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Water Reuse

Introduction

Meeting water demand and supplying water for future generations is a significant challenge for the water industry. Although water scarcity is an issue of critical importance in drier areas,[1] communities across our nation are increasingly experiencing water shortages, calling into question the longevity of a national water supply that is threatened by droughts, consumption patterns and continued population growth. The recently released Report on Freshwater Supply from the Government Office of Accountability states that according to state water managers, experts, and literature GAO reviewed, freshwater shortages are expected to continue into the future. In particular, 40 of 50 state water managers expected shortages in some portion of their states under average conditions in the next 10 years.

Amidst growing water scarcity, and concern about the future availability and quality of water, a GE consumer survey indicates that Americans strongly support reusing water to help the U.S. drive economic competitiveness and protect the environment. Despite the "ick factor" often associated with recycled water, two thirds of Americans (66 percent) feel positive about water reuse, according to the survey of 3,000 consumers in the U.S., China and Singapore. The survey reports that Americans also think that industry and government should play a stronger role in making water reuse a priority.[2]

Background: Applications and Treatment

The water cycle is a natural process that recycles water, but with advancements in treatment technologies, water can now be recycled more efficiently to meet our needs. Water reuse is a term describing the reclamation, treatment and recycling of wastewater (sewage derived from industrial use, washing or toilet flushing) or stormwater collected from homes, commercial buildings and industrial facilities.[3] Reused water *is not used for drinking*, which accounts for only one percent of overall consumption.[4] As such, tremendous opportunity lies in reusing water for a variety of other non-potable (non-drinking) purposes.

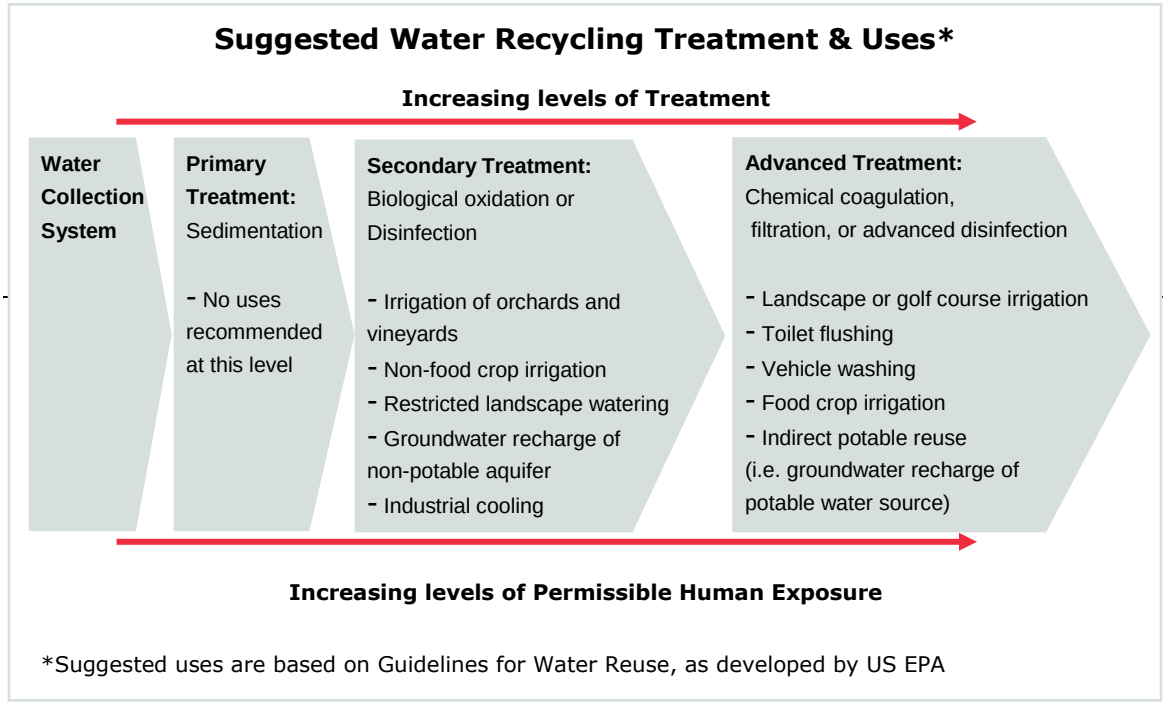
Water is reused in two main ways: non-potable (non-drinking) reuse, which involves taking treated wastewater to use for agriculture and landscape irrigation, industrial use (such as cooling processes), toilet flushing and fire protection; and indirect reuse, which involves using wastewater

[1] Refer to the American Water White Paper: Meeting Demand in the West for more information.
[2] GE Consumer Survey: "American Attitudes Toward Water Reuse" October 2012 https://knowledgecentral.gewater.com/kcpguest/categoryLanding.do?path=documents/Category_Templates/English/Consumer%20Survey%20Results/guests/water-reuse-survey2012.html
[3] This paper will refer to wastewater or stormwater reuse as simply water reuse.
[4] Zinkevich, Andre, Vice President American Water Applied Water Management. Personal interview. 28 Nov. 2007.

to recharge ground water supplies. Indirect reuse, also called land application, allows treated wastewater to percolate down to aquifers to replenish water sources. Non-potable reuse is already a widely accepted practice that will continue to grow, and indirect potable reuse is becoming an increasingly favored and applied method of reuse over discharging water into surface water, which ultimately evaporates or runs off into the ocean.[5]

Since the vast majority of water goes toward industrial use or irrigation, using wastewater as an alternative supply for such applications can help protect existing supplies. Water reuse also helps the environment by decreasing the amount of wastewater discharged into bodies of water, which has long been considered a pollutant and problem, and by beneficially utilizing the nutrients in the discharge as fertilizers in irrigation applications.[6] Water reuse can also be an economical long-term water management solution, since treating water to non-potable, versus potable, standards is energy efficient, and it precludes the need to purchase from or draw upon new water sources.

The table below shows how reused water is subject to differing levels of treatment and quality criteria, as determined by its end use.[7] As a means of ensuring public safety, water that is more likely to come into contact with human beings is subjected to further treatment and more stringent standards.



Technology in Practice

Water reuse in the United States is a growing practice, with more than 2 billion gallons per day reused,[8] and reused water volume is growing at an estimated 15 percent per year.[9] With so many communities experiencing a reduction in water supply, wastewater reuse is increasingly being explored to meet water demand in an environmentally friendly as well as an economically feasible

[5] Environmental Protection Agency. http://www.epa.gov/region09/water/recycling/index.html
[6] Environmental Protection Agency, http://www.epa.gov/region09/water/recycling/index.html
[7] Environmental Protection Agency, http://www.epa.gov/region09/water/recycling/index.html
[8] WateReuse Association, http://www.watereuse.org/files/images/04-006-01.pdf
[9] Environmental Protection Agency, http://www.epa.gov/nrmrl/pubs/625r04108/625r04108.pdf

way. Utilities, municipalities and the industrial private sector are now, more than ever, seeking ways to implement such solutions as a way to reserve water resources and meet demand. Additional drivers of putting water reuse systems in place include: alleviating stress on our nation's water infrastructure by reducing water volumes; implementing water reuse systems while repairing or updating pipes and facilities; regulatory mandates and incentives, such as water rate and tax subsidies; and shifting expectations toward sustainability.

Recycling nearly two billion gallons of water annually, American Water has a long history of designing, implementing and operating water reuse systems across the United States. Notable projects include:

- **Residential buildings –** Five high-rise buildings in Battery Park City, Manhattan employ underground double piping systems to collect, treat and recycle wastewater and storm water for a variety of purposes, including toilet flushing, air conditioning and irrigation for rooftop gardens and an adjacent park. By reusing wastewater for non-potable applications, these buildings' potable water needs are reduced by nearly half. Together, these five buildings save approximately 56 million gallons of water per year.
- **Community developments –** The Homestead at Mansfield in New Jersey is an active adult, residential development connected to a dedicated wastewater treatment plant. The water reuse system provides up to 250,000 gallons per day of reclaimed water to irrigate landscaped spaces at personal residences and open common areas.
- **Sports facilities** – Gillette Stadium, the home of the New England Patriots, would not have been in Foxboro, Massachusetts, a town with limited water supplies, had it not been for the stadium's water reuse system. The facility's double piping system treats recycled wastewater from the stadium, as well as from adjacent office complexes and stores, saving 250,000 gallons of water for every major event.
- **Commercial complexes –** Wrentham Mall has undertaken the first commercial water reuse project in Massachusetts. Facing space and environmental constraints for wastewater discharge, an onsite water recycling and disposal system was necessary. Now the mall can meet its water requirements, supporting the operation of the facility's 130-store outlet center, office complex, hotel, movie theater and restaurant.
- **Schools –** The Copper Hill School in Raritan Township, New Jersey recycles wastewater from school toilets, the cafeteria and gym showers to be used for toilet flushing, saving the elementary school about 12,000 gallons of wastewater each day. The 20 percent of treated wastewater that is not used in the recycling process is recharged to groundwater.
- **Golf courses –** The Hawk Pointe Golf Course in Washington, New Jersey reclaims and treats wastewater to supply the significant volumes of water required to irrigate the course.

Implementation

While the benefits of water reuse are clear, only a small percentage of American communities have implemented such systems and technologies. In order to successfully implement water reuse projects, communities need to prioritize the financing of wastewater infrastructure projects. Public-private partnerships, as well as the Clean Water State Revolving Fund, offer solutions for funding such investments. Collaboration between wastewater and water agencies is also needed to set policies and develop system and facility plans that optimize water recycling opportunities. Community leaders must also perform public outreach to educate consumers about water reuse and mitigate any public safety and cost concerns.

Additionally, legislations are being introduced to address green infrastructure. The Green Infrastructure for Clean Water Act of 2011 was established to ensure that projects effectively manage stormwater flow and improve water quality, bringing us closer to a clean-energy economy and improving our outdated water infrastructure. If passed, it would establish up to five Centers of Excellence charged with conducting research on green infrastructure and provide

communities with training and technical assistance on how to implement green infrastructure practices. The legislation would also provide funding to help communities develop green infrastructure technologies.

Conclusion

As discussed in this paper, water reuse will play an increasingly important role in safeguarding our long-term water supply as water demand grows. While water reuse cannot solve scarcity issues alone, it is an essential part of a sustainable approach toward water resource management.