ADDRESSING WATER SCARCITY THROUGH RECYCLING AND REUSE: A MENU FOR POLICYMAKERS

PERSPECTIVE ON LATIN AMERICA, BRAZIL AND MEXICO

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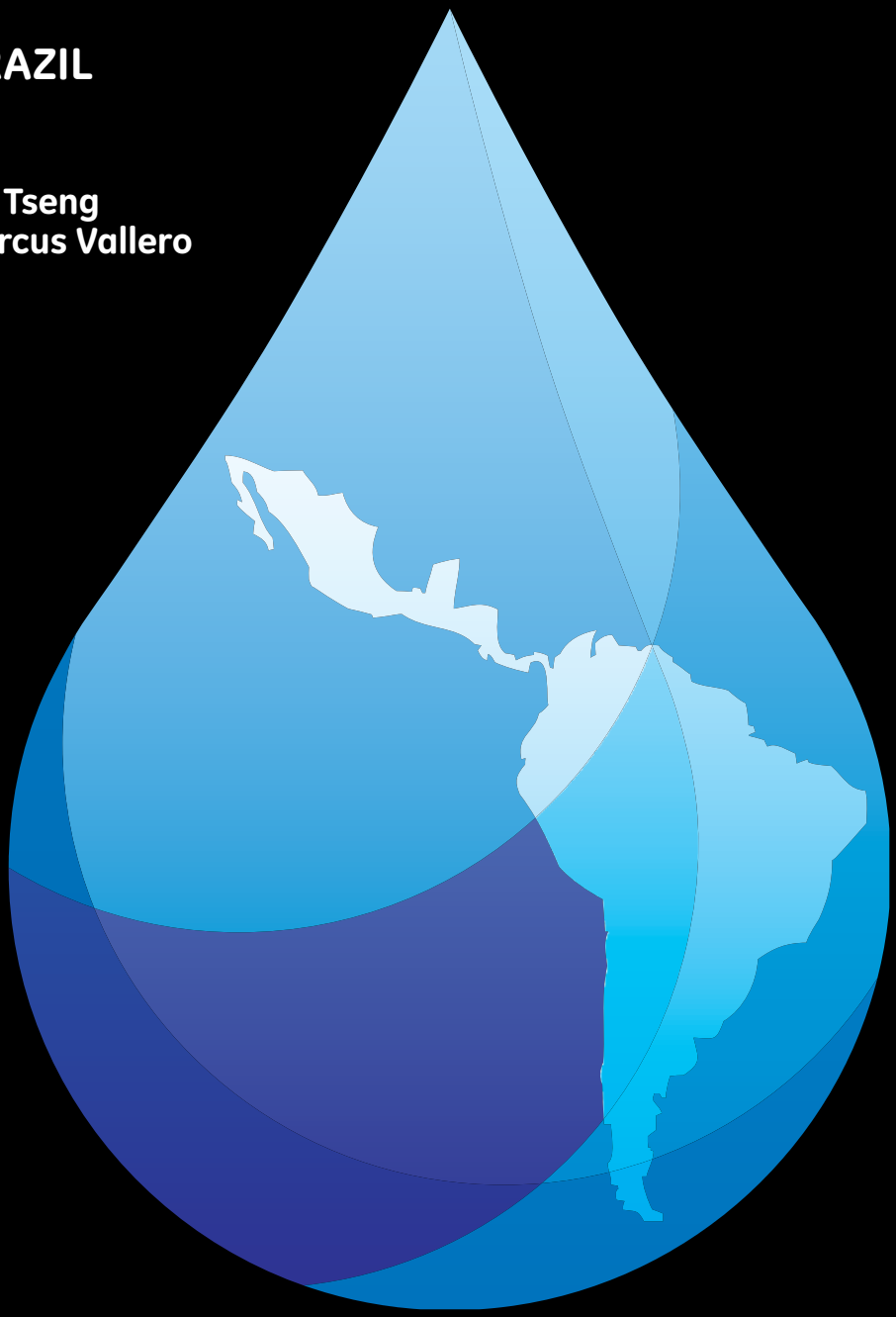

Ecomagination

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1. Executive Summary

Although this white paper broadly addresses water scarcity in Latin America, it focuses on Brazil and Mexico. Paradoxically, Latin America has almost 31 percent of the world's fresh water resources — more fresh water per capita than any other region in the world — but still faces acute water scarcity challenges. The fundamental problem is simply that much of the population lives in places where water is scarce. For example, 73 percent of Brazil's fresh water is in the Amazon River Basin, but only 4 percent of Brazil's population lives there. Put another way, 96 percent of Brazil's population lives in areas that account for only 27 percent of its water. In Mexico, more than 75 percent of the population lives in the central and northern regions, while 72 percent of the country's fresh water is in the south. And in Peru, 97.5 percent of the surface water is in the Peruvian Amazon basin, while only 30 percent of the population lives there.

Latin America is by no means standing still in the face of its water challenges. Both Brazil and Mexico, for example, have developed sophisticated policy regimes and invested billions of dollars to implement solutions. This white paper highlights many of the positive steps Latin American governments have already take to address water scarcity, and also offers additional examples of water recycling and reuse policies that governments around the world have implemented.

While this white paper does not provide an exhaustive list of programs and policies, the major types of initiatives used to increase water recycling and reuse include the following:

- Education and Outreach
- Removing Barriers
- Incentives
- Mandates and Regulation

This white paper provides a valuable starting point for governments to evaluate the appropriate mix of policies that might best fit their needs to increase water recycling and reuse. Because water reuse often requires treatment technologies, at the end of this paper GE offers a brief menu of water treatment technologies. For further information on how this policy menu might be applied, please visit www.gewater.com.

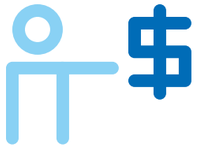
FIGURE 1: MENU OF WATER REUSE POLICY OPTIONS

Education and Outreach

- Recognition awards and certification programs
- Information dissemination and educational outreach efforts
- Reporting of water consumption, discharge, and reuse data

Removing Barriers

- Modifying local regulations requiring that all water meet potable standards
- Revising plumbing codes to allow dual piping
- Alleviating stringent permitting and inspection requirements for recycled water



Incentives

- Direct subsidies
- Reductions in payments to the government
- Payments for reintroduction of recovered water
- Pricing mechanisms
- Regulatory relief for recycled water users
- Government procurement of water recycling/ reuse equipment
- Structuring of water rights to reduce the use of potable water

Mandates and Regulation

- Requiring utilities to develop plans for recycled water
- Restricting potable water to human or food-related uses
- Requiring the use of recycled water for certain large-volume activities, e.g., irrigation
- Requiring water recovery systems

Source: General Electric

2. Introduction

Water recycling and reuse is most common in communities that face limited water supplies. Common responses to diminished water availability include aggressive conservation measures combined with water recycling and reuse initiatives to address current, as well as future, water scarcity. Treated wastewater is generally defined as water used by a business, home or industry that has been treated to remove its contaminants and is suitable for discharge. The terms "water recycling," "reuse" and "reclamation" are often used for the recapture and potential further treatment of water from wastewater treatment facilities. This paper does not discuss water conservation or water efficiency programs that focus on using less water for a particular purpose; nor does it intend to address water from alternative sources such as brackish groundwater or seawater.

The purpose of this white paper is to help Latin American communities and governmental authorities think through their options for increasing recycling and reuse of water. The paper highlights four major types of policy options that are being used in different locations:

1. **Education and Outreach:** Provide more information on, and recognition of, water recycling and reuse efforts.
2. **Removing Barriers:** Reduce or remove regulatory or cost barriers that prevent more water recycling and reuse.
3. **Incentives:** Provide financial, regulatory or other incentives for water recycling and reuse.
4. **Mandates and Regulation:** Require more water recycling and reuse.

Examples of how these policies are being applied in communities around the world are included in the following sections, as well as in a more detailed appendix at the end of this paper.

Since each community may have a different need, this white paper is best seen as a tool to explore which policies might be most effective in any particular situation, or for any particular group of users.

3. Water Landscape in Latin America

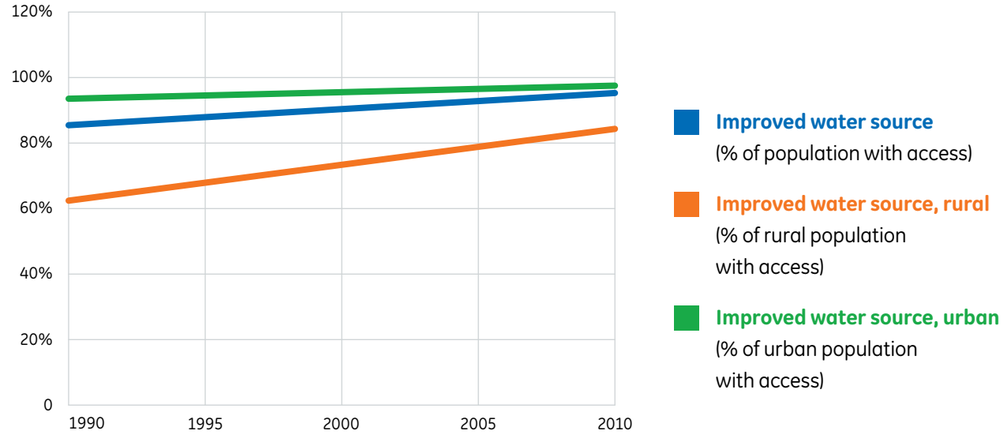
With nearly 31 percent of the world's fresh water resources, Latin America is the richest region in the world in terms of freshwater availability per person. In addition, the region encompasses roughly 15 percent of the territory of the planet and approximately 10 percent of the world's population, while receiving 29 percent of the world's rainfall.[1]

Furthermore, three Latin America countries rank in the top 10 in terms of water volume: Brazil (first), Colombia (third) and Peru (eighth).

Despite being rich overall in water resources, Latin America has many water supply and sanitation challenges. Two-thirds of the region is classified as dry land, arid or semi-arid, including portions of northern and central Mexico, northeast Brazil, southern Argentina, northern Chile, Bolivia and Peru. In addition, the region's development patterns at times create challenges to accessing water. For example, 97.5 percent of Peru's surface water is contained in the Peruvian Amazon basin, while only 30 percent of the population lives in this region. In Mexico, more than 75 percent of economic activity, population and irrigated land is in the central and northern regions, while 72 percent of its water availability is in the south.[2]

Overall, the region's water and distribution systems require urgent attention. According to the World Bank, 45 percent of the water in Latin America is lost before reaching the end consumer, with losses of up to 75 percent in some large cities.[3] Moreover, only 20

FIGURE 2: PERCENTAGE OF LATIN AMERICAN POPULATION WITH ACCESS TO WATER FOR DOMESTIC PURPOSES



Source: World Bank: http://data.worldbank.org/indicator/SH.H2O.SAFE.UR.ZS?locations=ZJ

percent of the wastewater in Latin America is actually treated,[4] and roughly 100 million Latin Americans lack access to sanitation.

Despite such challenges, many improvements are being made. According to the World Bank, the percentage of the population in Latin America with ready access to water for domestic purposes ("improved water source") has been steadily increasing over the past two decades, as shown in Figure 2.

Not only are improvements to access and infrastructure a critical step for LAM to overcome water challenges, it is equally important for the region to consider water reuse to generate more water supply for the overall population.

In terms of water reuse, a recent article by IDA News highlighted two key changes needed for Latin America to reach its full potential: increased awareness of proven technology alternatives at competitive prices, and policies that facilitate and regulate the use and reuse of water resources.[5]

The following sections dive deeper into Brazil and Mexico, specifically into the water and water reuse landscape and regulations.

Brazil

Brazil is the world's most water-rich country, with 13.7 percent of the world's freshwater resources.[6,7] However, over 73 percent of this water is in the Amazon region, which accounts for only 4 percent of the country's population and economic output.[8] The mismatch between Brazil's freshwater resources and the locations of high population density and water use, along with other factors like population growth and changing weather patterns, result in water stress for many areas of the country. In fact, the two most populous cities, São Paulo and Rio de Janeiro, recently encountered unprecedented drought conditions.[9,10,11,12]

Recognizing the importance of water security to the sustainable development of the country, the Brazilian government has recently bolstered investment in the water sector (including water reuse) through multi-billion dollar programs. These actions by the leadership in Brazil come in the face of significant water supply and demand challenges: uneven distribution of water resources; rapid urbanization; growing demand for energy, agriculture, and other large water uses; dwindling groundwater supplies; deteriorating water quality, and lack of wastewater infrastructure.[13,14,15]

Water supply infrastructure is more developed than wastewater infrastructure in Brazil. Access to a drinking water supply is available for over 82.5 percent of households.[16] Drinking water quality standards are considered to be well developed, monitored and enforced.[17] Wastewater collection, on the other hand, is only available for 48.6 percent of households, with just 39 percent of total wastewater collected actually treated.[18] As a result, some of the main challenges — and therefore the main opportunities — for investment in Brazil are connectivity, treatment, and the consequent reuse of sewage.

To boost investment in the country's infrastructure, the Brazilian government launched the Growth Acceleration Program (PAC) in 2007, with PAC1 for the period of 2007–2010, followed by PAC2 for 2011–2014.[19] As of 2011, US$9.4 billion in PAC1 and PAC2 funding had been allocated to wastewater projects, with about US$4.9 billion yet to be allocated.[20] Wastewater investment grew from US$660.8 million in 2005 to US$2.1 billion in 2010, a 26.1 percent compound annual growth rate (CAGR).[21] For the period of 2013–2018, market analysts forecast that the water and wastewater equipment market in Brazil will grow at a CAGR of 9.3 percent.[22] For both water and wastewater, capital expenditure in Brazil is set to double from a 2013 baseline to US$9.9 billion by 2018.

Moreover, the National Basic Sanitation Plan (PLANSAB), approved in 2013 by Brazil's National Cities Council, launched the goal of providing universal water supply and sanitation for the whole country.[23] PLANSAB calls for $220 billion in water infrastructure investment over 20 years, or nearly four times more than called for in recent years, according to the National Water and Sewerage (Private) Concessionaires Association (ABCON).[24] The Plan outlines short-, medium- and long-term goals across 23 water supply and wastewater indicators to guide public and private investment in the water sector through 2033. Among these goals are targets for 99 percent of urban and rural households to be connected to the water distribution network (or supplied by a well or channelized spring), and at least 92 percent of households to be connected to a sewer network or septic tank.[25] Importantly, PLANSAB specifically encourages the "rationing and controlled reuse of water, and the use of treated sewage" in the detailing of water programs.[26]

Planned water reuse has been in operation in Brazil since 1992, primarily for aquaculture and crop irrigation, as well as for highway and pavement cleaning in São Paulo.[27] Today, overall reuse in Brazil is estimated to be less than 0.1 percent of the water produced, according to the most recent figures.[28]

Despite this low estimate, water reuse in Brazil is becoming increasingly attractive, driven primarily by the financial benefits to industry.[29] There are several industrial water reuse initiatives in São Paulo and Rio de Janeiro, one of the most notable being the Aquapolo Ambiental project, which reuses municipal wastewater for a petrochemical complex in São Paulo.[30] The Aquapolo project was initiated to reduce potable water use in São Paulo and is the largest industrial water reuse project in the Southern Hemisphere.[31]

Depending on the need for conveyance and storage, the cost of reclaimed water is often lower than potable water and therefore attractive to industry.[32] During the last 10 years, Petrobras, the state-run oil company, has been upgrading its downstream operations, including modernizing treatment systems and implementing water reuse projects in refineries such as REVAP, REPAR, REGAP, RENEST, REDUC and COMPERJ. Petrobras estimates that its reuse activities resulted in over 35 billion liters of water savings in 2015.[33,34]

In the steel industry, ArcelorMittal Brasil reuses virtually all of the water used in industrial processes (taking into account six industrial units) with an average recirculation rate of 98 percent.[35] Another example of water reuse is in the packaging sector for the production of glue, cleaning, irrigation, and cooling. For instance, five production units owned by Klabin, a paper producer, reuse 100 percent of factory effluents.[36]

At the city level, São Paulo is leading the way, at close to 2 percent of water reuse.[37] In July 2015, the government of São Paulo signed a financing contract for an innovative "plug and play" technology that will allow the increased production of reused water for industries and services.[38] SABESP, the water utility of São Paulo, believes water reuse in São Paulo could increase by a two-digit percentage in the medium term, and that strong and clear government regulations are needed to encourage companies to invest in water reuse technologies.[39]

Primary responsibility for water and wastewater regulation — and thereby water reuse — lies with the federal Ministry of Environment.[40] The National Water Agency (ANA), created in 2000 by Law No. 9.984/2000, is part of the Ministry of Environment and is responsible for implementing the National Water Resources Policy, which was established by Law No. 9.433 in 1997.[41,42] The National Water Resources Management System (SINGREH) is a set of legal and administrative mechanisms designed to coordinate integrated water resources management and to implement the National Water Policy of Water Resources.[43] The National Water Resources Council (CNRH) is responsible for developing rules and strategies, implementing programs and projects, and coordinating water resources planning.[44,45]

The National Environmental Council (CONAMA — Conselho Nacional de Meio Ambiente) is responsible for setting water quality standards.[46] State regulatory agencies establish water quality standards based on existing legislation, as well as enforce and impose penalties. Each state of the Brazilian federation is free to create its own organizational structure, but only six states have established a water regulatory agency. In the absence of a regulatory agency, individual municipalities are responsible for regulating the water sector.[47] Most states without water regulatory agencies have state agencies that regulate public services, including sanitation.[48]

The country's first major water legislation to deal with water stress and pollution dates back to Decree No. 24.642, or the 1934 Water Code.[49] A 1997 update to the 1934 Water Code, Law No. 9.433/1997, or the Federal Water Law, established political instruments and basic principles to help guide water resources management.[50] Most notably, it states that water is a limited natural resource with an economic value (formerly, water was considered a free resource), a principle that is the foundation of water conservation and water use fees.[51] The Federal Water Law makes companies pay for wastewater discharges and withdrawals from water bodies. As a result, after the law was passed, the reuse of large volumes of water has become quite common within certain industries because of the ability to lower costs through water reuse.[52,53] Lastly, in 2007, Federal Law No 11.445, or the National Sanitation Law, established national guidelines for basic sanitation.[54]

Starting in 1997, NBR 13.969/97 set forth regulations for agricultural, municipal, and industrial water reuses.[55] Item 5.6 identifies four categories for treated effluent reuse with four distinct recommended technologies to reach the required specifications.[56] Resolution No. 54/2005 is the first specific legislation on non-potable water reuse in Brazil.[57] It establishes procedures, guidelines and criteria for direct non-potable water reuse for urban use, agriculture and forestry, environmental application, industry and aquaculture.[58] The CONAMA Resolution No. 357/2005 classifies water bodies and indicates wastewater discharge standards. The resolution stipulates three classes of water; it categorizes water supplies that are suitable for human consumption after treatment.[59] As a result, this regulation indicates that indirect potable reuse is permissible. The CONAMA Resolution No. 430/2011 established further wastewater discharge standards and amendments to Resolution No. 357/2005.[60]

At the state level, in Rio Grande do Sul, the state Ordinance No. RS 04/1995 approved the Technical Standard No. 001/1995, which establishes wastewater discharge standards for the petrochemical industry. For large water reuse projects, companies usually assume international water reuse standards or follow technical guidelines created by private institutions.[61]

The state of São Paulo is forward-leaning in terms of water reuse regulations. Since 2002, the Municipality of São Paulo has required the use of reclaimed water for cleaning and irrigation (Law 13.309).[62] In 2010, several regulations were implemented to promote the use of reclaimed water in agriculture. [63,64] Most recently, in 2012, a task group was formed to propose a norm for non-potable urban reuse in São Paulo. The norm, once published, would regulate the quality requirements for two classifications of treated effluent for non-potable urban reuse — less restrictive (i.e. for urban irrigation) and more restrictive (i.e. for washing streets/buildings, civil construction uses, pipe unplugging and car washing). While this norm still has to be published, it provides evidence that São Paulo is moving towards more disciplined water reuse governance.

In August 2014, in the middle of a severe water crisis, the city of Campinas published a resolution to encourage the use of recycled water. The resolution was published 28 months after Sanasa (the municipal state-owned water concessionaire of Campinas) started up the first membrane bioreactor (MBR) to treat domestic sewage in Brazil. Regulatory changes were necessary to further support the use of high quality water being produced in the EPAR (Reuse Water Production Stations) Capivari II plant. Resolution SVDS/SMS No. 09/2014 established general guidelines and quality requirements for the direct reuse of non-potable water, with two classes of reuse: restrictive Class A (e.g., for firefighting purposes and external automated car washing) and the less restrictive Class B (e.g., landscape irrigation, washing streets, etc.). Specifically, for Class A, the resolution states that ultrafiltration membranes must be part of the sewage treatment process.

In terms of industrial reuse, Brazil has specific industry-by-industry wastewater regulations as well as voluntary standards.[65] With no overarching industrial reuse regulations at the country level, FIESP, the association of industries from São Paulo state, published a manual for the rational use of water in the industrial sector. The manual contains management tools to identify water reuse opportunities, information on available technologies, and quality requirements

for common equipment, such as boilers and cooling towers, to help industry professionals to manage water wisely.[66] While the document is not a governmental norm, it provides best practices and general technical recommendations that have helped to guide FIESP associates and other industries in São Paulo.[67]

The National Confederation of Industries (CNI) has also been pursuing actions to stimulate water reuse. CNI has led a dialogue with the Brazilian business community in order to find a consensus on the proposal of a Bill of Law (PLS 12) that would regulate water reuse in the industry, defining water reuse production as an appropriate final destination of treated sewage, and creating financial and fiscal incentives to water reuse.

Going forward, the Brazilian government will formulate a Plan of Action Proposal to implement a treated wastewater reuse policy in Brazil.[68] Recently, the Minister of the Environment, Izabella Teixeira, revealed that the Brazilian government is considering a national regulation to govern the reuse of industrial water.[69]

Potable reuse is also gaining attention in Brazil. For instance, in 2014, SABESP announced its plans to study the construction of two indirect potable reuse projects, or EPARs.[70,71] Also in 2014, national and international experts convened in São Paulo to discuss the feasibility of potable reuse.[72] And scholarly articles in Brazil are drawing attention to successful potable reuse case studies around the world.[73]

Finally, other growing trends in Brazil's water sector include the concept of zero discharge, the use of public-private partnerships, and increased water reuse in irrigated agriculture.[74,75,76]

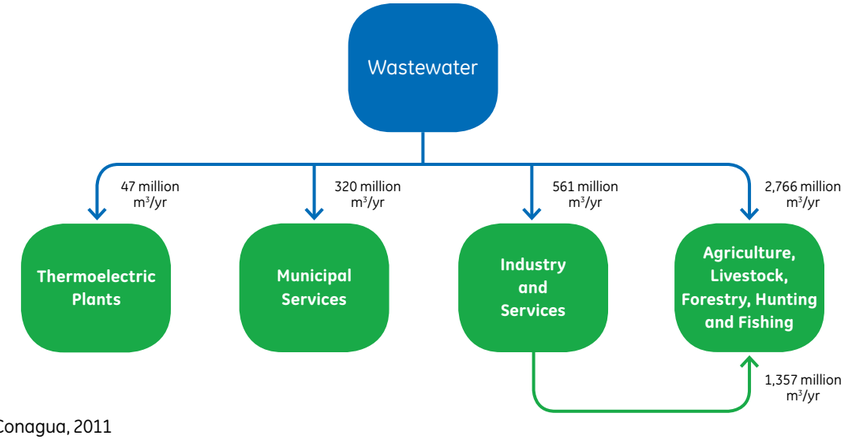
Mexico

Approximately two-thirds of Mexico, in the north and central regions, is arid or semiarid.[77,78] In recent years, one of the main challenges faced by the Mexican government has been population and economic growth in areas with low water availability.[79,80] Other water-related challenges include efficiency in the agricultural sector (which accounts for 76.7 percent of total water use), urbanization, aquifer over-exploitation, water quality concerns, and aging infrastructure.[81]

With investment in Mexico's water market growing rapidly,[82] one strategy the Mexican government has prioritized is expanding water reuse in the country. Recognizing the water supply and treatment challenges in Mexico, the government administrations declared water a "strategic matter of national security."[83] In its commitment to solving its water challenges and expanding water reuse, the 2007–2012 National Water Program (Programa Nacional Hídrico, PNH) was launched as part of the National Development Plan (PND) to increase water and wastewater coverage, as well as wastewater treatment.[84]

One of the six key policy priorities identified in the PNH was water reuse, with an emphasis on selling recycled water to industrial users in order to cover the operating costs of the water reuse facility. In April 2014, the subsequent PNH was launched for the period of 2014–2018. It noted that treated municipal wastewater reuse is growing across agricultural and industrial sectors, mainly involving irrigation of urban green areas.[85]

FIGURE 3 : REUSE OF MUNICIPAL AND NON-MUNICIPAL WASTEWATER IN MEXICO, 2011[93]



Source: Conagua, 2011

In fact, the 2014–2018 PNH's first overall objective — to strengthen integrated and sustainable water management — includes a goal to reuse all treated wastewater. Furthermore, the ability to customize water reuse — treat it to a specific standard for a specific purpose — is highlighted as important for cities.[86] This demonstrates the Mexican government's cutting-edge approach to water reuse. Currently, the Peña Nieto government is giving priority to sustainable development, amplifying the treatment of wastewater and optimizing water use in the agricultural sector.[87]

In 2012, water supply and wastewater network connections in Mexico stood on average at over 90 percent of the population. Yet there remains an opportunity for updated government policies and advanced wastewater technologies to improve wastewater supply.[88]

Since 2000, the government has accelerated investments in the water and wastewater sector.[89] Between 2000 and 2011, five major water supply projects and 32 treatment projects have moved forward with both federal and private financing.[90] Wastewater spending in 2011 was up by 135 percent compared to 2007.[91] Global Water Intelligence (GWI) found that total municipal and industrial capital expenditure in the water market stood at US$2.78 billion in 2011, and projects the market to grow to over US$5 billion by 2018, a compound annual growth rate of 9 percent.[92]

Depending on the source, Mexico is either the second or the third leading country in the world in terms of wastewater reuse in agriculture.[94] The country reuses approximately 85 percent of its entire production of municipal wastewater for agricultural irrigation.[95] Especially in northern Mexico where it is dry, reuse is

necessary and more profitable when compared to the south where it is wet and water reuse is less common.[96]

One successful example of industrial water reuse in Mexico is located in San Luis Potosi, where recycled urban water has various uses including cooling for a power plant, agricultural irrigation, groundwater restoration, and environmental enhancement.[97]

To increase Mexico's reuse capacity, in 2015, the Atotonilco Wastewater Treatment Plant (WWTP) was launched in the municipality of Atotonilco de Tula in the state of Hildalgo. The Atotonilco WWTP became the largest wastewater treatment plant in Latin America and one of the largest in the world with a capacity of 35,000 liters per second. The Atotonilco WWTP project was part of the Sustainable Water Program for the Valley of Mexico, launched by CONAGUA in 2007. The Atotonilco WWTP treats approximately 60 percent of wastewater produced by the metropolitan area of Mexico City at capacity (compared to 8 percent beforehand), and will irrigate approximately 80,000 hectares of land using treated effluent from the plant.[98]

To promote even greater reuse, in 2011, the Mexican government launched the Water Agenda for 2030 ("Agenda"), a long-term planning document to guide water sector investments in the country.[99] The Water Agenda for 2030 sets out ambitious goals: for instance, by 2030, the Agenda targets 100 percent water and wastewater coverage as well as 100 percent of water reused by 2030.[100] Figure 4 highlights some of the goals of the Water Agenda.

FIGURE 4: WATER AGENDA FOR 2030, GOALS AND OBJECTIVES[102]

Pillar	Objectives
Clean Rivers	All municipal and industrial wastewater treated
	All rivers and lakes free of solid waste
	All diffuse pollution sources under control
River Basins in Balance	All treated wastewater is reused
	Basins are self-managed
	All aquifers are in balance
	Entire surface irrigation is technified
Universal Coverage	Urban slums connected to networks
	Rural areas with access to drinking water
	Service providers working efficiently
Settlements Safe From Catastrophic Floods	Effective territorial planning
	Zones prone to floods free of settlements
	Early warning and prevention systems equipped with latest technology

Source: Conagua, 2011

To achieve the objectives outlined by the Agenda, it would require upwards of an estimated US$79 billion over 20 years until 2030.[101] The largest proportion of the investment is projected to go to wastewater treatment infrastructure.[102] CONAGUA estimates that an investment of US$9.7 billion by 2030 will be needed to bring wastewater treatment to 100 percent.[103]

According to GWI, Mexico is one of ten countries in the world where advanced water reuse capacity is projected to grow the most. GWI forecasts that from 2009 to 2016, 2.1 million m3 of advanced water reuse capacity per day will be added in Mexico.[104] In order to reach greater reuse capacity and meet the Agenda's targets, policies and regulations will be required to incentivize increased treatment and reuse of water.[105]

The Ministry of the Environment and Natural Resources (SEMARNAT) has the primary responsibility for regulating water and wastewater in Mexico. Organized under SEMARNAT, the Comisión Nacional del Agua (National Water Commission or CONAGUA) was created in 1989 and is a decentralized agency that is responsible for the protection of the country's natural resources and the development of the water and wastewater services sector.[106] CONAGUA oversees twelve subdivisions and thirteen River Basin Organizations (organized by the thirteen Hydrological-Administrative Regions).[107] CONAGUA is also responsible for enforcement and compliance of water quality standards and imposes fees for the right to use water resources.[108]

The National Water Law, passed in 1992 and revised in 2004, sets the foundation for regulation of the water sector. The National Water Law steers the responsibility for water services to municipalities, and gives CONAGUA the role of implementing and directing federal funds for water projects. Under the law, CONAGUA is required to create incentives for the development of infrastructure for water reuse.[109]

Since 2007, the federal government in Mexico has been encouraging reuse through the "federal program of reuse and exchange of treated wastewater."[110] This program promotes water reuse by providing tax incentives to service providers who treat wastewater for reuse in agriculture, industry, aquifer recharge and green area irrigation.[111]

Endorsed by both SEMARNAT and the Employers' Confederation of the Mexican Republic (COPARMEX), "Por un Uso Eficiente del Agua (For the Efficient Use of Water)" is a national project that is part of the Environmental Cooperation Program. This project supports and promotes water reuse among companies, research centers, higher education institutions , social organizations, and governmental entities. As of 2010, this project has supported the reuse of one million cubic meters of water per year on average.[112]

In 2012, an amendment to the constitution included access to water as a right to all citizens. The National Water Law is currently under revision as a result of this amendment. There is indication that the government may reform the law to put greater emphasis on wastewater treatment and reuse, especially by changing incentive schemes and reinforcing the need for greater private sector participation.[113]

Two standards dealing with water reuse quality levels and activities regulate discharges into federal bodies and include important detail about permissible limits for pollutants in water reuse activities. The parameters in NOM 001 are based on two criteria: (1) place of disposal and reused water use/activity and (2) quantities of pollutant/water characteristics. NOM 002 deals with discharge into municipal bodies.[114] More importantly, NOM-003-ECOL-1997 ("NOM 003") is known as the main water reuse standard for Mexico and sets the conditions and criteria for sampling, testing, disposal, and contaminant parameters. NOM-003 identifies two different categories of reuse: (1) water reused for activities with direct human contact; and (2) water reused for activities with non-direct or occasional human contact.[115]

A topic that has received increased attention among regulating authorities is the artificial recharge of aquifers. NOM 014 and NOM 015 detail national parameters and conditions for the process of injecting treated wastewater into aquifers. Currently, this practice is being used only at a pilot level in small volumes.[116] Indirect potable reuse through groundwater recharge has been studied in Tijuana, but not implemented yet.[117]

Another important piece of legislation impacting water reuse is the Federal Duties Law (Article 224). This law allows water users to avoid paying duties for first-use water if the source is replenished or wastewater is discharged into authorized sites.[118]

The Mexican government recognizes that its ambitious water goals will require heavy participation by the private sector. Private sector investments have been welcome in Mexico since the 1990's.[119] The most recent legal framework for public-private partnerships is the "Ley de Asociaciones Publico Privadas," a public-private partnership (PPP) law passed in 2012. While not focused solely on the water sector, the law is expected to increase the level of private sector involvement in the water sector in Mexico.[120]

In fiscal year 2014, Mexico's CONAGUA issued guidelines for wastewater treatment and reuse, including financial incentives for wastewater treatment plants (WWTP). A WWTP is granted $0.05 per cubic meter if between 30 to 60 percent of treated wastewater is reused, and $0.10 per cubic meter if greater than 60 percent of treated wastewater is reused.[121]

As highlighted in this section, Latin America, specifically Brazil and Mexico, is advancing the reuse of treated wastewater on numerous fronts. As these countries continue to pursue their ambitious water strategies to battle water scarcity challenges, advanced water reuse will remain a critical element. A menu of water reuse policy options provided in the following section is a valuable starting point to evaluate the appropriate mix of additional policies that will best fit their needs.

Education and Outreach

One of the tools commonly used to promote water recycling and reuse is public education. Education and outreach is generally perceived as critical to advancing water recycling, not only to encourage its use, but also to overcome possible public concerns regarding the safety and quality of recycled water. Thus, most communities with a water-recycling program have active public education programs. These programs are often supplemented by state- and regional-level government campaigns.

Local communities raise awareness through a number of common techniques used by governments worldwide. We have highlighted a few below:

- Present awards to individuals and entities that have voluntarily made significant contributions to water recycling.
- Use government publications and websites to officially recognize private water recycling efforts, in particular those efforts that are innovative or are examples for other water users.
- Develop government certification programs for water recycling technologies.

For example:

- The U.S. Environmental Protection Agency (EPA) recognizes public and private entities for water conservation and recycling efforts through its WaterSense Award.
- On April 27, 2015, the Mayors of San Jose and Santa Clara, California, each took sips of recycled water from the new (2014) Silicon Valley Advanced Water Purification Center. The event's purpose was to highlight the safety of the water and to promote indirect potable reuse.
- Global Water Intelligence (GWI) began handing out Global Water Awards in 2011, including the Water Reuse Project of the Year. Winners have included projects in Jeddah, Saudi Arabia; King County, Washington; Big Spring, Texas and Orange County GWRS Expansion, California.

Information dissemination and educational outreach are one of the most common mechanisms used by local governments and treatment districts in the promotion of their recycling and reuse programs. These programs raise awareness through brochures, information on government websites, and advertising on TV and in newspapers and other media. The messages conveyed by these outreach programs fall into several broad categories:

- The condition of the community's water supply and the importance of water recycling to the future growth and stability of the community.
- The community's water reuse programs and how residents and businesses can participate.
- The allowable uses of recycled water or the situations when its use is required.
- The treatment processes required for recycled water and the methods for ensuring the safety and quality of the treated water.

For example:

- Spain's 2010 National Plan for Water Reuse (PNRA) has three of its eight main objectives focused on public education and outreach, including: promotion of reclaimed water use; informing and raising awareness of the benefits of water reuse; and promotion of research, development and technological innovation.
- In Jordan, the Ministry of Water and Irrigation is strongly promoting expanded public awareness and education programs.

Technical assistance is another form of public education for the larger, more sophisticated water users such as industrial or institutional users. Governments and water treatment or wastewater districts offer more specialized information and services for these users, including:

- Water use audits intended to identify conservation and water reuse opportunities.
- Technical manuals that detail the water recycling technologies available to large users and the treatment standards that must be met before effluent may be reused.
- Construction and development guidelines for recycled water systems.
- Recycled water permit application guidelines.

For example:

- To build support and acceptance of direct potable reuse (DPR), in February 2015 WateReuse released a project titled, "Model Communication Plans for Increasing Awareness and Fostering Acceptance of Direct Potable Reuse." The project will help to develop communication plans at the state and community levels.
- To support the use of alternative water sources in buildings, San Francisco Public Utilities (SFPUC), along with the San Francisco Department of Building Inspection (SFDBI) and the San Francisco Department of Public Health (SFDPH), in March 2015, published the guidebook, "San Francisco's Non-potable Water Program."
- The United Nations, through its Institute for Water Education, runs an annual course, Advanced Water Treatment and Re-Use, which is recognized across different European institutions of higher learning.

Reporting of water consumption, discharge, and reuse by large water users is used primarily by local governments to track their water recycling progress. Additionally, reporting requirements has the benefit of educating users about their own efforts and allows the government to identify entities that could be encouraged (or required) to replace potable water with recycled water.

For example:

- Australia has been producing National Performance Reports on water management, including water reuse, for more than eight years.
- The Florida Department of Environmental Protection publishes an annual reuse inventory, which is one of the largest and most comprehensive databases of reuse systems in the world.

Removing Barriers

Barriers to water recycling and recycling systems come in several forms: technological, financial, and regulatory. In fact, certain regulations intended to protect the public or programs providing services to the community may have the unintended effect of discouraging or even preventing voluntary water reuse.

One of the biggest barriers to water recycling is a municipal, state, or regional water code that does not recognize the use of recycled water. Local regulations requiring that all water used in the community meet potable water standards hinders or prevents water reuse.

In this case, the first steps towards water recycling are to set specific quality standards for recycled water and to provide guidance on the use of the reclaimed water.

Other local requirements that may present barriers to water reuse by making it more difficult or expensive include:

- Building and plumbing codes that prohibit the installation of the dual piping necessary for recycled water or grey water use.
- Regulations that impose stringent permitting and inspection requirements for recycled water regardless of the use or risk of human exposure; for example, imposing the same set of standards on a water reuse system in an industrial chemical manufacturing facility as for residential lawn irrigation.
- Actions that encourage (or do not discourage) potable water use, such as subsidizing the construction of potable water systems or not imposing full-cost pricing on potable water use.
- Incentives for investments in technologies that consume large amounts of water.

Depending on their authority and on the structure of their state or national legal schemes, not all communities will initiate the regulatory changes necessary to allow the use of recycled water. Many communities are constrained by state or federal requirements that they must follow. However, communities do have control over local building and development codes as well as local funding, all of which can play a significant role in water recycling and reuse.

For example:

- Two international standard organizations, NSF International and the International Organization for Standardization (ISO), have been developing water reuse standards over the past few years. NSF adopted two water reuse standards in July 2011, and ISO has developed a range of water reuse standards.

- Canada has been ramping up its implementation of reuse/reclaimed water regulations and codes. Canada's National Plumbing Code was updated in 2010 to include a grey water reuse standard; design and installation of non-potable water systems was added to Quebec's Construction Code in April 2014; British Columbia's 2012 Plumbing Code expanded permitting of grey and black water systems; and Alberta's Environment and Sustainable Resource Development (ESRD) Ministry is working to complete a policy directive to guide reuse applications (est. 2015).
- In the US, the state of Georgia issued guidelines for using reclaimed water in buildings in January 2011, and revised them in March 2012.
- In 2012, the City of Irving, Texas petitioned the Texas Commission on Environmental Quality (CEQ) to amend the definition of "Municipal Use" in §297.1(32) to allow indirect reuse of treated wastewater effluent for watering of parks, golf courses, and parkways as a municipal use. The CEQ in July 2013 adopted an amendment to the Texas Administrative Code as requested in the petition. In addition, the CEQ expanded authorized uses to include watering of other public or recreational spaces.
- In May 2014, Queensland, Australia's Reform of the Water Supply Act was amended to simplify the regulation of recycled water, and reduce the regulatory burden on recycled water providers supplying recycled water to schemes with lower exposure uses. Only recycled water providers supplying recycled water to higher exposure uses are required to have an approved recycled water management plan (RWMP).
- In May 28, 2014, the governor of Oklahoma signed Senate Bill 1187, making it possible for water agencies to implement potable water reuse projects. Under the new law, the Department of Environmental Quality (DEQ) can issue permits for point-source discharges into sensitive public and private water supplies for the purpose of developing and implementing a water-reuse project.
- In France, the Decree Order of 2014 (Article R211-23 of the Code of the Environment) streamlined approvals for the use of treated wastewater for agricultural purposes.

Incentives

Incentives used by communities to encourage water recycling most commonly take the form of economic incentives that make recycled water cheaper than potable water. Another approach is to tie water usage to conservation programs and exempt recycled water users from many of the community's conservation requirements. Other programs involve property rights and payments for the reuse of recycled water; pricing schemes that use higher rates for potable water; subsidies or grants for water recycling; and reuse technologies and programs for government procurement of water recycling infrastructure. Examples of these types of financial and regulatory incentives include:

Direct subsidies, generally in the form of tax credits, grants or low-interest loans for the installation of water reuse technologies and other capital expenditures.

For example:

- The San Francisco Public Utilities Commission's (SFPUC) grant assistance program provides up to $250,000 for single-building projects adopting non-potable water reuse, and as much as $500,000 for projects in which two or more buildings share alternative water sources.
- Austin, Texas' "Bucks for Business" Rebate Program for water efficiency and reuse has increased its maximum rebate from $40,000 in 2008 to $100,000 in 2015, and San Antonio, Texas has similarly increased rebates from 50 percent in 2008 to a maximum of 100 percent cost coverage in 2015 for its Large-Scale Retrofit Rebate Program.
- Approved by voters in 2013, the State Water Implementation Fund for Texas (SWIFT) is a $6 billion initiative to provide low interest loans for water projects that are part of the State Water Plan. The program sets aside 20 percent of funds for water conservation and reuse projects, providing significant incentive for water agencies to embrace conservation and reuse.
- The state of Karnataka, India, in October 2014, launched its Industrial Policy 2014-2019. The policy supports subsidies of up to 75 percent of the cost of wastewater recycling by "small and medium manufacturing enterprises."

Reductions in payments to governments in the form of tax deductions, rate reductions, or reduced lease payments for investments in water recycling technologies.

For example:

- In the US, Denver Water in Colorado will pay commercial, industrial and institutional customers $18.50 for each thousand gallons of water saved annually.
- The Beijing, China city government, in 2013, made the decision to invest billions in upgrading its wastewater treatment and reuse capacities. It simultaneously implemented more competitive pricing and corporate financing for water reuse.

Payments or other credits for the reintroduction of recovered water into the raw water source — programs under the water supply or wastewater treatment district — compensates water users who recover and re-inject treated water into its original source.

For example:

- In the US in July 2012, Florida implemented "substitution credits" which allow the use of reclaimed water to replace all or a portion of an existing permitted use of resource-limited surface water or groundwater.

Pricing that imposes higher charges for the use of potable water.

For example:

- In the US, the Governor of California, in April 2015, issued an Executive Order on water use that directs the State Water Resources Control Board to devise a plan to cut urban water use by 25 percent across the state. In response, the Metropolitan Water District of Southern California said it would triple the cost of water for anyone who exceeded these limits.
- In New York City, residential, commercial, and mixed-use buildings with a Comprehensive Water Reuse System (CWRS) are provided with rate incentives. The water rate for a CWRS building in fiscal year 2015 is $2.78 per 100 cubic feet versus $3.70 per 100 cubic feet for other buildings, a 25 percent savings incentive.

Competitive financing for private sector industrial projects.

For example:

- In the United States, private industry has traditionally financed industrial water treatment and reuse systems through a combination of commercial loans and corporate bonds, while public water utilities have had access to government-subsidized financing through the Clean Water State Revolving Fund (CWSRF). With passage of the 2014 Water Resources Reform and Development Act (WRRDA), however, private companies can now obtain CWSRF loans to support on-site industrial water reuse projects and other privately-owned facilities that reuse or recycle wastewater, storm water, or subsurface drainage water. Interest rates for the CWSRF average 1.7 percent (2015 data). Funding can only be used for capital costs for the construction of new facilities or the rehabilitation of existing facilities. Operation and maintenance costs are not eligible.
- There are also a number of other programs that can potentially finance publicly-owned water reuse activities in the US, including the Community Development Block Grant program through the Department of Housing and Urban Development; the Water & Waste Disposal Loan & Grant Program through the Department of Agriculture; and the WaterSMART program through the Bureau of Reclamation.

Regulatory relief by eliminating certain requirements for users of recycled water.

For example:

- **Alberta, Canada** in-situ oil sands water use and recycling has been regulated since 1989. Directive 81, in effect since November 21, 2012, sets water disposal limits and provides formulas that are used for monitoring and comparing thermal operations. In essence, the Directive's water disposal limits drive constant improvement in water recycling technologies. For example, the Directive incentivizes new technologies by removing water disposal limits for small thermal pilot or experimental systems.

Additional incentives for water recycling and reuse include government procurement of water recycling and reuse equipment, requirements that government buildings and operations maximize their recycling and reuse of water, and structuring of water rights to reduce use of potable water.

Mandates and Regulation

Communities facing severe water restrictions due to natural water scarcity, population growth, or resource overuse frequently adopt laws requiring the use of recycled water. A number of communities have taken these actions on their own, while others are responding to state or regional mandates.

There are two common approaches to mandating the use of recycled water: (1) requirements targeting the supply of recycled water by regional or local wastewater treatment or water supply districts; and (2) requirements affecting the use of recycled water by residents or businesses.

Wastewater Treatment and Water Supply Utilities

Most commonly, recycled water is provided by the community's wastewater treatment district or utility, as these organizations are best positioned to deliver high-quality recycled water. Not only do the districts have a large volume of wastewater, they often are the only ones with the capacity to carry out the level of treatment necessary to meet water quality standards.

Communities may require treatment districts to develop plans for the recycled water and/or to provide recycled water to certain types of users. Some local governments couple the wastewater treatment utility mandates with restrictions on the local water supply utility. These regulations typically restrict the use of potable water, forcing water users to rely on recycled water and creating more customers for the local water reuse program.

For example:

- **California's** Water Code Section 13551 states that "A person or public agency, including a state agency, city, county, district, or any other political subdivision of the state, shall not use water from any source of quality suitable for potable domestic use for non-potable uses, including cemeteries, golf courses, parks, highway landscaped areas, and industrial and irrigation uses if suitable recycled water is available."

- **Israel** passed legislation in 2010 which sought to "facilitate the recovery of effluents as a water source" through stricter standards for 36 effluent parameters. In essence, the goal of the legislation is to gradually replace freshwater allocations to agriculture with reclaimed effluent through upgrades to wastewater treatment plants to tertiary treatment.

- **Korea** passed the Promotion of and Support for Water Reuse Act in June 2010. The legislation requires, among other actions, the establishment of a comprehensive water reuse management plan in each jurisdiction.

Residents and Businesses

Ensuring that wastewater treatment districts are prepared to supply recycled water is a prerequisite to any community's program, but a community must also ensure that there are users for the recycled water. Thus, the second category of regulation targets water users themselves, either mandating the use of recycled water or prohibiting particular uses of potable water, thereby forcing water reuse. Some of the most common requirements are:

- Mandating the use of recycled water for certain large volume activities such as landscape and agricultural irrigation.

- Using local permitting and development codes to require the provision of the infrastructure necessary for recycled or grey water reuse, such as the installation of dual piping systems and other systems in new buildings or developments that allow the use of recycled water now or in the future.

- Requiring water recovery systems for high-volume water users and dischargers such as car washes.

- Restricting potable water to human or food-related uses. For example:

  ~ In January 2009, China's Circular Economy Promotion Law went into effect. The law contains a strong mandate to reuse water. Article 31 states: "Enterprises shall develop an interconnected water use system and a circulatory water use system so as to improve the repeated use of water....Enterprises shall use advanced technologies, techniques and equipment for the circulatory use of the wastewater generated in the production process."

  ~ Singapore last updated its Handbook on Application for Water Supply in 2009. It mandates, among other things, water recovery systems for the washing of vehicles at construction sites, and water recycling systems to reclaim processed water for reuse in the production process or other non-potable purposes such as cooling, irrigation, etc.

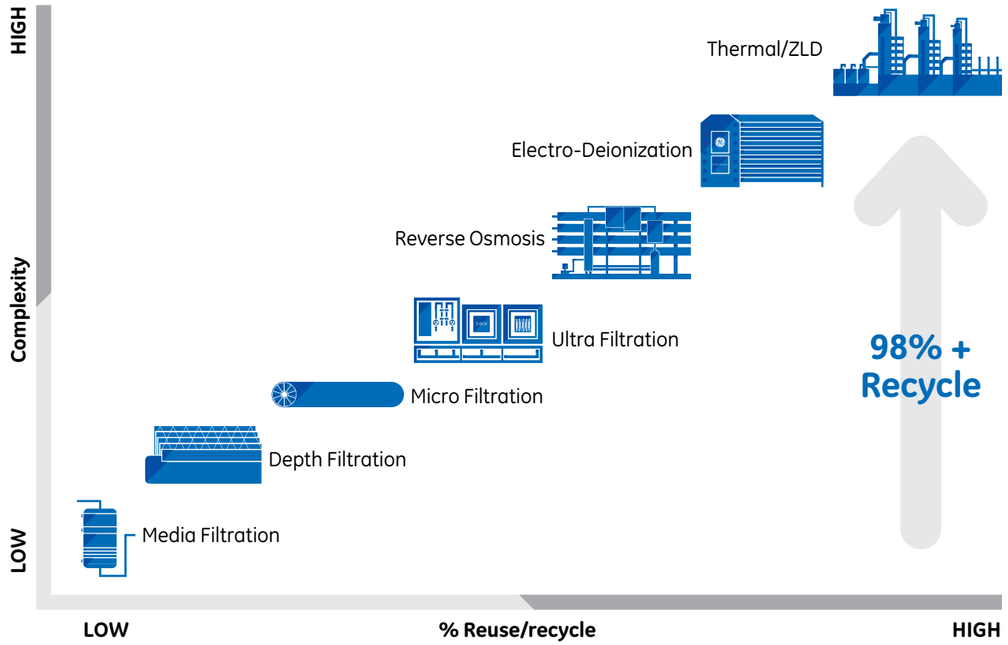
  ~ Since May 2009, all new homes in the United Kingdom must meet a water efficiency standard of 125 liters of water per person per day (l/p/d). "Sustainable Homes" have even stricter limits (between 80-120 l/p/d), based on performance targets.

  ~ The 2014 revision of San Antonio, Texas' Water Conservation and Reuse Ordinance mandates that cooling towers not utilizing recycled water must operate a minimum of four cycles of concentration.

5. A Range of Technology Options

When evaluating policy options to promote water recycling and reuse, it is often helpful to consider what is achievable from a technology standpoint. Figure 5 illustrates how select technologies may be deployed as a function of water recovery needs and water quality. GE Water & Process Technologies personnel are located in communities around the world. For further information, contact a local GE representative at www.gewater.com.

FIGURE 5: REUSE TECHNOLOGY SPECTRUM: GE WATER REUSE TECHNOLOGIES AS A FUNCTION OF THE PERCENTAGE OF REUSE/RECYCLE AND THE LEVEL OF PROJECT COMPLEXITY



6. Conclusion

More and more communities are facing acute water scarcity issues. Many are choosing water recycling and reuse as part of their response.

The policy options for encouraging water recycling and reuse described in this paper — education and outreach, barrier removal, incentives, and mandates and regulations — provide a menu of policy options for communities and their governments to address their water resources needs. Identifying appropriate policies for any particular community depends on various factors, including the time horizon for program implementation; governmental structures and processes to promulgate and implement such programs; resources, including both funding and expertise; and degree of "buy-in" from stakeholders and policymakers. This white paper reviewed the current state of water and water reuse in Latin America, specifically Brazil and Mexico.

Water reuse offers a water source that is dependable and locally controlled. Water reuse allows communities to become less dependent on groundwater and surface water sources. They can then decrease the diversion of water from sensitive ecosystems, such as the Amazon in Latin America.

While the needs and circumstances of different communities vary greatly, the options presented in this white paper show that a wide range of policies to promote water recycling and reuse are being adopted around the world.

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74 GWI Global Water and Wastewater Quality Regulations 2012.

75 "Brazil Water Market Insight." Press Release. PR Newswire. 9 April 2014. Link http://www.prnewswire.com/news-releases/brazil-water-market-insight-254565291.html, last accessed July 2015.

76 *Brazil Water Report Q1 2015. Abstract.* Business Monitor International, Market Research.com. 20 May 2015. Link http://www.marketresearch.com/Business-Monitor-International-v304/Brazil-Water-Q1-8516492/, last accessed July 2015.

77 "The CONAGUA In Action." Link http://www.amtrak.com/3-day-sale-northeast-regional-train?WT.mc_t=NER3DayJuly2015NYC_AGR&WT.mc_n=NER3Day&WT.mc_r=365.

78 *GWI Global Water Market 2014.*

79 *GWI Global Water Market 2014.*

80 "While the southern states in Mexico have over 15,000 m3 of per capita water, in the northern and central states per capita water is only 500 and 1700 m3 respectively which demonstrates the water stress severity outside of the south, where 75% of the population lives and where 87% of the Mexican economy is located." See: "Quarterly Mexico Water Report," 2011.

81 *GWI Global Water Market 2014.*

82 Mexico is characterized by Global Water Intelligence as one of five "smaller, but rapidly-growing" water markets. *GWI Global Water Market 2014.*

83 "The CONAGUA in Action."

84 Conagua. Programa Nacional Hídrico 2007–2012. http://www.conagua.gob.mx/CONAGUA07/Contenido/Documentos/PNH_05-08.pdf, last accessed September 2015.

85 Conagua. Programa Nacional Hídrico 2014–2018. http://www.conagua.gob.mx/Contenido.aspx?n1=1&n2=28&n3=28, last accessed September 2015.

86 Conagua. PNH 2014–2018.

87 National Development Plan 2013–2018. http://www.dof.gob.mx/nota_detalle_popup.php?codigo=5299465, last accessed September 2015.

88 *GWI Global Water Market 2014*, p. 303. Also: CONAGUA 2010.

89 *GWI Global Water and Wastewater Quality Regulations 2012.*

90 *GWI Global Water and Wastewater Quality Regulations 2012.*

91 *GWI Global Water and Wastewater Quality Regulations 2012.*

92 *GWI Global Water Market 2014.*

93 *GWI Global Water Market 2014.* Originally from CONAGUA, 2011.

94 China is the first. "Quarterly Mexico Water Report." LGA Consulting. Issue 6. Winter 2011. Mexico could be interpreted to be the third after China and India. See endnote: Lautz, Jonathan, etc. Where is earlier reference to Lautz ??

95 McCann, Bill. "The expanding role of water reuse." The International Water Association (IWA) Publishing. February 2009. Link here,[what is the link??] last accessed July 2015. Primary source: "Water reuse; an international survey of current practice, issues and needs," ed. by Blanca Jiménez and Takashi Asano. IWA, 2008.

96 LGA Consulting. 2011.

97 "Treatment capacity (as of 2006) was 90,720 m3 per day. "*Milestones in Water Reuse: The Best Success Stories*."

98 Nogarin, Mauro.

99 Water Agenda for 2030.

100 *GWI Global Water Market 2014.*

101 *GWI Global Water Market 2014.*

102 *GWI Global Water Market 2014.*

103 *GWI Global Water and Wastewater Quality Regulations 2012.*

104 *GWI Global Water Market 2014.*

105 LGA Consulting, 2011.

106 *GWI Global Water Market 2014.*

107 *GWI Global Water Market 2014.*

108 *GWI Global Water and Wastewater Quality Regulations 2012.*

109 National Water Law and National Water Program. http://www.conagua.gob.mx/home.aspx.

110 *GWI Global Water Market 2014.*

111 "By 2011 the programme had reused 2,203,200 m3/d of water, more than the objective for that year. The amount exchanged was 656,640 m3/d." *GWI Global Water Market 2014.*

112 Secretariat of Environment and Natural Resources (Secretaría del Medio Ambiente y Recursos Naturales, SEMARNAT) Por un Uso Eficiente del Agua (For the Efficient Use of Water) http://mexichem.com/English/docs/Desarrollo_sust_ing/Desarrollo2010/DesarrolloSustentable2010_ing.pdf.

113 *GWI Global Water Market 2014.*

114 LGA Consulting.

115 *GWI Global Water and Wastewater Quality Regulations 2012.*

116 LGA Consulting. Issue 6, Winter 2011.

117 Jonathan Lautze et al., "Global Experiences in Water Reuse," Series 4, International Water Management Institute, United States Environmental Protection Agency (2014). Accessed November, 2016. http://www.iwmi.cgiar.org/Publications/wle/rrr/resource_recovery_and_reuse-series_4.pdf?galog=no.

118 *GWI Global Water and Wastewater Quality Regulations 2012.*

119 *GWI Global Water Market 2014.*

120 *GWI Global Water Market 2014.*

121 CONAGUA (Comisión Nacional del Agua) Incentive Program Guidelines for the Operation of Wastewater Treatment Plant — http://www.conagua.gob.mx/CONAGUA07/Noticias/U037.pdf.

8. Appendix — Matrix of Policy Examples and Additional Information

LOCATION	PROGRAM	DESCRIPTION
EDUCATION AND OUTREACH		
Australia		
National Urban Water and Desalination Plan	Australian Centre of Water Recycling Excellence https://www.awa.asn.au/AustralianCurriculumProject/ http://www.australianwaterrecycling.com.au/projects/national-demonstration-education-amp-engagement-program http://www.wme.com.au/categories/water/nov5_2014.php	The Australia Water Recycling Centre of Excellence, as part of the Australian government's Department of the Environment, runs the National Demonstration, Education and Engagement Program (NDEEP). NDEEP's goal is "to help remove the social, political, economic and regulatory barriers to augmenting Australia's drinking water supplies with recycled water." Its work to date has included reports on the risks and benefits of recycled water, as well as work with the Australian Water Association to support extensive water education reform and development in schools nationwide as part of the Australian Curriculum Project — Water Education in Schools. For these and other efforts, NDEEP in November 2014 received the WateReuse International Award.
National Water Commission	National Performance Reports for Urban Water Utilities http://www.nwc.gov.au/publications/topic/nprs/npr-2013-urban	In Australia, the National Performance Reports for Urban Water Utilities have been jointly published for the past eight years by the National Water Commission, state and territory governments, and the Water Services Association of Australia. The 2014 report covers 81 reporting urban utilities including all capital cities, major regional cities and a large number of small water utilities. Combined, these utilities supply water services to approximately 18.7 million Australians. The utilities report on approximately 150 performance indicators spanning critical areas including water resources and recycling, health, customer service, asset management, environment, finance and pricing.
International		
Asian Development Bank (ADB)	Promotion of water reuse in Chinese cities http://www.thejakartapost.com/news/2013/11/20/adb-supports-wastewater-reuse-peoples-republic-china.html	The ADB's Climate Change Fund and the Multi-Donor Trust Fund under the Water Financing Partnership Facility (funded by the governments of Australia, Austria, the Netherlands, Norway, Spain, and Switzerland) is providing technical assistance and financial resources of $500,000 to help to promote the reuse of wastewater in cities across the China.
Global Water Intelligence (GWI)	Global Water Awards http://www.globalwaterawards.com/	GWI began presenting Global Water Awards in 2011, with one award specifically for Water Reuse: the Water Reuse Project of the Year. Winners have included a sewage lake cleanup project in Jeddah, Saudi Arabia; the Brightwater membrane bioreactor wastewater treatment plant in King County, Washington; and the Big Spring Raw Water Production Facility in Texas.

LOCATION	PROGRAM	DESCRIPTION
Southeast Asia	Building awareness of water management and reuse https://wateractionhub.org/media/files/2014/09/26/SEAAWA_summary_report.pdf	In 2011, the CEO Water Mandate and UN Environment Programme (UNEP) launched the Southeast Asia Apparel Water Action, also known as SEAAWA, aimed at bringing together the Mandate Secretariat; Mandate-endorsing companies from the apparel sector; suppliers; UNEP; and local civil society and government representatives to drive water use efficiency and reduce pollution in apparel laundering and finishing facilities in Vietnam and Cambodia. The project's overarching goals were to build awareness and capacity to enhance water management among apparel suppliers; to mitigate business risks to manufacturers; to reduce costs for suppliers; and to improve the water conditions in the region. A wide range of practices were featured, including internal governance, monitoring, recycling/reuse, single-process and multiple-process optimization, and treatment.
U.S. Green Building Council	Leadership in Energy & Environmental Design (LEED) green building program http://www.usgbc.org/leed	The U.S. Green Building Council works closely with governmental organizations globally to promote green infrastructure, including water reuse training and awards.
	Green Business Award http://www.bizjournals.com/cincinnati/print-edition/2014/03/07/2014-green-business-awards-winner-Miller.html	In September 2013, a large brewery in Trenton, Ohio received a Green Business Award for its innovative tertiary reclaimed water system that reduces water consumption. After wastewater is treated, it is reused in cooling towers and in other non-beer making processes. Over the course of a year, the system saves approximately 55 million gallons of water.
	LEED Certification http://blogs.aecom.com/photoblog/2015/02/04/city-of-san-francisco-water-reuse-and-living-machine-sfpuc-project/ http://www.dupont.co.in/corporate-functions/media/press-releases/DuPont-achieves-top-sustainability-certification.html https://www.ucalgary.ca/eeel/	Highlighted here are only a couple of global examples of LEED awards for reuse: • The San Francisco Public Utilities Commission (SFPUC) headquarters building, completed in 2012, is built to LEED Platinum standards, and captures, treats and reuses both rainwater and wastewater. • In March 2015, the research center of a major global chemical company in Hyderabad, India received LEED Gold Certification, in part due to water reuse by its on-site sewage treatment plant. • The University of Calgary's Energy Environment Experiential Learning (EEEL) building received LEED Platinum certification in April 2013. The building collects rainwater, reused river water and grey water and recycles it.
WateReuse	State and community education and outreach program to support direct potable reuse (DPR) https://www.watereuse.org/foundation/press-release_012714	To build support and acceptance of DPR, the WateReuse Organization in February 2015 launched a project titled, "Model Communication Plans for Increasing Awareness and Fostering Acceptance of Direct Potable Reuse." The project will help develop communication plan documents at the state and community levels. See also the US/Australia joint project on developing a Global Connections Map to highlight operating and planned potable reuse projects. http://www.australianwaterrecycling.com.au/projects/national-demonstration-education-amp-engagement-program

LOCATION	PROGRAM	DESCRIPTION
Jordan		
Jordanian Ministry of Water and Irrigation (MWI)	Water Strategy 2008-2022 Adaptation Fund Proposal, August 2014: https://www.adaptation-fund.org/sites/default/files/Jordan%20Revised%20Fully-developed%20programme%20Proposal-08-31-2014+LOE.pdf	The Jordanian Ministry of Water and Irrigation (MWI) adopted the Water Strategy 2008-2022 that aims to increase the volume of recycled wastewater more than fourfold to 256 million cubic meters per year by 2022. As part of its 2014 proposal to the Adaptation Fund for financing of innovative water and agriculture projects, the proposal states: "The key element in the strategy for climate change adaptation through wastewater reuse and marketing crops grown with reclaimed water is through a public awareness and education program linked to the water reuse demonstration projects.... Efforts are needed to organize public awareness campaigns at different levels, starting with farmers, to overcome the negative image of using reclaimed water for irrigation."
Mexico		
Secretariat of Environment and Natural Resources (Secretaría del Medio Ambiente y Recursos Naturales, SEMARNAT)	Por un Uso Eficiente del Agua (For the Efficient Use of Water) http://mexichem.com/English/docs/Desarrollo_sust_ing/Desarrollo2010/DesarrolloSustentable2010_ing.pdf	Endorsed by both SEMARNAT and the Employers' Confederation of the Mexican Republic (COPARMEX), this national project is part of the Environmental Cooperation Program, which supports and promotes water reuse among companies, research centers, institutions of higher education, social organizations, and governmental entities. As of 2010, this project has supported on average the reuse of one million cubic meters of water per year.
Mongolia		
Mongolian Government	Green Mine Award for water reuse http://ot.mn/en/media/press-release/160114	The Mongolian Mining Journal Award, presented during the Mongolian Government's Minerals 2025 conference, recognizes water reuse and efficiency in the mining sector. In January 2014, the mine Oyu Tolgoi was named 'Best Green Mine' by implementing international standard environmental monitoring programs, introducing innovative technology; and developing detailed plans for biological rehabilitation in the Gobi desert. The mine is one of the most water-efficient mines of its type worldwide, reusing 85–90 percent of its water.
Singapore		
Public Utilities Board	Education and outreach efforts http://www.pub.gov.sg/fow/Programmes/Pages/watermarkaward2015.aspx http://www.singaporeworldwaterday.com/index.php	Singapore's Public Utilities Board (PUB) is world-renowned for its efforts in education and outreach concerning water reuse — or "used water," as described by the PUB. For example, its NEWater recycled water program won the United Nation's Water Best Practices Award in 2014 for its public communications and education efforts. In another example, in 2015 more than 400,000 Singaporeans participated in PUB's World Water Day, with events including education about NEWater. And every year the PUB gives out its Watermark Award — one of the 2015 recipients, Alexandra Health System, innovates though reuse of condensate water for cooling towers.

LOCATION	PROGRAM	DESCRIPTION
Public Utilities Board	Watermark Award http://www.pub.gov.sg/fow/Programmes/Pages/WatermarkAward.aspx	Award given by Board in recognition of water usage and conservation. National Environmental Agency Lee Kuan Yew Water Prize www.siww.com.sg/about-prize Award recognizing outstanding contributions toward solving the world's water problems.
Public Utilities Board	Public Education and Information www.pub.gov.sg/water/Pages/singaporewaterstory.aspx#a2	Outreach programs include: • TV/Internet/Newspaper tips • Water audit program for commercial users • NEWater Visitor Centre, to advocate to the public about recycled water • Encouraging companies to replace potable water with recycled water
National Environmental Agency	Lee Kuan Yew Water Prize http://www.siww.com.sg (See "Lee Kuan Yew Water Prize")	Award recognizing outstanding contributions toward solving the world's water problems.
Spain		
Ministry of the Environment	Public awareness campaigns http://www.magrama.gob.es/es/calidad-y-evaluacion-ambiental/participacion-publica/version_preliminar_pnra231210_tcm7-153069.pdf	The draft National Plan for Water Reuse (PNRA), first issued in December 2010 and still in draft form as of 2014, has three of its eight main objectives focused on public education and outreach, including: 1. Promotion of reclaimed water use, in accordance with good practices. 2. Informing and raising awareness of the benefits of water reuse. 3. Promotion of research, development and technological innovation.
United Nations		
UNESCO-IHE, Institute for Water Education	Training programs http://www.unesco-ihe.org/advanced-water-treatment-and-reuse	The United Nations, through its Institute for Water Education, runs an annual course, Advanced Water Treatment and Reuse, which provides European Credit Transfer and Accumulation System (ECTS) credits for water professionals. These credits allow recognition of such courses across different European institutions of higher learning.
United States		
Federal Environmental Protection Agency (EPA)	WaterSense Award http://www.epa.gov/watersense/partners/watersense_awards.html	Annual award and recognition program. Recognizes public and private entities for water conservation and recycling efforts.

LOCATION	PROGRAM	DESCRIPTION
California (Los Angeles)	Los Angeles Department of Water and Power (LADWP) Bureau of Sanitation http://lacitysan.org/irp/documents/Recycled_Water_Advisory_Group_Launch.pdf	The city of Los Angeles has been engaging stakeholders through the "Recycled Water Advisory Group" (RWAG) since 2009 to obtain input on the development of the City's Recycled Water Master Plan. Consisting of over 60 community groups, environmental organizations, businesses, academia, and public agencies, the RWAG provides critical input to the city team during the planning process. They held numerous workshops, facility tours, surveys, webinars, and other activities to inform the stakeholders. For current activities of RWAG, see "Outreach" under "Recycled Water" at: https://www.ladwp.com/ladwp/faces/ladwp/aboutus/a-water?_adf.ctrl-state=16dia8gwxl_43&_afrLoop=82706331162617
California (San Diego)	Education about indirect potable reuse http://www.uswateralliance.org/2015/01/26/2015-water-prize-winners/ http://www.katzandassociates.com/category/water/	Public outreach and education was a major component in San Diego's Water Purification Demonstration Project — completed and approved by the San Diego City Council in 2013 — which showed how wastewater could be turned into a "reliable, sustainable and diversified" local purified water supply suitable for drinking. Public approval for water reuse went from 26 percent in 2004 to 73 percent in 2012. The project, now known as Pure Water San Diego, was a 2015 winner of the U.S. Water Alliance's U.S. Water Prize, and targets supplying the city with 83 million gallons of drinking water locally by 2035.
California (San Jose and Santa Clara)	Promotion of indirect potable reuse http://www.valleywater.org/EkContent.aspx?id=11491 http://www.mercurynews.com/drought/ci_27999661/california-drought-san-jose-mayor-drinks-recycled-sewage	On April 27, 2015, the Mayors of San Jose and Santa Clara, California each took sips of recycled water from the new (2014) Silicon Valley Advanced Water Purification Center. The event's purpose was to showcase the safety of the water and to promote indirect potable reuse. Legislative initiatives are underway in these two cities and elsewhere around California to suspend requirements for detailed environmental reviews through California's Environmental Quality Act (CEQA) for recycled water projects.
Florida	Department of Environmental Protection (FDEP) Information dissemination — water reuse inventory http://www.dep.state.fl.us/water/reuse/inventory.htm	The FDEP publishes an annual "reuse inventory," which is "the largest and most comprehensive database of permitted reuse systems in the world." Domestic wastewater treatment facilities (0.1 million gallons per day and greater) that provide reclaimed water are required to submit annual reuse reports to the FDEP. These reports are the basis for FDEP's reuse inventory database.
Texas (Austin)	Austin Water Utility's Water Reclamation Initiative (WRI) www.austintexas.gov/department/water-reclamation	Austin's Water Reclamation Initiative (WRI) supports the city's conservation program by promoting use of reclaimed water by businesses and industry.

LOCATION	PROGRAM	DESCRIPTION
Texas (El Paso)	El Paso Water Utilities (EPWU) Direct potable reuse project, public education and outreach http://www.epwu.org/water/purified_water.html http://www.epwu.org/public_information/agenda/attachments/237914.pdf http://www.elpasoinc.com/news/local_news/article_6ec60be8-e8f9-11e3-a3bd-001a4bcf6878.html	El Paso, Texas was the first city in the state to practice IPR, back in 1985. The next step is DPR, and in 2012-13 EPWU and the Public Service Board began moving forward on concrete plans to have a DPR facility in operation by 2017. Fundamental to the project is public education and outreach. A preliminary survey indicated 84 percent of El Pasoans support DPR; nevertheless, EPWU launched a major public education and communications plan to support every phase of the project. Communication avenues include media events, utility-produced videos, social media outreach, an independent expert advisory panel, public tours, and exhibits, with over 35,000 people visiting the TecH2O Water Resources Education Center in 2013-14. The key messages are 1) water reuse is decades-old in El Paso; 2) advanced technology makes the system safe; and 3) the project provides the city with a "drought-proof, sustainable supply" of drinking water. Phase I studies were completed in 2014 and phase II pilot testing is underway in 2015.
	Water Environment Foundation (WEF) & American Society of Mechanical Engineers (ASME) Expanding wastewater reuse between water and electric utilities through education on best practices http://nexightgroup.com/wp-content/uploads/2013/02/municipal-wastewater-reuse-by-electric-utilities.pdf	In May 2012, WEF and ASME sponsored a workshop to address challenges and potential paths forward to increasing water reuse by electric utilities through partnerships with municipal wastewater utilities. The report outlines outcomes and potential next steps. The report won the 2012–13 Excellence Award from the Society for Technical Communication (D.C. Chapter) in the Technical Publication Competition. The report will also support a technical presentation at Power 2015 entitled, "Resource Recovery: Water and Energy Utility Collaboration Opportunities."

REMOVE BARRIERS

Australia

Federal	Plumbing Code of Australia (PCA) - Volume Three of the National Construction Code (NCC) http://www.abcb.gov.au/about-the-national-construction-code.aspx	In early 2015, Australia released the National Construction Code (NCC), an initiative of the Council of Australian Governments, developed to incorporate all on-site construction requirements into a single code. The NCC comprises the Building Code of Australia in two volumes and the Plumbing Code of Australia (PCA) as Volume Three. The PCA contains technical provisions for the design, construction, installation, replacement, repair, alteration, and maintenance of plumbing systems including alternative supplies such as recycled water.

LOCATION	PROGRAM	DESCRIPTION
Federal	http://www.pc.gov.au/inquiries/completed/urban-water/report/urban-water-volume1.pdf	The Australian Government's Productivity Commission's 2011 report from its inquiry into Australia's Urban Water Sector provided some good commentary on the various options and role of governments. Suggested methods to remove barriers to water recycling and reuse include: 1. Removal of "policy bans" on supply augmentation for sources such as indirect potable reuse. 2. Gathering of "reliable information" on costs, benefits and risks of reclaimed water, and making it publicly available. 3. Creating economic incentives and opportunities for water recycling and reuse technologies.
Federal	On-site reuse and gra–ywater reuse http://www.recycledwater.com.au/index.php?id=79	Accreditation is given to on-site grey water and blackwater treatment systems at the state level by Health Departments. Local government generally has responsibility for approving / certifying the installation of these systems.
Queensland	Reform of the Water Supply (Safety and Reliability) Act 2008 (QLD) www.legislation.qld.gov.au/Bills/54PDF/2014/WaterSupplySLAB14.pdf	In May 2014, the Act was amended to simplify the regulation of recycled water and to reduce the regulatory burden on recycled water providers supplying recycled water to schemes with lower-exposure uses. Only recycled water providers supplying recycled water to higher-exposure uses are required to have an approved recycled water management plan (RWMP).

Canada

Federal	Health Canada www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/reclaimed_water-eaux_recyclees/index-eng.php; British Columbia, 2012 BC Building Code www.housing.gov.bc.ca/building/code; Alberta ESRD http://esrd.alberta.ca/water/water-conversation/docum_ents/WaterFuture-PlanAction-Nov2014A.pdf	Canada has been ramping up its implementation of reuse/reclaimed water regulations and codes. Several examples are included here. In January 2010, Health Canada released the Canadian Guidelines for Domestic Reclaimed Water for Use in Toilet and Urinal Flushing. In addition, Canada's National Plumbing Code was updated in 2010 to include the CSA B128.1 grey water reuse standard, Design and installation of non-potable water systems. CSA B128.1 was added to Chapter III of Quebec's Construction Code in April 2014. British Columbia's 2012 Plumbing Code expanded permitting of grey and black water systems. Finally, Alberta's Environment and Sustainable Resource Development (ESRD) Ministry is working to complete a policy directive to guide reuse applications (est. 2015).

France

National	Use of treated urban domestic wastewater for the irrigation of crops or green spaces. See: http://legifrance.gouv.fr, JORF n°0153 du 4 juillet 2014 page 11059 texte n° 29.	Article R211-23 of the Code of the Environment states that wastewater can be used, after treatment, for agronomic or agricultural purposes, through spraying or irrigation, providing that methods are compatible with requirements for the protection of public health and the environment. The Decree Order of 2014 modified the previous Code by streamlining approvals and adding additional technical details. See also: http://www.developpement-durable.gouv.fr/IMG/pdf/LPS191EN.pdf

LOCATION	PROGRAM	DESCRIPTION

India

State of Tamil Nadu	12th Five-Year-Plan (FYP) Tamil Nadu, 2012-17 Developing water reuse http://www.spc.tn.gov.in//fiveyearplans/TN_XII_fyp_overview.pdf http://www.spc.tn.gov.in//12plan_english/6.%20WATER_SUPPLY.pdf Chennai tender: Water Desalination Report, Volume 51, Number 18, May 2015	The FYP lays out several initiatives to increase water reuse throughout the state, including: 1. Developing water reuse systems to make "satellite townships" self-sufficient. 2. Developing innovative water reuse technologies. 3. Creating a circular use and reuse process in water management. 4. Using recycled water for irrigation, industry, graywater, and groundwater replenishment (indirect potable reuse). In the capital of Chennai, the Metropolitan Water Supply and Sewerage Board (CMWSSB) in April 2015 released a tender for a 45,000 cubic meter per day (12 million gallons per day) tertiary treatment RO plant at Koyambedu in the state of Tamil Nadu. The project will supply reclaimed water to the State Industries Promotion Corporation (SIPCOT) industrial facility, which has no fresh water alternatives. The $66 million dollar project includes a transmission line to convey the water to area industries. Thirty five percent of the cost will be funded by the central Indian government; the remainder will come from Tamil Nadu state.

International

International Standards Organization (ISO)	ISO/TC 282 Water reuse http://www.iso.org/iso/iso_technical_committee?commid=4856734	ISO is currently (May 2015) developing international standards in the following categories: 1. Water reuse — terminology 2. Treated wastewater reuse for irrigation 3. Water reuse in urban areas 4. Risk and performance evaluation of water reuse systems
NSF International	Standards for water reuse www.nsf.org http://www.nsf.org/newsroom_pdf/SU_PSD_Magazine_Article_LT_EN_350_351_LSU-2722-0911.pdf	NSF International, as an independent, accredited organization, develops standards and tests and certifies products and systems through third-party certification. The standards set thorough health requirements and performance criteria for products. While not a government entity, its standards set the bar for many countries' permitted water treatment products and technologies. After four years of development, NSF in July 2011 adopted two new standards for evaluating technologies for on-site treatment of wastewater for reuse: NSF/ANSI Standard 350: On-site Residential and Commercial Water Reuse Treatment Systems, and NSF/ANSI Standard 350-1: On-site Residential and Commercial Graywater Treatment Systems for Subsurface Discharge.

LOCATION	PROGRAM	DESCRIPTION
Jordan		
Ministry of Water and Irrigation (MWI)	Upgrading and expanding treatment capacity for reuse http://water.worldbank.org/sites/water.worldbank.org/files/publication/Water-Reuse-Arab-World-From-Principle%20-Practice.pdf http://www.water-technology.net/projects/as-samra-wastewater-treatment-plant-jordan/	With rapid population growth in Amman, Zarqa and Russeifa, the MWI upgraded the existing As-Samra Stabilization Pond-Wastewater Treatment Plant and expanded treatment capacity from 68,000 to 268,000 cubic meters per day. As-Samra's expansion included state-of-the-art technology that can treat effluent for agricultural reuse, produce fertilizer from sludge, as well as generate clean energy. Treated effluent is sold to the Ministry of Water and Irrigation and used by farmers in the Wadi Dhleil, the Jordan Valley and the King Talal Reservoir areas. http://www.water-technology.net/projects/as-samra-wastewater-treatment-plant-jordan/
Middle East		
Egypt, Israel, Jordan, Morocco, Tunisia, Lebanon, the West Bank, the Gaza Strip, and the United States Agency for International Development (USAID)	Development and deployment of cost-effective reuse technologies http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2012/08/09/000333037_20120809052415/Rendered/PDF/717450WP0Box3700Principle00Practice.pdf	The Middle East Regional Cooperation (MERC) Program was established by USAID in 1981 to facilitate research collaboration. In 2012, construction was completed on an experimental wastewater treatment facility in Israel that uses MERC technology to cost-effectively produce water for reuse. It was designed and built using the expertise of Palestinian, Jordanian and Israeli researchers with technology developed in a previous MERC project.
Portugal		
Federal	Reuse of reclaimed urban water for irrigation http://www.ersar.pt/website/	The Portuguese Regulating Authority for Water and Sanitation Services issued reuse standards through NP 4434 in 2005, and subsequently issued the supporting Technical Guide of the Regulatory Authority for Water Services and Waste No. 14 in 2010. The Guide lists the potential uses of treated wastewater, as well as health and environmental risks; outlines quality standards; provides the legal and institutional context at all governmental levels; and defines strategies for implementing wastewater reuse systems.

LOCATION	PROGRAM	DESCRIPTION
Singapore		
Inter-Ministerial Committee on Sustainable Development (IMCSD)	Sustainable Singapore Blueprint 2015 http://www.mewr.gov.sg/ssb/files/ssb2015.pdf	In April 2009, Singapore's IMCSD (formed in 2008) released a new national framework to support Singapore's sustainable development efforts through 2030. Known as the Sustainable Singapore Blueprint, the framework set higher targets than those in the country's previous environmental blueprint, the Singapore Green Plan (2002-12), and also introduced several new initiatives. In the 2015 update, there are several notable examples: 1. Four NEWater water reclamation facilities already produce over 100 million gallons per day of recycled water for industrial, commercial and domestic use, with a fifth plant at Changi to be completed in 2016. 2. Singapore's Public Utilities Board (PUB) is enhancing the "used water" sewer network. The recently-begun Phase 2 of the Deep Tunnel Sewerage System will be completed by 2024 to connect western Singapore with the existing network. 3. Having already exceeded the original goal of supplying at least 25 percent of Singapore's water demand from non-conventional sources (30 percent in 2015), the Blueprint is targeting 55 percent by 2060.
United States		
General	Graywater codes and reuse throughout the U.S. Yu et al. Critical Review: Regulatory Incentives and Impediments for Onsite Graywater Reuse in the United States. July 2013. Water Environment Research, Vol. 85, No. 7. http://innovation.luskin.ucla.edu/sites/default/files/GraywaterPolicy.pdf	From the article: "The provision and inclusion of graywater definitions in the plumbing codes and other state regulations for 41 states suggests that most states accept graywater as a separable stream of domestic wastewater having water quality characteristics different from domestic wastewater and black water." "Although the provision of regulatory definitions does not always translate into granting homeowners permission for collecting and reusing graywater, it represents an important first step toward allowing graywater reuse. Additionally, allowance of graywater reuse by 29 states demonstrates acceptance of graywater as an alternative water source for nonpotable applications. Approximately 75 percent of homes in the United States are served by public sewers (U.S. Census Bureau, 1990), hence allowing these homes to collect graywater is an important step toward point-of-use graywater recycling."
Federal Environmental Protection Agency (EPA)	2012 Guidelines for Water Reuse http://nepis.epa.gov/Adobe/PDF/P100FS7K.pdf	In 2012, the US EPA issued an updated version of its 2004 Guidelines for Water Reuse. The document is comprehensive in providing information for policymakers and the broader water reuse community on management techniques, reuse by sector, new reuse technologies, case studies, and new information on direct and indirect potable reuse. The guidelines do not directly remove barriers to water reuse; they do, however, provide communities, states, and even international policymakers with the tools to do so.

LOCATION	PROGRAM	DESCRIPTION
Arizona (Phoenix)	City of Phoenix, Tres Rios Project https://www.phoenix.gov/waterservices/tresrios	Since 2010, the City of Phoenix's 100% water reclamation facility at 91st Avenue and the Palo Verde Water Reclamation Facility (PVWRF) together highlight how water reuse can be multi-purpose. The 91st Avenue facility supplies the PVWRF — located on-site at the Palo Verde Nuclear Generating Station, the largest nuclear plant in the U.S. — with 90 million gallons per day of treated secondary effluent. PVWRF then treats the water for cooling purposes. In addition, the 91st Avenue facility sends approximately 45 million gallons per day to the Tres Rios Flow Regulating Wetland Facilities, which is subsequently used by the Buckeye Irrigation District.
Colorado	Colorado Department of Public Health and Environment, Water Quality Control Division www.colorado.gov/pacific/cdphe/wq-graywater	Colorado is close to expanding its graywater use provisions. Its Water Quality Control Commission supports and, at the time of this writing (May 2015), is encouraging the adoption of revisions to the Colorado Discharge Permit System (Regulation 61) and the adoption of a Graywater Control Regulation (Regulation 86).
California	California Department of Housing and Community Development www.hcd.ca.gov/codes/shl/preface_et_emergency_graywater.pdf California Building Standards Commission	Chapter 16A, "Non-potable Water Reuse Systems," was added to the California Plumbing Code in 2009. These rules establish minimum guidelines for the installation of graywater systems in units that are regulated by the Department of Housing and Community Development (HCD). The California Plumbing Code was revised again in 2013 (effective January 1, 2014), with new graywater plumbing provisions.
California	State Water Resources Control Board (SWRCB) http://www.waterboards.ca.gov/water_issues/programs/water_recycling_policy/draft_amendment_to_policy.shtml	In 2009, the California State Water Resources Control Board (SWRCB) adopted a Recycled Water Policy intended to increase the use of municipal recycled water in California. Specifically, the policy called for increasing the use of recycled water to at least one million acre feet by 2020 or at least two million acre feet by 2030. One of the purposes of the policy was to ensure that recycled water use in California was subject to similar regulatory actions by the nine Regional Water Quality Control Boards of California. WRCA continues to seek changes in Title 17 and Title 22, including adding additional uses for recycled water into Title 22. This regulatory change will need to be made by the new SWRCB Drinking Water Division through a formal regulatory process.
California (San Francisco)	Non-potable water ordinance http://www.sfwater.org/index.aspx?page=686 http://www.sfwater.org/modules/showdocument.aspx?documentid=4962	In September 2012, San Francisco adopted the Onsite Water Reuse for Commercial, Multi-family, and Mixed Use Development Ordinance, also known as the Non-potable Water Ordinance. It added Article 12C to the San Francisco Health Code, allowing for the collection, treatment, and use of alternate water sources for non-potable applications. The ordinance was amended in October 2013 to allow district-scale water systems consisting of two or more buildings sharing non-potable water. To support the use of alternate water sources in buildings, San Francisco Public Utilities (SFPUC), along with the San Francisco Department of Building Inspection (SFDBI) and the San Francisco Department of Public Health (SFDPH), in March 2015 published the guidebook, *San Francisco's Non-potable Water Program*.

LOCATION	PROGRAM	DESCRIPTION
Georgia	Environmental Protection Division Reclaimed water systems for buildings and urban water use See "Reclaimed and Reuse Water" at https://epd.georgia.gov/municipal-wastewater	Georgia first issued guidelines for using reclaimed water in buildings in January 2011, and last revised its *Design Guidelines for Water Reclamation and Urban Water Reuse* in March 2012.
Hawaii	State Department of Health, Wastewater Branch Guidelines for the Reuse of Gray Water http://health.hawaii.gov/wastewater/files/2013/06/graywater_guidelines.pdf	In April 2009, all four counties in Hawaii waived the portions of the Uniform Plumbing Code (UPC) to allow the use of washing machine wastewater to be used for subsurface irrigation, as long as the service areas are not serviced by a publicly-owned sewer system.
Nevada	Clark County Water Reclamation District Reclaimed water program therightwater.com www.cleanwaterteam.com/waterreclamation.html	Reclaimed water is available on a case-by-case basis for a variety of applications, including irrigation of golf courses and landscaped areas at public facilities; use as a coolant in generators at power generation stations; and dust control. Note: Reclaimed water is availability-based in the District, and not legislation- or program-driven. Clark County Water Reclamation District is a member agency of the Southern Nevada Water Authority.
Oregon	Department of Environmental Quality Revision of recycled water use regulations and adoption of requirements for graywater reuse and disposal Oregon Administrative Rules www.deq.state.or.us/regulations/rules.htm	In mid-2008, the state of Oregon amended its recycled water use rules to expand uses, remove barriers that stigmatize recycled water, clarify government oversight, allow for improved treatment technology, and more. In September 2011, the Department approved requirements for graywater use, including a policy to encourage the development of this resource.
Texas	Texas Water Development Board (TWDB) Development of monitoring guidelines for direct potable reuse projects http://www.twdb.texas.gov/innovativewater/reuse/projects/CRMWD%20RWPF/index.asp	In August 2013, the TWDB began funding 65 percent of a $464,000 project to test the quality of wastewater effluent that has been treated to drinking water standards at the Raw Water Production Facility, a full-scale potable water reuse facility in Big Spring, Texas. The goal of the project is to show that DPR is a safe and viable alternative for producing potable water, with a June 2015 project deliverable of monitoring guidelines for direct potable reuse projects in Texas.
Texas	Texas Commission on Environmental Quality (TCEQ) Expanding the allowance of use of reused water http://bnaregs.bna.com/default.aspx?id=TX_24260&vdte=20130621&act=Adopted%20Rule&aid=3&cyear=2013	In 2012, the City of Irving, Texas petitioned the TCEQ to amend the definition of "Municipal Use" in §297.1(32) to allow indirect reuse of treated wastewater effluent for watering of parks, golf courses, and parkways as a municipal use. The TCEQ in July 2013 adopted an amendment to the Texas Administrative Code as requested in the petition. In addition, the TCEQ expanded authorized uses to include watering of other public or recreational spaces.

LOCATION	PROGRAM	DESCRIPTION
Texas (Wichita Falls)	Direct Potable Reuse (DPR) Project http://www.wichitafallstx.gov/ (Search "direct potable reuse") http://www.texas-water.com/awardstw15.html http://www.timesrecordnews.com/news/lifeline/lakes-see-large-increase-from-weeks-rain_10239339	Due to extreme drought, the City of Wichita Falls, Texas turned to its more than seven billion gallons of treated wastewater for a drinking water source. Neither Texas (TCEQ) nor Wichita Falls had DPR regulations in place, so the city worked with the TCEQ and spent months testing and verifying an extensive protocol to verify all the processes put in place to produce clean, safe drinking water. On June 28, 2014, the TCEQ approved a permit for the project, and on July 9, 2014, direct reuse of wastewater for drinking water in Wichita Falls went online. For these and other water conservation efforts, the city was awarded the Alan Plummer Environmental Sustainability Award at the Texas Water 2015 Conference. In May 2015, the city received draft approval for a second DPR system.
	WateReuse Association, Water Environment Federation (WEF), American Water Works Association (AWWA), National Water Research Institute (NWRI) Supporting the development of guidelines for Direct Potable Reuse	In the summer of 2014, WateReuse, WEF, AWWA, and NWRI began working on a document entitled, Framework for Direct Potable Reuse. The purpose of the document is to provide guidance for state and local governments and water utility decision-makers on implementation of direct potable reuse programs. The report will cover key components involved in developing and running direct potable reuse programs, including regulatory, technology, and public outreach sections. The document is due for release in 2015, and will be available at www.watereuse.org
Washington	Department of Health Graywater reuse for subsurface irrigation www.doh.wa.gov/CommunityandEnvironment/WastewaterManagement/GreywaterReuse	The Department of Health set requirements for using graywater for subsurface irrigation in July 2011 through the Washington Administrative Code (WAC).

INCENTIVES

Australia

Federal	National Urban Water and Desalination Plan http://www.environment.gov.au/water/cities-towns/national-urban-water-and-desalination-plan	The National Urban Water and Desalination Plan provides Australian government funding to help cities and towns to secure water supplies Grants have been given for desalination, water recycling, and storm water harvesting projects to the private sector, local governments, and State and Territory Governments.
Federal	National Water Security Plan for Cities and Towns http://www.environment.gov.au/topics/water/water-cities-and-towns/national-water-security-plan	Funds were allocated for projects to save water and reduce water losses for towns with populations generally less than 50,000, including for water efficiency projects, water recycling schemes and stormwater harvesting projects.

LOCATION	PROGRAM	DESCRIPTION
Victoria	Living Victoria Rebate Program http://www.depi.vic.gov.au/water/using-water-wisely/water-rebate-program	Rebates of up to $1,500 for residences and $2,000 for small businesses are available for the installation of water-efficient products, including rainwater tanks and graywater systems.

Brazil

São Paulo	Pricing incentive for use of reclaimed water http://site.sabesp.com.br/site/imprensa/Releases-Detalhes.aspx?secaoId=192&id=4893 http://site.sabesp.com.br/uploads/file/clientes_servicos/comunicado_07_2014.pdf http://site.sabesp.com.br/site/imprensa/noticias-detalhe.aspx?secaoId=65&id=6335	Aquapolo Ambiental is a water reuse venture launched in November 2012 by Foz do Brasil (Odebrecht Organization) and Sabesp, a Brazilian state-owned utility that provides water and sewage services for residential, commercial, and industrial use in the municipalities of the state of São Paulo. The Aquapolo project was initiated to reduce potable water use in São Paulo and is the largest industrial water reuse project in the Southern Hemisphere. The cost of reclaimed water is lower than potable water and therefore attractive to industry. Aquapolo will provide water for a petrochemical facility located in São Paulo's ABC region, thereby conserving enough drinking water to continuously supply a population of 300,000 people. In addition, Sabesp in 2014 launched indirect potable reuse projects.

China

Federal	Support for water recycling through reform of standards for the collection of water resource fees www.lawinfochina.com	In January 2013, three state agencies (the State Development & Reform Commission, the Ministry of Finance, and the Ministry of Water Resources) issued a notice on "Issues Concerning the Standards for the Collection of Water Resource Fees." The notice outlines standards and principles for water resource fee guidelines, and specifically encourages water recycling. Search www.lawinfochina.com: "Issues Concerning the Standards for the Collection of Water Resource Fees."
Beijing Water Bureau	Improve and standardize the price of recycled water http://zhengwu.beijing.gov.cn/ghxx/qtgh/t1307326.htm	In 2013, the Beijing city government made the decision to invest billions in upgrading its wastewater treatment and reuse capacities, including the pricing and corporate financing for water reuse. These financial changes have the explicit goal of incentivizing more water reuse. The new plan emphasizes recycling water, with a goal of 47 new recycling water treatment plants and an upgrade of 20 existing plants by 2015, in an effort to turn Grade V+ water into Grade IV water for potential industrial water reuse. (For more details in English, see: http://chinawaterrisk.org/resources/analysis-reviews/water-beijing-leads-the-way/

Germany

KfW	Financial support for water reuse projects www.kfw.de/240 www.kfw.de/241	The KfW, formerly KfW Bankengruppe (banking group), is a German government-owned development bank. The bank provides support to water production, distribution, sanitation and water reuse projects, including in part through its Umweltprogramm, which provides 100 percent financing up to €10 million per project in loans. Projects can have a maximum duration of 20 years.

LOCATION	PROGRAM	DESCRIPTION
FONA	Grants for commercial water reuse projects http://www.bmbf.de/foerderungen/25563.php	Through its Research for Sustainable Development (FONA) program, Germany's Federal Ministry of Education and Research (BMBF) launched in April 2015 the first round of a water reuse funding project for applicants in the areas of municipal and industrial reuse. Commercial entities based in Germany may apply, and funding is through grants of up to 50 percent of eligible costs over three years. SMEs and research institutions may receive higher percentages.
Korea		
Ministry of Government Legislation	Water reuse project subsidies http://www.moleg.go.kr/english/korLawEng?pstSeq=54779&pageIndex=7	In June 2010, the Korean government enacted broad legislation to promote water efficiency through water reuse. Article 23 states that governmental entities may "subsidize or lend funds" for "water renewal facilities." In addition, local governments may reduce water and/or sewerage charges for facilities with "water renewal facilities."
Mexico		
CONAGUA (Comisión Nacional del Agua)	Incentive Program Guidelines for the Operation of Wastewater Treatment Plants http://www.conagua.gob.mx/CONAGUA07/Noticias/U037.pdf	In fiscal year 2014, CONAGUA presented guidelines for wastewater treatment and reuse, including financial incentives for wastewater treatment plants (WWTP). A WWTP is granted $0.05 per cubic meter if between 30–60 percent of treated wastewater is reused, and $0.10 per cubic meter if greater than 60 percent of treated wastewater is reused.
CONAGUA	Evaluation of new concession titles http://www.gob.mx/cntse-rfts/tramite/ficha/54b9341b8217e66fe500007e	Applicants for new concession titles to use surface and groundwater under permit CAN-01-001 must submit document CNA-02-002 and include, if water is reused or recycled, and a description of the "works" that will be used. The authors found no changes in policy since 2002.
CONAGUA, local governments, and water utility systems	Joint investment in the infrastructure required for the reuse of water	Water utility companies may jointly invest/finance the infrastructure required for the reuse of water. 2013 example: A joint project between the Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food (SAGARPA) and CONAGUA. Link: http://www.elcamporadio.com/index.php?option=com_content&view=article&id=2427:beneficiara-a-sinaloa-inversion-conagua-sagarpa&catid=38:noticias&Itemid=54 2015 example: A joint project between CONAGUA and the state of Mexico. Link: http://mundoaguaysaneamiento.net/noticias-nacionales/entrega-conagua-planta-de-tratamiento-de-aguas-residuales-en-edomex/

LOCATION	PROGRAM	DESCRIPTION
India		
Federal	Reform-linked central government assistance for reuse projects http://jnnurm.nic.in/wp-content/uploads/2012/11/scan-18.pdf http://jnnurm.nic.in/ http://jnnurm.nic.in/byelaws-on-reuse-of-recycled-water.html	The Indian Government, through the Ministry of Urban Development, in 2012 launched the Jawaharlal Nehru National Urban Renewal Mission (JNNURM), under which 63 Mission Cities are being provided reform-linked central assistance for capital expenditure (capex) projects. State governments will contribute central from 10 to 20 percent, and Urban Local Bodies (ULBs) 10 percent, with the remainder from the central government. "ULBs of Mission cities and state governments are required to undertake mandatory and optional reforms to avail JNNURM assistance." One of the optional reforms at the local level is formulating byelaws for wastewater reuse. The state of Gujrat appears to be the first entity that has taken advantage of this assistance.
State of Karnataka	Subsidies for water recycling technologies http://www.bangaloreitbt.in/docs/2014-new/industrial_policy.pdf	The state of Karnataka, India in October 2014 launched its Industrial Policy 2014–2019. The policy implements subsidies of up to 75 percent of the cost of equipment (max. Rs 750,000) for wastewater recycling by "small and medium manufacturing enterprises."
International		
Asian Development Bank	Regional water guidelines and Private Incentives http://www.thejakartapost.com/news/2013/11/20/adb-supports-wastewater-reuse-peoples-republic-china.html	The Asian Development Bank (ADB) in 2013 provided a US$240 million private sector loan package to a Beijing-based integrated water infrastructure operator. The loans support upgrades to wastewater treatment plants to meet the Grade 1A Standard, leading to an estimated additional 600 million tons of wastewater treated annually by 2019. The water can be reused for industrial cooling and watering city gardens.
Israel		
Federal	Reduction in recycled water tariffs http://www.swim-sm.eu/files/Best_Practices_in_WW_Reuse.pdf	To encourage Israeli farmers to irrigate with reused wastewater, two main incentives were developed for the conversion of fresh water allocation with reclaimed water. First, the cost of the reclaimed water was lowered significantly below the price for fresh water (about 30–50 percent lower). Second, the allocation of water for each farmer that connects to reused water supplies was increased by a factor of 20 percent over their former fresh water allocation.
Singapore		
Public Utilities Board	Taxation	Water fees include a water conservation tax of 30 to 45 percent of the water tariff. The water conservation tax is waived for recycled water.
	Water Pricing http://www.pub.gov.sg/general/Pages/WaterTariff.aspx	Recycled water may be used for non-potable purposes and the tariff is lower than for potable water use.

LOCATION	PROGRAM	DESCRIPTION
Public Utilities Board	Water efficiency and reuse http://www.pub.gov.sg/conserve/Pages/SgStdSS5772012_WEMS.aspx	Singapore Standard, SS 577:2012, for Water Efficiency Management Systems (WEMS), was jointly launched by Singapore Standards Council and PUB in March of 2013. The standard provides non-domestic water users with a framework, methodology and set of guidelines to put in place policies, systems and processes to improve water efficiency, including water reuse (through NEWater).
Public Utilities Board	Water Efficiency Fund http://www.pub.gov.sg/wef/Pages/default.aspx www.pub.gov.sg	The board co-funds the cost of recycled water use feasibility studies, and provides up to 50 percent of capital cost of water recycling facilities. They will also fund a company for every cubic meter of water saved, up to a cap.
Thailand		
National Economic and Social Development Board (NESDB)	Economic incentives http://www.nesdb.go.th/Portals/0/news/plan/p11/Plan11_eng.pdf	The Eleventh National Economic and Social Development Plan (2012-16) encourages the development of economic incentives to increase efficiency in community wastewater treatment (as well as charging fees for waste-water collection). Water reuse is a key component of the Plan's promotion of "efficient, cost-effective, and environmentally-sound water use."
United States		
Department of the Interior, Bureau of Reclamation	Funding for water conservation and reuse projects http://www.doi.gov/news/pressreleases/secretary-jewell-announces-50-million-for-western-drought-response.cfm	Secretary of the Interior Sally Jewell announced in February 2015 that the Bureau of Reclamation is making $50 million in funds available immediately for drought relief projects throughout the West — including nearly $20 million for California's Central Valley Project. The funding enables the Bureau to work with water districts and other water users to increase efficiency and conservation of available water, including $9 million for WaterSMART and Title XVI Water Reclamation and Reuse Program grants. The competitive grant programs support water conservation initiatives and technological breakthroughs that promote water reuse, recycling and conservation in partnership with states, tribes and other partners.
Federal Water reuse project financing	Water Resources Reform and Development Act (WRRDA) (HR 3080) https://www.govtrack.us/congress/bills/113/hr3080/text http://www.usace.army.mil/Missions/CivilWorks/ProjectPlanning/LegislativeLinks/wrrda2014.aspx	In the U.S., private industry has traditionally financed industrial water treatment and reuse systems through a combination of commercial loans and corporate bonds, while public water utilities have had access to government subsidized financing through the Clean Water State Revolving Fund (CWSRF). With passage of the 2014 WRRDA, however, private companies can now obtain CWSRF loans to support on-site industrial water reuse projects and other privately-owned facilities that reuse or recycle wastewater, stormwater, or subsurface drainage water. Interest rates for the CWSRF average 1.7% (2015 data). Funding can only be used for capital costs for the construction of new facilities or the rehabilitation of existing facilities. Operation and maintenance costs are not eligible. In addition to financial incentives, WRRDA supports water reuse projects more broadly by supporting reuse of municipal stormwater on- and offsite. The U.S. Army Corps of Engineers is developing "implementation guidance" (on-going as of May 2015). See link to the left.

LOCATION	PROGRAM	DESCRIPTION
Federal Water reuse project financing	Community Development Block Grant Program: http://portal.hud.gov/hudportal/HUD?src=/program_offices/comm_planning/communitydevelopment/programs http://www.rd.usda.gov/programs-services/water-waste-disposal-loan-grant-program http://www.usbr.gov/WaterSMART/title/	There are also a number of other programs that can potentially finance publicly-owned water reuse activities in the United States, including the Community Development Block Grant program (CDBG) through the Department of Housing and Urban Development; the Water & Waste Disposal Loan & Grant Program through the Department of Agriculture; and the WaterSMART program through the Bureau of Reclamation. The CDBG program allows modifications of the Total Development Cost (TDC) based on "green construction costs," which can include graywater reuse.
Arizona (Tucson)	Water pricing http://www.tucsonaz.gov/water/reclaimed-rates http://www.tucsonaz.gov/water Additional information available on reclaimed water, water conservation, including gray water use.	Reclaimed water is cheaper than potable water. The reclaimed water rate recovers 73 to 85 percent of service costs with the remaining percentage paid by potable water users. Potable water fees increase as the volume used increases while reclaimed water is a flat fee. These rates were offered to two school districts for capital costs associated with reclaimed water. Tucson also funded installation of dual piping in a neighborhood which was an early adaptor (not an ongoing program, but an example of government funding of pilot programs).
Connecticut	Water reuse incentives http://www.cga.ct.gov/2014/act/pa/pdf/2014PA-00163-R00HB-05424-PA.pdf	Connecticut Public Act 14-163 directs the Connecticut Water Planning Council to engage in a three-year process for writing a comprehensive statewide water plan for the management of water resources in the state. In addition to establishing guidelines and incentives for consumer water conservation, the plan directs the state to "develop a water reuse policy with incentives for matching the quality of the water to the use." The plan will then be submitted no later than July 1, 2017 to the General Assembly for vetting and passage.
California	Funding for water recycling projects	In 2014, a $7.5 billion water bond known as the Water Quality, Supply, and Infrastructure Improvement Act (or Proposition 1) was passed by the Legislature, signed by Governor Brown and adopted by the voters of California. Proposition 1 contained up to $725 million for recycled water and desalination projects. The Governor's plan is to expedite $625 million of these funds over the next few years for water recycling projects in California. This amount is seven times more state funding than has ever been available for recycled water projects in California.
	Turf grass replacement rebates http://www.nbcbayarea.com/news/local/Turf-Replacement-Rebates-Available-Across-California-273210221.html http://socalwatersmart.com/index.php/qualifyingproducts/turfremoval	In April 2015, Governor Brown of California issued an executive order with the state's first mandatory water restrictions. The order requires cities and towns to reduce consumption by 25 percent and replace 50 million square feet of lawn with lower-water-use landscapes. The state is offering rebates for residents who remove water-intensive turf grass and replace it with drought-friendly landscaping. Rebates are available for $2.00 or more per square foot of turf removed. This executive order will drive water recycling and reuse.

LOCATION	PROGRAM	DESCRIPTION
California	Metropolitan Water District (MWD) Recycled Water Hookup Pilot Program http://www.mwdh2o.com/mwdh2o/pages/yourwater/SB60/archive/SB60_2015.pdf http://www.bewaterwise.com/OnSite_Pilot_Program.html	The MWD, which represents 26 water agencies that serve approximately 19 million people across six counties in southern California, in fiscal year 2013-14 implemented the Recycled Water Hookup Pilot Program. The program will provide financial incentives to help residential and business customers convert from potable water to recycled water systems to reduce outdoor potable demand. The program is budgeted at $7.5 million over three years, and incentives of up to $195 per acre-foot (AF) for five years of estimated water use are available, with a cap at the actual retrofit costs. The program is open for applications from July 1, 2014 to June 30, 2016.
	Incentivizing recycled water production at water agencies http://www.desalination.biz/news/news_story.asp?id=7772 http://www.mwdh2o.com/2014LRPApplicationPackage.pdf	In October 2014, the MWD increased by 36 percent (from 2008 figures) its sliding-scale incentives for water agencies to develop and produce recycled water, recovered groundwater, and desalinated seawater supplies. The board approved a series of refinements to the district's local resources program. Previously, MWD paid local water agencies up to $250 for every AF of water that is recycled, recovered, or returned to the groundwater supply. In 2014, three LRP incentive payment options exist: sliding scale incentives up to $340 per AF over 25 years; sliding scale incentives up to $475 per AF over 15 years, or fixed incentives up to $305 per AF over 25 years.
	Water Savings Incentive Program http://www.bewaterwise.com/Water_Saving_Incentive_Program_Brochure_WEB.pdf	This MWD program provides financial assistance to public, commercial, industrial, and institutional entities for documented water savings that meet the minimum qualifying criteria. Qualifying projects include any water reuse project that saves water; a specific example is any change to an industrial process water system to capture, treat, and reuse process wastewater. In 2014, incentives are paid based on the volume of water saved: • $0.60 per 1,000 gallons of actual water saved over the project life (maximum of 10 years). Incentives are limited to 50 percent of eligible project costs
California **Orange County Water District (OCWD)**	Government-industry collaboration http://www.ocwd.com/Portals/0/News/PressReleases/2015/OCWDIncreasesEnergyEfficiencyAndLocalWaterReliability.pdf	As the Water-Energy Nexus becomes more important, the connection between water reuse and energy savings is seen more often. Financial incentives come into play, and in this case industry is promoting government entities. In January 2015, The Orange County Water District (OCWD) received a $500,000 Savings by Design grant award from a large primary electricity supply company for energy-saving strategies that were incorporated into the design of the Groundwater Replenishment System (GWRS) Initial Expansion, which takes treated wastewater, further purifies it, and injects it into drinking water aquifers. The Awards are granted to businesses incorporating smart, energy-saving designs into long-term facility planning. The OCWD facility is expected to save millions of kilowatt hours and reduce its CO_2 footprint.

LOCATION	PROGRAM	DESCRIPTION
California **State Water Resources Control Board (SWRCB)**	Water Recycling Funding Program http://www.waterboards.ca.gov/water_issues/programs/grants_loans/water_recycling/ http://www.waterboards.ca.gov/water_issues/programs/grants_loans/water_recycling/docs/wrfp_prop1_pres.pdf	The program promotes the reuse of treated municipal wastewater by providing technical and financial assistance. Eligible projects must be economically feasible, result in a statewide public benefit, and achieve recycled water targets. In 2014 the SWRCB made $800 million in low interest loans available for recycled water projects. California's Water Recycling Funding Program will manage the funding through its guidelines, with approval by the State Water Board and implementation anticipated by summer 2015.
California **San Jose and Santa Clara Valley Water District**	Commercial Rebate Program http://www.valleywater.org/Programs/CommercialRebates.aspx	The program offers rebates of up to $50,000 (or 50 percent of the project cost, whichever is less) to commercial, industrial, and institutional businesses for the implementation of process and equipment changes which reduce the company's wastewater discharge. Sample projects include reclamation and reuse of rinse waters, and reuse of process water in fume scrubbers. Rebates are based on wastewater flow reduction. Eligible projects must reduce wastewater flows to the sanitary sewer system by at least 100 hundred cubic feet (CCF) per year. (1 ccf is equal to 748 gal.). In 2015, the rebate amount is $8 per CCF.
California **(Los Angeles)**	Water pricing Department of Water and Power See www.ladwp.com, search "other water rates," then see Water Rates Ordinance.	Charges for recycled water service are set by contract. The City has entered into contracts for delivery of recycled water in which the charge is 80 percent of the charge for potable water (last updated in March 2012).
California **(San Francisco)**	Grants for buildings using non-potable water http://www.sfwater.org/modules/showdocument.aspx?documentid=5445	The San Francisco Public Utilities Commission (SFPUC) provides financial incentives for those interested in adopting water reuse practices and solutions. SFPUC's grant assistance program provides up to $250,000 for single-building projects adopting non-potable water reuse, and as much as $500,000 for projects in which two or more buildings share alternative water sources.
Colorado **(Denver)**	Indoor Incentive Program: Commercial, Industrial & Institutional Customers Denver Water http://www.denverwater.org/Conservation/IncentivePrograms/IndoorCommercial/	In 2015, Denver Water will pay commercial, industrial and institutional customers $18.50 for each thousand gallons of water saved annually. Savings must be at least 100,000 gallons of water in one year. Customers can earn 50 percent of project cost up to $40,000 for conserving water. Projects must remain in service for at least 20 years. An example of an eligible project is installing a processed water reclamation system.

LOCATION	PROGRAM	DESCRIPTION
Florida	Permit incentives Department of Environmental Protection http://www.dep.state.fl.us/water/reuse/study.htm	Florida's state senate, in its 2014 legislative session, passed Senate Bill 536, which requested DEP to comprehensively study the expansion of the use of "reclaimed water, storm water, and excess surface water." Among the goals, the study will evaluate the use of permit incentives, such as an extension of current authorizations for long-term consumptive use permits for entities that substitute reclaimed water for traditional water sources that become unavailable or otherwise cost prohibitive. The report is due by December 1, 2015.
	Substitution credits http://www.myfloridahouse.gov/Sections/Bills/billsdetail.aspx?BillId=47857	In July 2012, Florida implemented "substitution credits", which allow the use of reclaimed water to replace all or a portion of an existing permitted use of resource-limited surface water or groundwater. These credits allow a different user or use to initiate a withdrawal or increase withdrawals from the same resource-limited surface water or groundwater source, provided that the withdrawal creates no net adverse impact on the limited water resource. These credits were introduced through HB 639, Reclaimed Water, which contained numerous expansions of the use and support of reclaimed water.
Florida	Water Management Districts Alternative Water Supply Funding Program http://www.sfwmd.gov/portal/page/portal/xweb%20-%20release%203%20water%20supply/funding%20assistance	Provides grants to cities, community development districts, and other water users of up to 40 percent of project construction costs for alternative water supplies including reclaimed water. (All of Florida's five water management districts provide construction grants for water reclamation activities.) The Program is updated every five years, and the details of the fiscal year 2015 program were under development at the time of publication (May 2015). See: http://www.sfwmd.gov/portal/page/portal/xweb%20-%20release%203%20water%20supply/alternative%20water%20supply
Florida (Naples)	Incentives for property owners to use reclaimed water http://www.naplesnews.com/news/local-government/naples-expansion-of-reclaimed-water-system-continues-with-next-phase-monday_47088674 http://naples.granicus.com/MetaViewer.php?view_id=&clip_id=2235&meta_id=111202 http://www.naplesgov.com/index.aspx?NID=407	For the past few years and with plans through 2018, Naples, Florida has been aggressively expanding its reclaimed water system, with several incentives built in. Property owners next to the reclaimed water line are first incentivized to connect and use the water for irrigation by the low monthly base charge ($10). The second incentive comes with a decrease in use costs. With average bi-monthly homeowner irrigation volumes at 40,000 gallons, a typical $128 potable water bill would drop to $40. In fact, reclaimed water rates, at a flat $0.67 per 1,000 gallons, are vastly cheaper than the potable water usage rates, which vary by block from $2.40 to $4.09 per 1,000 gallons (February 2014 data). Third, reclaimed water users need not follow Florida's mandatory times for watering lawns. Fourth, while some residents might need to modify irrigation systems, the cost should be recouped in two to three years — an attractive ROI. Finally, the City of Naples notes that its reclaimed water provides 10 percent of the nitrogen and 100 percent of the phosphorus needs for southern Florida landscaping, so users save on fertilizer costs as well.

LOCATION	PROGRAM	DESCRIPTION
Florida (St. Petersburg)	Reclaimed water program http://www.stpete.org/water/reclaimed_water.php Restrictions on water use: http://www.stpete.org/water/water_conservation/watering_restrictions.php	Reclaimed water is available for agriculture and golf course irrigation as well as residential lawn irrigation. Reclaimed water is not subject to the same use restrictions as potable water, which is restricted to 2 days per week, while reclaimed water lawn irrigation is not restricted (residents are asked to limit watering to 3 days per week on a voluntary basis). Reclaimed water, as opposed to potable water, is significantly cheaper (approximately 68 percent) to use for irrigation [Source: author communication with Water Resources Department, May 2015]. Charges for potable water are per-gallon while reclaimed water is a flat fee per month for residents.
Nevada (Las Vegas)	Las Vegas Valley Water District (LVVWD) Service Rules http://www.lvvwd.com/custserv/service_rules.html http://www.lvvwd.com/assets/pdf/serv_rules_fulldoc.pdf	Effective January 1, 2014, the LVVWD adopted its most recent non-potable water irrigation rate (subject to change). The non-potable water irrigation rate for large turf and landscaping irrigation is $2.33 per 1,000 gallons. This rate must be at or below the annual average cost that the potable and non-potable water users would pay for potable water service on an annual basis.
New Jersey	www.state.nj.us/dep/watersupply/ www.njleg.state.nj.us/2000/Bills/PL01/321_.pdf www.njleg.state.nj.us/2000/Bills/PL01/322_.pdf Corporate Business Tax credit concerning the reuse of treated effluent in industrial facilities	Set up in 2000, this program includes a one-time tax credit against the Corporate Business Tax for the purchase of effluent treatment or conveyance equipment available for industrial facilities (up to 50 percent of the cost). Treatment equipment includes any equipment that is used exclusively to treat effluent from a primary wastewater treatment facility, for reuse in an industrial process. Conveyance equipment includes equipment used to transport effluent to the facility in which the treatment equipment is installed, and also to transport the treated product to the site of the reuse. See: http://www.nj.gov/dep/dwq/reuseff.htm and http://www.nj.gov/dep/dwq/adm_twa.htm
New Jersey	The New Jersey Environmental Infrastructure Financing Program Department of Environmental Protection http://www.nj.gov/dep/dwq/mface_njeifp.htm	There is a revolving loan program that provides zero percent interest rate loans to local government units for up to half the allowable project costs, and a market rate loan for the remaining allowable costs. Eligible wastewater projects include facilities for the treatment and beneficial reuse of sewage and water treatment system sludge.

LOCATION	PROGRAM	DESCRIPTION
New York (New York)	Comprehensive Water Reuse Program, New York City Water Board Water and Wastewater Rate Schedule http://nyc.gov/html/dep/html/ways_to_save_water/index.shtml http://www.nyc.gov/html/nycwaterboard/html/rate_schedule/index.shtml	Residential, commercial, and mixed-use buildings with a Comprehensive Water Reuse System (CWRS) are provided rate incentives. CWRS includes both black water and graywater systems. The water rate for a CWRS building in fiscal year 2015 is $2.78 per 100 cubic feet versus $3.70 per 100 cubic feet for other buildings. This 25 percent savings incentive has remained the same since the original publication of this paper in 2008 (water reuse rates were $1.52 versus $2.02 per 100 cubic feet for standard buildings). The New York Department of Environmental Protection in early 2015 was in the process of developing a cost sharing program to further incentivize water reuse in the non-residential sector. See: http://www.nyc.gov/html/dep/pdf/conservation/water-demand-management-plan-single-page.pdf
Pennsylvania	Incentives to reuse water during hydraulic fracturing Department of Environmental Protection (DEP) http://files.dep.state.pa.us/Waste/Bureau%20of%20Waste%20Management/WasteMgtPortalFiles/SolidWaste/Residual_Waste/GP/WMGR123.pdf	In response to public complaints over oil and gas drillers sending hydraulic fracturing (HF) fluids to public drinking water plants, and with very few disposal wells in the state, the DEP in July 2011 began encouraging water reuse in two ways. First, reused wastewater from HF wells was exempted from general waste regulations. Second, if operators did not recycle produced water for further use in HF operations, they were required by the PA legislature to submit water management plans. Information can be found in the 2012 revised General Permit WMGR123. See also this 2015 DEP overview: http://www.dep.state.pa.us/dep/subject/advcoun/solidwst/2015/1-15-15/Water_Recycling_and_Oil_and_Gas_Waste.pdf
Texas	Low interest loan financing for water projects Water Development Board http://www.twdb.texas.gov/financial/programs/swift/index.asp	The State Water Implementation Fund for Texas (SWIFT) is a $6 billion initiative to finance through low interest loans water projects that are part of the State Water Plan. This was a referendum approved by voters in 2013. The program sets aside 20 percent of funds for water conservation and reuse projects, providing significant incentive for water agencies to embrace conservation and reuse. It should be noted that approximately 29 percent of the water supplies planned through 2060 to meet Texas' water needs are based on conservation and water reuse strategies.
Texas	Water-related Exemptions from State Sales and Use Tax http://www.texastransparency.org/State_Finance/Budget_Finance/Reports/Tax_Exemptions_and_Incidence/incidence15/96-463_Tax_Incidence2015.pdf	Equipment, services, or supplies used solely for water recycling and reuse are exempt from sales and use tax.
Texas	Property Tax Exemptions Regarding Certain Water Conservation Initiatives www.window.state.tx.us/taxinfo/proptax/tc06/ch11b5.htm#11.32	Local governments may exempt from taxation part or all of the assessed value of property on which approved water conservation initiatives have been implemented.

LOCATION	PROGRAM	DESCRIPTION
Texas	Incentives to reuse water during hydraulic fracturing Texas Railroad Commission (TRC) http://www.sos.state.tx.us/tac/index.shtml	Due to ongoing extreme drought throughout the state, the TRC in April 2013 adopted new rules to further encourage the reuse of "frack" water by streamlining the requirements of recycling activities conducted on-lease. Companies are now exempt from more rigorous permitting requirements if they treat produced and flow-back water for reuse. In the Texas Administrative Code, see Title 16, Part 1, Chapter 4, Subchapter B, Division 1, Rule §4.202, among others.
Texas (Austin)	Water Use Management Ordinance http://www.austintexas.gov/department/watering-restrictions	Water conservation regulations contained in Ordinance No. 20120816-004 do not apply to reclaimed water.
Texas (Austin)	"Bucks for Business" Commercial Rebate Program http://www.austintexas.gov/sites/default/files/files/Water/Conservation/Rebates_and_Programs/bucks_for_business_guidelines_and_application_web.pdf	The program offers rebates up to $100,000 to industrial, commercial, and institutional water users toward the cost of installing new equipment and processes that conserve water at existing facilities. The City also offers rebates for specific items such as efficient landscape irrigation equipment. Eligible projects include the reuse of high quality rinse water, and combined process or storm water reuse for landscape irrigation.
Texas (San Antonio)	Large-Scale Retrofit Rebate Program, San Antonio Water System (SAWS) http://www.saws.org/conservation/commercial/custom.cfm	The program offers rebates of up to 100 percent of the cost of water-saving equipment rebates to commercial, industrial, and institutional water users for implementing water saving processes or installing water saving equipment. The amount of the rebate is determined by water savings, the life of the equipment and the installed cost. Eligible equipment includes process water reclamation systems and air conditioning condensate capture and reuse.

Vietnam

Vietnamese Government, the Investment & Trade Promotion Centre of Ho Chi Minh City, Vietnam (ITPC)	Increase in wastewater discharge fees https://www.academia.edu/5504082/The_Legal_Framework_of_Vietnam_s_Water_Sector_Update_2013 http://www.itpc.gov.vn/investors/how_to_invest/law/Decree_No.25_2013/mldocument_view/?set_language=en	The government in July 2013 increased industrial and municipal wastewater discharge fees by a factor of almost 10 (Decree No: 25/2013/ND-CP). These fees will likely support future reuse projects.

MANDATES AND REGULATION

LOCATION	PROGRAM	DESCRIPTION
Australia		
Federal	Water Restrictions http://www.bom.gov.au/water/restrictions/	Water restrictions can be put in place in all major cities of Australia in response to the severe drought. Most states currently have in place permanent water saving rules. Water inspectors patrol streets in several cities, and impose fines or turn off water systems. Compliance with these restrictions has forced Australians to adopt innovative water recycling and reuse strategies.
States (Victoria, Queensland, New South Wales, Western Australia) & Commonwealth (Murray-Darling Basin)	Water Trading http://www.environment.gov.au/node/25057	In many parts of Australia, rural water use is managed through water access entitlements and water allocations. A water access entitlement, such as a water license, refers to an ongoing entitlement to exclusively access a share of water. A water allocation refers to the specific volume of water that is allocated to water access entitlements in a given season. Water trading is the process of buying, selling, leasing, or otherwise exchanging water access entitlements (permanent trade) or water allocations (temporary trade). Water trading principles for the Murray-Darling Basin are set out in federal legislation. Further information about Water Trading Rules in the Murray-Darling Basin can be found at http://www.mdba.gov.au/what-we-do/managing-rivers/water-trade/trading-rules/guidelines-for-the-water-trading-rules
Federal, Victoria, Western Australia, New South Wales	Recycled water target http://www.environment.gov.au/resource/progress-against-national-target-30-australias-wastewater-being-recycled-2015	In 2007, the Australian Government committed to a national target of recycling 30 per cent of wastewater by 2015. Changes in weather patterns, including flooding in a number of states, has reduced the need for such a target. Victoria is one of a number of states which set a recycled water target — 20 percent reuse of treated waste water by 2010 — which has since been achieved. Western Australia set a long-term target in its 2007 State Water Plan to exceed 30 percent for wastewater recycling. The New South Wales Metropolitan Water Plan set a recycling target of 70 gigaliters per year.
Bahrain		
Bahrain Supreme Council for the Environment (Water Resources Council)	Discharge regulations leading to water reuse www.bahrain.bh/wps/portal/environmentalProtection_en https://www.gewater.com/kcpguest/documents/Technical%20Papers_Cust/Americas/English/Addressing_Water_Scarcity_in_Saudi_Arabia.pdf	The Bahrain Petroleum Company (BAPCO) Sitra refinery is among the largest refineries in the Middle East, processing over 250,000 barrels per day. The refinery's wastewater treatment goals are driven by strict discharge regulations set by the Bahrain Supreme Council for the Environment (Water Resources Council arm). The aim of the Council, established in 2012, is to protect and develop environmental resources through practical implementation of Bahrain's environmental laws. Due to these strict regulations, the refinery upgraded its treatment system and is reusing most of its treated wastewater.
Brazil		
São Paulo	Regulations and guidelines for water reuse http://www.prefeitura.sp.gov.br/cidade/secretarias/habitacao/plantas_on_line/legislacao/index.php?p=7292 http://www.capital.sp.gov.br/portal/	São Paulo is leading Brazil in water reuse regulations. For example, the Municipality of São Paulo has since 2002 required the use of reclaimed water for cleaning and irrigation (Law 13.309). More recently, in 2010, several regulations were implemented to promote the use of reclaimed water in agriculture, e.g., Norma Técnica: P 4.002 and Decisão de Diretoria nº 388/2010/P.
Canada		
Alberta	Water recycling requirements https://www.aer.ca/	The Alberta Energy Regulator (AER) oversees water reuse in the oil and gas sector and issues directives that companies and permit holders under AER jurisdiction must "obey." Directives 74 and 81 provide specific guidance in water management for oil sands operations: Directive 74 for surface mining and Directive 81 for in-situ recovery.
	Directive 74: https://www.aer.ca/rules-and-regulations/directives/directive-074	Directive 74, published in February 2009, specifies performance criteria for the reduction of fluid tailings and the formation of trafficable deposits associated with mineable oil sands. However, the Directive has been suspended since March 13, 2015. [At the time of writing (May 2015), no revised Directive had been issued.]
	Directive 81: https://www.aer.ca/rules-and-regulations/directives/directive-081	Alberta in-situ oil sands water use and recycling has been regulated since 1989. Directive 81, in effect since November 21, 2012, sets water disposal limits and includes detailed requirements for reporting injection facility water streams to PETRINEX (Canada's Petroleum Information Network). This ensures that AER facility water balance requirements are met. In addition to limiting disposal, the directive provides formulas that are used for monitoring and comparing thermal operations. In essence, the Directive's water disposal limits drive constant improvement in water recycling technologies. For example, the Directive incentivizes new technologies by removing water disposal limits for small thermal pilot or experimental systems. It also acknowledges that as technologies and the industry evolve, the Directive will adjust its requirements.
British Columbia	Environmental Management Act - Municipal Wastewater Regulation (2012) http://www.bclaws.ca/civix/document/id/complete/statreg/87_2012#section106	In March 2012, British Columbia repealed its Municipal Sewage Regulation (MSR) — which contained a 2001 Code of Practice for the Use of Reclaimed Water, but no details on indirect potable reuse — and replaced it with the Municipal Wastewater Regulation (MWR). The new MWR has replaced the prescriptive MSR framework with four new categories based on permitted use(s) and anticipated exposure potential (or risk to human health and the environment). The categories following the idea of "fit for purpose" reuse, with categories by stringency: 1) indirect potable reuse; 2) greater exposure potential; 3) moderate exposure potential; and 4) lower exposure potential.

LOCATION	PROGRAM	DESCRIPTION
China		
National People's Congress (NPC)	China's Twelfth Five Year Plan (2011–2015) Water targets http://www.britishchamber.cn/content/chinas-twelfth-five-year-plan-2011-2015-full-english-version	The NPC approved the new Five-Year Plan (FYP) in mid-March 2011. The FYPs are blueprints that outline key economic and development targets for the country for the coming five-year period. The current FYP has several water-related goals: 1. A binding target of 30 percent reduction in water consumption per unit of value-added industrial output. 2. Build-out of water conservation projects. 3. Comprehensive upgrades to wastewater infrastructure. 4. Create water resource allocation systems. 5. Restrict groundwater use. 6. "Progressive pricing" for household water use. These goals will drive water reuse and recycling.
Standing Committee of the National People's Congress	Circular Economy Promotion Law (CEPL) http://www.lawinfochina.com/display.aspx?id=7025&lib=law	In January 2009, China's CEPL went into effect. The law promotes development of a circular economy; improved resource utilization efficiency; protection and improvement of the environment; and sustainable development. The law contains a strong mandate to water users throughout China to reuse water. For example, Article 31 states: "Enterprises shall develop an interconnected water use system and a circulatory water use system so as to improve the repeated use of water." "Enterprises shall use advanced technologies, techniques and equipment for the circulatory use of the waste water generated in the production process."
Ministry of Water Resources (MWR)	Water Allocation Plan for the Development of Coal Bases (WAPDCB) http://chinawaterrisk.org/notices/mwr-announces-for-coal-plan/ http://www.mwr.gov.cn/zwzc/tzgg/tzgs/201312/t20131217_520799.html	In December 2013, the MWR announced the WAPDCB. The "Water-for-Coal Plan" sets provincial water use quotas to meet the "Three Red Lines" (the national water use quotas for 2015, 2020 & 2030). The Water-for-Coal Plan addresses the development of large scale coal bases in China. The mandates are clear, stating that "large-scale coal plants should fully implement the most stringent water management system according to regional water resources." In terms of water reuse, the Plan limits water use within plants and states that "sewage wastewater, after treatment compliance, should be fully reused."
European Union		
European Commission (EC)	Proposed water reuse "regulatory instrument" http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52012DC0673&from=EN	The EC adopted the Blueprint to Safeguard Europe's Water Resources in November 2012. One specific objective is to maximize water reuse through the EU. The blueprint contains a proposal for an EU-wide "regulatory instrument" for water reuse by 2015. See the blueprint at the link to the left.

LOCATION	PROGRAM	DESCRIPTION
European Commission	Water reuse policy options http://ec.europa.eu/environment/consultations/water_reuse_en.htm	A consultation was issued to evaluate water reuse policy options for the EU. The consultation period was from July through November 2014, with the aim of evaluating suitable policy instruments at the EU level to support water reuse. The results of the consultation (February 2015) indicate that respondents see legally-binding standards and regulatory measures as the most effective EU actions to promote water reuse, followed by education and outreach and financial incentives. An overview, background, and results of the consultation can be found at the link to the left.
European Commission	General status of water reuse regulations in the EU (2013) http://ec.europa.eu/environment/water/blueprint/pdf/Final%20Report_Water%20Reuse_April%202013.pdf	According to an April 2013 report commissioned by the EU, Update of the Final Report on Wastewater Reuse in the European Union, the following countries have national water reuse guidelines or regulations: Cyprus, France, Greece, Hungary, Italy, Portugal, and Spain. The following countries are preparing regulations or guidelines: Belgium, Bulgaria, Germany, Malta, Poland, and the UK. See link at left. For more information regarding European Union regulations and directives, see the Water Framework Directive: http://ec.europa.eu/environment/water/water-framework/index_en.html
Israel		
Interior and Environmental Protection Committee of the Knesset	Effluent Quality Standards and Rules for Sewage Treatment http://www.sviva.gov.il/English/Legislation/Pages/WaterAndWastewater.aspx http://www.waterworld.com/articles/wwi/print/volume-27/issue-1/regional-spotlight/middle-east-africa/israel-s-ingenious.html	This 2010 legislation sought to "facilitate the recovery of effluents as a water source" through stricter standards for 36 effluent parameters. In essence, the goal of the legislation is to gradually replace freshwater allocations to agriculture with reclaimed effluent through upgrades to wastewater treatment plants to tertiary treatment.
Korea		
Ministry of Government Legislation	Promotion of and Support for Water Reuse Act http://www.moleg.go.kr/english/korLawEng?pstSeq=54779&pageIndex=7	In June of 2010, the Korean government enacted broad legislation to promote water efficiency through water reuse. The legislation requires, among other actions, the establishment of a comprehensive water reuse plan and a management plan for water reuse in each jurisdiction.
Mexico		
CONAGUA	National Water Law and National Water Program http://www.conagua.gob.mx/home.aspx	CONAGUA is required to create incentives for the development of infrastructure for the reuse of water.

LOCATION	PROGRAM	DESCRIPTION
Saudi Arabia		
Ministry of Economy and Planning	10th Development Plan (2015–19) Implementing water reuse legislation and regulations http://www.mep.gov.sa/themes/BlueArc/ https://www.gewater.com/kcpguest/documents/Technical%20Papers_Cust/Americas/English/Addressing_Water_Scarcity_in_Saudi_Arabia.pdf	Saudi Arabia has a long-term plan for sustainable development, and is currently implementing its 10th Development Plan. The 9th Plan, which covered the years 2010 to 2014, listed increasing treated wastewater reuse to 50 percent as one of its priority objectives. Moving forward, the Kingdom has set forth ambitious goals that will require equally bold policy plans, such as: 1. Accelerating approval and implementation of its National Water Strategy. 2. Establishing a Supreme Council for Water Affairs. 3. Passing a new water law. 4. Increasing agricultural reclaimed water use. 5. Creating a MOWE water management department. More details on water reuse in Saudi Arabia can be found in the 2014 GE white paper (link to the left).
Singapore		
National	Handbook on Application for Water Supply http://www.pub.gov.sg/general/Documents/RPUB00003.pdf	The handbook, last updated in 2009, serves as a single source for water supply matters, containing mandatory requirements and non-mandatory recommendations: Water recovery systems for washing of vehicles at construction sites and other premises where washing of vehicles are required; Setting up a water recycling system, where possible, to reclaim processed water for reuse in the production process and other non-potable purposes such as cooling, irrigation, etc.; and Recycling facilities shall be incorporated into any bath which has a capacity, measured to the overflow level of the bath, exceeding 250 liters.
	Technical Guide for Greywater Recycling System http://www.pub.gov.sg/general/code/Pages/default.aspx	The document, last published in September 2014, provides building owners and other technical experts with a guide and minimum standards regarding the design, installation, testing, operation and maintenance of graywater recycling systems that supply non-potable water.
	Public Utilities Regulation (last update 2004) http://statutes.agc.gov.sg/aol/home.w3p (Search: "Public Utilities (Water Supply) Regulations")	The regulations prohibit: The installation of any cooling system which is of once-through design; Any cooling system in which the cooling water is not recycled; or Any bath having a capacity, measured to the overflow level of the bath, exceeding 250 liters which does not incorporate recycling facilities or has a drain plug for direct discharge of water.

LOCATION	PROGRAM	DESCRIPTION
Spain		
Barcelona	Multiple municipal ordinances mandating water savings and reuse http://www.innovationseeds.eu/Policy-Library/Core-Articles/Rainwater-And-Greywater-Reuse-Systems-In-The-Barcelona.kl http://rua.ua.es/dspace/bitstream/10045/38424/3/Investigaciones_Geograficas_61_06.pdf	In Barcelona, Agenda 21 establishes a number of local regulations aimed at promoting sustainable water practices. At the municipal level, ordinances mandate the installation of water-saving devices such as water pressure regulators or dual flush toilets, and enhancing wastewater treatment, for instance, through the (re)use of local water resources like rainwater, graywater and swimming pool water in new buildings. More than 50 municipalities in Catalonia — over 1.3 million people — had approved the regulations for saving and conserving water by the end of 2011.
United Kingdom		
Department for Communities and Local Government	Code for Sustainable Homes, May 2009 http://www.planningportal.gov.uk/uploads/br/water_efficiency_calculator.pdf	Since May 2009, all new homes in the U.K. must meet a water efficiency standard of 125 liters of water per person per day (l/p/d). "Sustainable Homes" have even stricter limits (between 80-120 l/p/d), based on performance targets. The government has also introduced an Enhanced Capital Allowance scheme for water-efficient plants and machinery.
United States		
Federal	Executive Order promoting water reuse https://www.whitehouse.gov/administration/eop/ceq/sustainability	President Obama on October 5, 2009 issued Executive Order 13514 titled, "Federal Leadership in Environmental, Energy, and Economic Performance." The Order sets sustainability goals for Federal agencies and focuses on making improvements in their environmental, energy and economic performance. Regarding water reuse, the Order requires agencies to identify, promote, and implement water reuse strategies to reduce potable water consumption. To support this effort, the U.S. EPA runs the Federal Green Challenge program which, with partners and an annual award, promotes its Water Goals of efficiency and reuse.
California	Water Code www.leginfo.ca.gov/cgi-bin/calawquery?codesection=wat&codebody=&hits=20 See also "Recycled Water-Related Statutes" at: http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/Lawbook.shtml	The use of potable domestic water for certain specific non-potable uses, including, but not limited to, golf courses, parks, industrial, and irrigation uses, is a waste or an unreasonable use of the water, if recycled water is available which meets certain conditions. The state thus indirectly mandates the regional water boards to promulgate rules that encourage or mandate the use of recycled water. Since 2008, there have been multiple additions and changes to the Water Code regarding recycled water. The latest guide to these changes, updated in May 2014, can be found under "Recycled Water-Related Statutes" at the link to the left.
	Statutes related to recycled water and the California Department of Public Health See "Recycled Water-Related Statutes" http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/Lawbook.shtml	For updates to various Codes in the California Code of Regulations (CCR) between January 2011 and May 2014, including to the Government Code, Health and Safety Code, Public Utilities Code, Street and Highways Code, and the Water Code, see the link to the left.

LOCATION	PROGRAM	DESCRIPTION
	Title 22 revisions – Recycled Water-Related Regulations related to indirect potable reuse (IPR) http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/RecycledWater.shtml http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/Lawbook.shtml Also see: CCR Title 22	Revisions to the Water Code in 2013 (sections 13560-13569) required the Division of Drinking Water to adopt regulations for groundwater replenishment using recycled water. Effective June 2014, the California Department of Public Health significantly modified Title 22 of the Code of California Regulations (CCR), or the Health and Safety Code. Two new articles on IPR were added: Article 5.1. Indirect Potable Reuse: Groundwater Replenishment — Surface Application and Article 5.2. Indirect Potable Reuse: Groundwater Replenishment — Subsurface Application. These sections provide details on testing, control, monitoring, and reporting requirements for IPR projects. Enforcement is through the overall jurisdiction of the State Water Resources Control Board (SWRCB).
	Title 22 revisions – Recycled Water-Related Regulations related to direct potable reuse (DPR) http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/RecycledWater.shtml	Revisions to the Water Code in 2013 (sections 13560-13569) required the Division of Drinking Water "to investigate and report to the Legislature on the feasibility of developing uniform water recycling criteria for direct potable reuse," and then to "adopt regulations regarding surface water augmentation with recycled water by December 31, 2016." The law requires the appointment of an Advisory Group and Expert Panel. For current updates on this process, see the link to the left.
	Assembly Bill No. 91 Funding for water and water recycling projects (AB-91 Budget Act of 2014) http://leginfo.legislature.ca.gov/ (Search Bill 91)	The bill, chaptered into law in March 2015, fast-tracks more than $1 billion in funding for drought relief and critical water infrastructure projects. Section 27 states that "$6,727,000 shall be available to the State Water Resources Control Board for drought-related water right and water conservation actions, including establishing and enforcing requirements to prevent the waste or unreasonable use of water and to promote water recycling… ."
	Assembly Bill No. 92 Management and funding of water recycling projects (AB-92 Water) http://leginfo.legislature.ca.gov/ (Search Bill 92)	The bill, chaptered into law in March 2015, amends the Fish and Game, Government, Public Resources, and Water Codes to better support drought relief efforts throughout California. Specific to water reuse, the bill: 1. Establishes "the Office of Sustainable Water Solutions within the State Water Resources Control Board to promote permanent and sustainable drinking water and wastewater treatment solutions [including, specifically, water recycling projects] to ensure effective and efficient provision of safe, clean, affordable, and reliable drinking water and wastewater treatment services." 2. Transfers $10 million from the 2014 Proposition 1 bond fund to the CalConserve Water Use Efficiency Revolving Fund, with $5 million allocated specifically for a pilot project for local agencies to provide water efficiency upgrades to eligible residents, including water recycling systems.

LOCATION	PROGRAM	DESCRIPTION
	Executive Order to cut urban water use http://gov.ca.gov/docs/4.1.15_Executive_Order.pdf	The Governor of California's recent executive mandate on water use directs the State Water Resources Control Board to devise a plan to reduce urban water use by 25 percent across the state. As a disincentive, the Metropolitan Water District of Southern California said it would triple the cost of water for anyone who exceeded these limits. The Governor's order allows the Board to set cuts differently in areas where per capita water use is higher or areas where the use is lower than average rates across California. The board will also be permitted to issue cease-and-desist orders to suppliers that fail to meet the guidelines, and suppliers could face fines of up to $10,000 per day. This order is expected to drive graywater and other reuse projects.
	The Water Recycling Act of 2013 (AB 803) http://leginfo.legislature.ca.gov/ (Search "803" in Session Year 2013–2014)	This version of the Act, original enacted in 1991, was chaptered in October 2013, and specifically: 1. Exempts people that cause an unauthorized release of recycled water from requirements in existing law that they notify the local health officer of the release. 2. Allows cemeteries that use disinfected tertiary treated recycled water to install hose bibs under certain circumstances. 3. Authorizes the State Water Board and Regional Water Boards to determine the point of compliance for a direct potable reuse project or recycled water surface augmentation project to be at the point at which the recycled water enters the conveyance facility, but prior to it commingling with any raw water or other water sources.
California (Santa Barbara)	Water Efficient Landscape and Reclaimed Water Use Regulations http://www.santabarbaraca.gov/gov/depts/pw/resources/system/recwater/policy.asp	The regulations declare that it is the policy of the City of Santa Barbara that reclaimed water be used for the appropriate purposes wherever it is available. Pursuant to the State Water Code, the City of Santa Barbara requires that a person or public agency not use water suitable for potable domestic use for the irrigation of greenbelt areas when reclaimed water is available.
Florida	Discharge of wastewater through ocean outfalls https://www.miamidade.gov/water/library/reports/ocean-outfall-legislation.pdf SB 536 Study http://www.dep.state.fl.us/water/reuse/study.htm	In July 2008, the Wastewater Disposal Bill or "Ocean Outfall Bill" (HB 7139 and SB 1302) was adopted into law. The bill requires all facilities that discharge domestic wastewater through ocean outfalls to meet higher treatment requirements by December 2018, and achieve at least 60 percent reuse of the wastewater by 2025, prohibiting the practice beyond that date, except as a backup for certain situations. No new or expanded ocean outfalls would be allowed. In April 2013, SB 444 was passed to amend the bill, with key provisions as follows: • Utilities have an expanded definition of service coverage to meet the 60 percent reuse requirement. • The time period was extended to 2025. • "Backup discharges" are allowed. • An evaluation of the regional reuse demand is required. Relatedly, SB 536, passed in 2014, required a comprehensive study and report on the expansion of the use of reclaimed water.

LOCATION	PROGRAM	DESCRIPTION
Nevada	Las Vegas Valley Water District Services Rules, 2013 www.lvvwd.com/assets/pdf/serv_rules_fulldoc.pdf	All large-scale turf and landscape irrigators (e.g. golf courses, landscape areas) and appropriate non-residential users must use non-potable water (recycled/reclaimed) when and where it is available. LVVWD is a member agency of the Southern Nevada Water Authority.
Oklahoma	Water for 2060 Act (HB 3055) Water Resources Board http://www.owrb.ok.gov/2060/2060statusrpt.pdf	With passage of the Water for 2060 Act (HB 3055) in 2012, Oklahoma became the first state in the nation to establish a bold, statewide goal of consuming no more fresh water in 2060 than is consumed today. Water for 2060 emphasizes the use of education and incentives instead of mandates. Rulemaking for oil and gas, industrial, and municipal water treatment plant water reuse is underway currently. Rulemaking for Indirect Potable Reuse is anticipated to begin in August 2015.
Oklahoma	Potable water reuse permitting http://www.oklegislature.gov/BillInfo.aspx?Bill=SB1187&Session=1400	On May 28, 2014, the governor of Oklahoma signed Senate Bill 1187 making it possible for water agencies to implement potable water reuse projects. Under the new law, the Department of Environmental Quality (DEQ) can issue permits for point-source discharges into sensitive public and private water supplies for the purpose of developing and implementing a water-reuse project.
Texas (San Antonio)	Water Conservation and Reuse Ordinance, 2014 revision https://www.municode.com/library/tx/san_antonio/codes/code_of_ordinances?nodeId=11508 (Search "Water Conservation and Reuse Ordinance")	The ordinance creates the following mandates in connection with water reuse: • Cooling towers not utilizing recycled water must operate a minimum of four cycles of concentration. • Vehicle wash facilities using conveyorized, touchless and/or rollover in-bay technology must reuse a minimum of 50 percent of water from previous vehicle rinses in subsequent washes. • Golf courses, other than those utilizing recycled water for irrigation, must comply with residential irrigation requirements on areas other than tee boxes, fairways, and greens. • Graywater, treated wastewater, and water reuse are exempted from some provisions of the Drought Management Plan. • 100 percent use of treated wastewater (recycled water) is a "defense to prosecution" regarding irrigation restrictions.

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