameworks for strong, community-backed wastewater reuse plans, within relevant local contexts.

The counties studied include Potter, Lubbock, Midland, and Collin. Potter is located in the Texas Panhandle, Midland and Lubbock are in West Texas, and Collin is located in North Central Texas. Each county reports more than ten million gallons of water per day of municipal water reuse, more than the other counties in the state, making them ideal candidates for a research project focusing on water reuse in Texas (Alan Plummer Associates 2010, 2010a).

Materials/Methodology

This project focused on two objectives.

Objective 1: Examined the similarities and differences between these counties, as well as the regions in which they reside, as well as how each incorporates reuse into their municipal water supply. Interviews with water managers and planners provided insight into the decision-making processes: what types of reuse initiatives are being utilized, benefits and costs of each reuse program, and how or if the community was involved throughout the process. The researcher completed in-person interviews with water managers in all counties, except Lubbock, where the interview was over-the-phone. For Potter, Lubbock, and Midland, only one interview was needed as there was only one municipal water supplier in each of these counties, as people living outside the scope of city municipalities were on well water. Collin County is more heavily urbanized than the other three, but since all municipalities in the county rely on North Texas Municipal Water District for their water supply, two interviews were completed for Collin. Finally, effluent and reuse amounts were also analyzed to compare supply and demand for each county.

Objective 2: Surveyed a sample of residents from each county to assess their perceptions concerning water reuse, what factor(s) convinced them to accept reuse plans (if at all), and to what extent they would be willing to utilize direct-to-reuse water sources. The researcher utilized an online questionnaire that consisted of both Likert Scale and open-ended questions. Postal delivery routes were randomly chosen and an initial postcard and follow-up postcard were mailed to potential participants, pointing them to the on-line survey.

Principal Findings

Water reuse is not new to West Texas or the Panhandle. Agricultural irrigation with reclaimed wastewater dates back to the late 1880s, petrochemical companies and oil refineries began direct reuse of water in the 1940s, and in the 1960s, water reclamation increased with municipality reuse programs. In counties such as Midland and Lubbock, water sources, regardless of origin, was vital to the community. Today, Midland and Lubbock counties recycle all treated effluent without returning any to a streambed for downstream use, as most, if not all, of the streams in these areas are intermittent at best. In the more humid north Texas region, Collin County does have return flows, with a total of 70% being recaptured and 30% being legally mandated for downstream uses. All interviewed water managers see reuse water as a benefit in conserving potable water supplies since it is a continuous source that can be utilized for water-intensive needs, such as irrigation. Similarly, 97% of survey participants agree water reuse is a valid conservation strategy for preserving fresh, potable water sources. All current reuse projects relating to potable supplies are indirect through augmentation of freshwater resources. Considering the increase in drought severity and limited resources, all water managers consider the potential for direct potable reuse to be a viable option in the future. Survey answers show the biggest concerns for community members lie in water demands/population growth, continued/future droughts, and lack of conservation, but only 8% of participants stated they would accept or potentially accept direct potable reuse.

According to the water managers, public participation in the planning process for current or planned reuse projects was minimal since the type of projects being implemented did not directly impact the general public as a whole. Meetings and/or educational workshops that were offered focused on conservation rather than reuse, and most of these were town hall meetings or presentations to civic groups. A few of the managers claimed to use the term “raw” water supply in place of “reuse,” “reclamation,” and “recycled” water in an effort to minimize negative reactions. Survey participants, however, expressed concern over these types of meetings, stating there was no open discussion, but rather a forced agenda; data presented was untruthful; or meetings were poorly set up and not interesting to sit through. Even still, 78% claimed they would attend meetings specifically discussing water reuse as a water supply strategy for their region.

As already stated, 97% of respondents agree reusing treated wastewater is beneficial for conserving freshwater resources. Perceptions on acceptable uses differ, however. Seventy-three percent stated irrigation is a good way to utilize reclaimed water. For purposes of this research, irrigation includes agricultural, personal and municipal landscaping, and watering of houseplants. Three of the fifty-five that answered this particular question claimed to be comfortable with reusing water, but did not want it used for any purpose that could contact the skin, such as bathing or swimming. Two of those three did not even want it used on residential lawns or for irrigating public parks. Their concerns lie in feeling unsure of the health risks of water reuse. More importantly, though, 8% responding to this same question either are, or would be, agreeable to more direct potable reuse if shown the water was treated to high enough standards for safety.

The topics mentioned most in answers to the open-ended questions focused on conservation and future supplies. Thirty-four percent commented on the wastefulness of water resources in their communities, either through overwatering of lawns, continued watering of football fields and golf courses, or a basic lack of conservation effort. Others were apprehensive over continued droughts and increased water demands due to population growth, 30% and 23% respectively. Two people expressed irritation at the city they lived in because they continued to draw in large businesses without having a firm water supply for future needs that could accommodate the growth new businesses brought into the region. In response to how participants thought water reuse could alleviate some of their concerns, an overwhelming majority (81%) said reuse for non-potable purposes could conserve freshwater resources for potable use and would help ensure future supplies.

Significance

Water reuse strategies are growing as viable options in Texas. As a resource, the amount of treated effluent grows with the population and is always an available supply. In general, communities are familiar with conservation practices and fairly familiar with reuse, but the two are not always presented as part of the same goal, if water recycling is discussed at all. Many people still have an aversion to the idea of reclaiming wastewater, especially if the water comes in contact with food products or the body. If drought severity continues to increase as it has over the last few years, and populations in Texas continue to grow at exponential rates, communities may need to accept the notion of direct potable reuse in the future. In fact, one city outside the counties researched for this study is already facing such a predicament. Therefore, public education programs are imperative to gaining community support for more direct water reuse programs, especially in areas such as Midland and Lubbock where water shortages are more likely. Not only does it open up communication lines, it allows water managers the opportunity to address public concern over health issues related to water reuse. If information is managed and presented correctly, water providers can positively influence community stakeholders' perceptions and promote acceptance of water reuse programs through effective education.

References Cited

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WATER REUSE SURVEY RESULTS SUMMARY

Presented to TWRI/USGS as part of final grant report, 14 May 2012

There were 75 responses to the survey (1.5% return) of which 11 were eliminated because the respondents did not live in a targeted county.

1. Which county do you live in?

	<u>N</u>	<u>%</u>
Collin:	32	50
Lubbock:	18	28
Midland:	10	16
Potter:	4	6

2a. Water reuse is acceptable only when there is a genuine need, such as during a drought.

	<u>N</u>	<u>%</u>
Strongly Agree	= 7	11
Agree	= 5	8
Strongly Disagree	= 24	37.5
Disagree	= 20	31
Neutral	= 8	12.5

b. Recycling treated wastewater for non-potable uses is a good way to conserve clean water sources for potable supplies.

	<u>N</u>	<u>%</u>
Strongly Agree	= 33	52
Agree	= 29	45
Strongly Disagree	= 1	1.5
Disagree	= 1	1.5
Neutral	= 0	0

c. Treated wastewater should only be used for non-potable purposes.

	<u>N</u>	<u>%</u>
Strongly Agree	= 21	33
Agree	= 23	36
Strongly Disagree	= 2	3
Disagree	= 4	6
Neutral	= 14	22

d. I believe my region has sufficient water supply to meet future needs.

	<u>N</u>	<u>%</u>
Strongly Agree	= 2	3
Agree	= 11	17.5
Strongly Disagree	= 20	32
Disagree	= 19	30
Neutral	= 11	17.5

3. *What do you see as acceptable uses for reclaimed wastewater? (55 responses)*

Respondents gave multiple answers to this question.

- Irrigation (includes agricultural, landscaping, and house plants):** 73%
- Car washes:** 27%
- Everything (includes potable or potentially potable):** 15%
- Anything except drinking and cooking:** 11%
- Toilets:** 13%
- Industrial (includes fracking and oil fields):** 13%

Other uses mentioned included construction sites, highway projects, cooling towers for power generation, decorative fountains and ponds, fire hydrants, appliances, wildlife habitats, showers, and pet bathing.

Three specifically mentioned they were not okay with skin contact, such as showering, and two of those did not want it used on lawns or public parks.

4. *Please explain any concerns YOU may have regarding future water supplies in your area. (53 responses)*

Respondents gave multiple answers to this question.

- Waste/Lack of conservation:** 34%
- Droughts/Other shortages:** 30%
- Population growth:** 23%
- Sustainability/Lack of firm future supply:** 23%

Other concerns mentioned included an increase in rates, zebra mussel infestations, cleanliness of potable supply, restrictions, and infrastructure.

5. *How could water reuse address the concerns you describe in question 4? (52 responses)*

Respondents gave multiple answers to this question.

- Conservation of/Ensure freshwater supplies:** 81%

Survey participants also stated water reuse could address their concerns by reducing water rates, alleviating restrictions, and simply being beneficial overall. Three people (6%) did not think it would help.

6a. *Water managers should consider public input when planning for future water supplies.*

	<u>N</u>	<u>%</u>
Strongly Agree	= 29	45.3
Agree	= 31	48.4
Strongly Disagree	= 0	0
Disagree	= 0	0
Neutral	= 4	6.3

b. Public education programs should be developed and offered so the community can obtain a better opportunity of how reused water can be utilized as part of their total regional water supply.

		<u>N</u>	<u>%</u>
Strongly Agree	=	39	62
Agree	=	19	31
Strongly Disagree	=	1	2
Disagree	=	1	2
Neutral	=	2	3

7. Are you the type person who would attend community meetings?

		<u>N</u>	<u>%</u>
Yes	=	21	33
No	=	13	20
Only if interested in topic	=	30	47

8. Would you attend a meeting discussing water reuse as a water supply strategy?

		<u>N</u>	<u>%</u>
Yes	=	50	78
No	=	14	22

8a. If no, why not?

Of the 14 participants that said “no,” only 12 responded to this question.

Time/Busy: 33%

No communication/discussion during meetings or forced agenda: 25%

Boring or not important enough use of time: 17%

Not staying in community/doesn't feel need to input since living in apt: 17%

Untruthful/not factual: 8%

Limited transportation: 8%

9. Age group:

	<u>N</u>	<u>%</u>
18-29:	9	14
30-45:	20	32
46-59:	20	32
60+:	14	22

10. Male or Female?

	<u>N</u>	<u>%</u>
Males:	33	52
Females:	30	48

11. How many people live in your home?

	<u>N</u>	<u>%</u>
1 person:	14	22
2 people:	18	28
3 people:	14	22
4 people:	14	22
5 people:	4	6

12. How long have you lived at this residence?

	<u>N</u>	<u>%</u>
<1 year:	7	11
1-5 years:	30	47
6-10 years:	12	19
11-15 years:	4	6
16-20 years:	3	5
>20 years:	8	12

13. Own/rent? (63 responses)

	<u>N</u>	<u>%</u>
Own:	41	65
Rent:	22	35

14. Is your residence connected to city water or well water?

	<u>N</u>	<u>%</u>
Wells:	2	3
City:	62	97

15. City sewage or septic?

	<u>N</u>	<u>%</u>
Septic:	2	3
City:	62	97

16. What is your highest level of education?

	<u>N</u>	<u>%</u>
Some high school:	1	1.6
High school/GED:	3	4.7
Some college:	14	21.9
Bachelor's:	20	31.3
Master's:	19	29.6
Doctorate:	7	10.9