ESMAP

Energy Sector Management Assistance Program

Energy Efficient Cities Initiative

GOOD PRACTICES IN CITY ENERGY EFFICIENCY

Monclova, Mexico - Monclova & Border Frontera Drinking Water System

Project title	Monclova Water and Energy Efficiency Project
Sector	Water
Type of project	System optimization to improve water and energy efficiency in water supply
City and country	Monclova, Mexico
City population	300,000
Capital cost/initial investment	US$5.3 million
Annual % energy reduction	4.75 million kWh (27%)
Project status	Complete

Project Summary

By optimizing the water distribution network and investing in additional enhancements to the system, *Sistema Intermunicipal de Agua y Saneamiento* (SIMAS) Monclova (the operating agency for the municipal water system and sanitation services in Coahuila, Mexico) was able to increase water supply from 10 hours/day to 24 hours/day, while increasing access to an additional 40,000 customers, and at the same time reduced the total energy and water consumed. Prior to the project, the system faced 40% technical water losses in its drinking water network and, as a result, could only provide service for about 10 hours/day. A lack of financial resources limited the utility's ability to undertake capital-intensive infrastructure upgrades to improve the City's water distribution services. In 2006, the Alliance to Save Energy's *Watergy* program offered technical assistance to help SIMAS Monclova identify and implement a series of improvements to improve its service levels. These included: optimization of the distribution network through changes in zoning patterns; use of hydraulic modeling to regulate water pressure and flows; sectorization[1] of the network; detecting leaks and making repairs; and installing new pumps and motors to improve the system's electromechanical efficiency. The US$5.5 million project was implemented in 2009 and significantly improved operational performance, allowing for 24-hour service, connection of new customers, improved water flow and pressure—all while reducing total energy and water consumed. The project resulted in energy savings of 4.75 million kWh (27% reduction) and water savings of 1.94 million cubic meters (m^3)—equivalent to annual cost savings of US$380,000 to the utility. More important, the project led to increased revenues of some US$2.28 million due to the connection of new consumers, enhanced operational efficiencies, improvements in revenue collection, fewer complaints, and increased customer satisfaction.

[1] Water sectorization consists of dividing a large interconnected city distribution network with multiple supply points into smaller sectors that have one (or two, in exceptional cases) supply inlets. Dividing a large distribution network into small supply sectors results in regular supply flow and pressures, which can be difficult to achieve in large networks. Additionally, it results in the reduction of pumping energy use and the consecutive costs associated with it.

1. Introduction

Mexico's population is expected to increase from almost 105 million in 2004, to 121 million by 2020. There are approximately 200,000 towns across the country, with around 80 million people concentrated in urban areas. Demographic trends in Mexico present tremendous drinking water supply and wastewater treatment challenges. Mexico has been expanding its water service faster than the rate of population growth. From 1980 to 2002, the population grew by 34 million people, approximately 1.5 million per year, while the number of people with water service increased by 43 million—almost 2 million per year. However, the existing water and energy infrastructure is still insufficient for the growing population and increasing economic activity.

The WHO/UNICEF Joint Monitoring Program reported that in 2004, 76% of the population lived in urban areas, while the remaining 24% resided in rural locations. While 97% of Mexico's urban population had access to a safe water supply, only 87% of the nation's rural population had such access. Lack of development in the water infrastructure has been due to the complex set-up of Mexico's water services business. There are more than 2,400 water service providers in Mexico, with almost 100% of them state-owned utilities; only three water utilities are privately owned and operated. The Federal regulatory authority is the National Water Commission (CONAGUA), which operates on a national level. In recent years, Mexico has witnessed an increasing call for water reforms, which includes decentralization, greater private sector participation, institutional and financial reform. But this process has been slow.

Presently, municipalities are straining to meet rising costs and overcome management challenges in the water delivery system. Everyday challenges include: catering to the needs of the 12 million people who lack access to water; chronic irregularities in the water supply; and significant distribution losses from the system. CONAGUA estimates that on average 36% of water in Mexico is lost due to distribution inefficiencies. As a result of these water losses, as well as other problems, such as those related to revenue collections, the utilities receive revenue for only 4.1 liters of every 10 liters of water supplied. Further, utilities face growing energy costs, often representing on average 44% of operating costs. The problem of intermittent water supply is also widespread, and most municipalities can only provide service at an average of 12 hours/day while struggling to maintain optimum pressure levels in their networks. As a result, consumers remain strongly dissatisfied with the water supply service, which leads to some resistance in paying water bills, causing further financial challenges for the municipal utilities.

The City of Monclova is the seat of the surrounding municipality of the same name in the northern Mexican state of Coahuila. According to the 2005 *Instituto Nacional de Estadística y Geografía* (INEGI) census, there were 198,819 inhabitants in the city and 200,160 in the municipality. Its metropolitan area (Monclova, Frontera, Castaños), with about 300,000 inhabitants and a population density of 29.88 inhabitants per square kilometer, is on the route that covers the Central and State of Coahuila desert. This area has no surface water sources, receives a maximum rainfall of only 300-400 millimeters/year, and faces extreme temperatures, reaching a high of 48° C (118° F) during summer months. Such conditions require water extraction via an aqueduct from a rural catchment area (*Pozuelos-Viborillas*), located 15 kilometers from the urban area.

Pozuelos-Viborillas has 27 deep wells from which water is supplied, and 16 storage tanks that distribute water to different parts of the city. The lack of sectorization in the distribution system results in high energy consumption, water distribution problems, along with intermittent and unreliable water supply to users.

Sistema Intermunicipal de Agua y Saneamiento (SIMAS) Monclova is a publicly owned and operated utility for the municipal water system and sanitation services in Coahuila, Mexico. In 2007, SIMAS Monclova served about 78,650 residential, commercial and industrial customers, delivered about 33.3 million m^3 of water, and had revenue earnings of more than 109 million pesos (~US$8.58 million)[2]. The wastewater generated is collected by SIMAS Monclova and sold to *Altos Hornos de México* for treatment and reuse. Their service area is divided into different sectors, namely, North Central, South, East and the border Frontera. Only the East sector had continuous water supply service for its five colonies, whereas the other areas received only intermittent water supply. On average, customers in the SIMAS Monclova service territory received only 10 hours of water supply per day, with some users receiving water only once a week. Significant water loss due to leakage and irregular water flow and pressure were also common in all sectors. The North Central, East, and Frontera sectors reported around 42% losses, while the South sector faced water losses of about 15.3% from its network. Additionally, SIMAS Monclova faced high energy costs, which amounted to 32% of its total operating budget. The inadequate water supply to consumers, significant water losses and the high energy costs motivated the utility to explore options to improve its service levels while increasing the water and energy efficiency of its water supply network.

2. Project Description and Design

SIMAS Monclova faced considerable financial and technical challenges that it needed to overcome before any project could be initiated. The utility approached CONAGUA, which agreed to provide the needed investment capital for the project, and partnered with the Alliance to Save Energy's (ASE) *Watergy*[3] program to access technical expertise on energy and water efficiency approaches, and to draw on global experiences in this area.

A project pilot phase was initiated in July 2004, when SIMAS requested that ASE identify energy and water saving measures using the methodology for the southern part of the city. The *Watergy* method involved a holistic approach to improve the water infrastructure system's efficiency. Program actions included: improvements to the management and operations of the system, installation of variable speed drives, and adoption of leak detection technologies. The pilot phase was very successful, resulting in increased service levels to 24-hours/day, 7 days/week, a 20% reduction in water losses, water savings of 0.61 million m^3/year, and energy savings of 1.4 million kWh/year—leading to US$180,000 per year in reduced operating costs. The results of the pilot phase

[2] From 2007 data downloaded from: http://www2.simasmyf.com.mx/

[3] The term "*Watergy*" was coined by the Alliance to Save Energy to describe the strong link between water and energy in municipal water distribution systems. The *Watergy* program helps cities realize significant energy, water and monetary savings through technical and managerial interventions in water and wastewater systems, providing consumers with quality water while using a minimum of water and energy. For more information, please see www.watergy.org.

in the South sector were so compelling that SIMAS Monclova expanded its water and energy savings effort to include the entire metropolitan region.

The full-scale Monclova project started in 2006 and had three main objectives:

i. Improving the hydraulic operation of the network through use of automatic control devices and sectorization[4] of the network;
ii. Reducing energy consumption by replacing old pumping equipment with more energy efficient pumps and optimizing the pumping operational schedules; and
iii. Reducing the extraction of water from the aquifer through a program of leakage detection and reduction.

The project utilized ASE's methodology[5]— an iterative process of hydraulic and energy calculations used to determine an optimum operational plan for water distribution—to improve hydraulic efficiency and reduce energy consumption with the lowest possible capital investment. The *Watergy* method is implemented in four stages: (i) site visits and field measurements to collect consumption data, production figures, and electro-mechanical characteristics of the water supply network; (ii) identification of cost-effective energy saving measures for implementation (for example, power factor optimization, head friction loss reduction, electromechanical efficiency of the pumping equipment, etc.); (iii) conducting a water balance test to identify problems in water distribution and establish the extent of physical water losses in the network, followed by development of a leak reduction strategy to simultaneously improve water pressure and lower energy use; and (iv) analysis of identified energy savings and hydraulic optimization methods, and validation using hydraulic simulation tools.

The project began with data collection and field measurements of the water distribution system, which included a detailed map of the piping network and measurements of flow and pressure. A complete rezoning of the water distribution network was conducted to optimize the flow and pressure in the supply system. The four sectors managed by SIMAS Monclova were further divided into subsectors, and an optimum flow was estimated for each new subsector (see Figure 1). The water flow was estimated based on a volumetric balance approach, which considered the total population served and availability of water supply in each sector. New regulating tanks were constructed, and the main aqueduct was temporarily isolated from the network to fully saturate the regulating wells. These tanks were used to supply water to individual sectors and appropriate changes were made to the distribution system to minimize the head friction losses. The hydraulic balance in the distribution was achieved by ensuring that each sector was supplied only from the wells situated nearest to each location. However, provisions were made for the water flow to be transferred between the sectors based on changing demand.

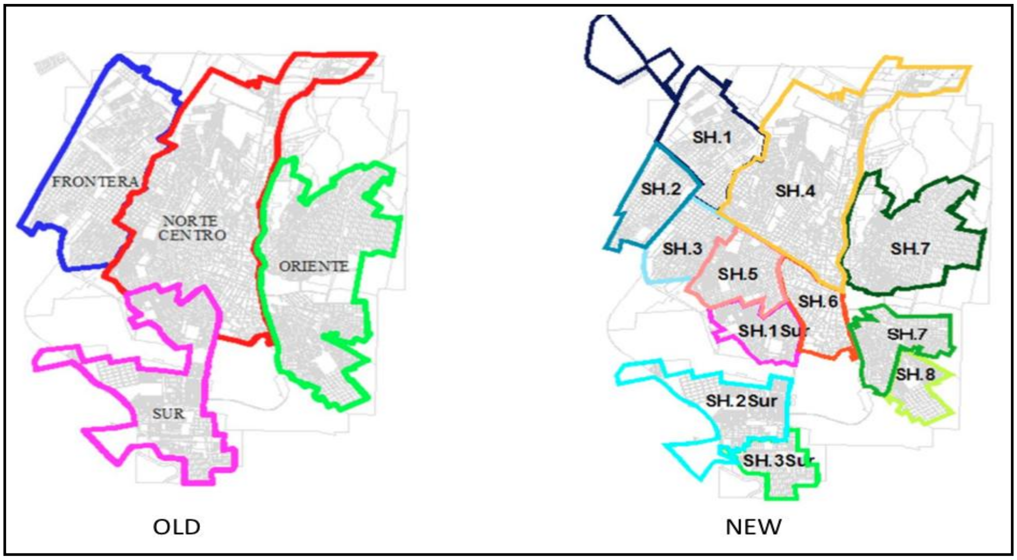
Changes were also made to the pumping capacity of the distribution network, which included replacing old pumps with new high efficiency pumps and removing underutilized equipment. The improvements in pumping efficiencies resulted in energy

[4] Water sectorization consists of dividing the large interconnected city distribution network into smaller networks with one or two supply points to regularize supply flow and pressures.

[5] Full description of Watergy approach is available at: http://www.watergy.org/resources/publications/watergy.pdf

and cost savings, and reduction of the water extraction from the wells, from 728 liters per second (*l*/sec) to 570 *l*/sec. Other measures adopted included installation of new hydraulic flow meters; installation of automatic control valves; leak detection; and repairs and replacement of old pipes and equipment. New flow meters were also installed in all households. This made it possible for SIMAS Monclova to conduct a water balance test to quantify water losses, by comparing the quantity of water supplied to each household with household level water consumption data. Details of the overall system and its components were used as inputs to generate a hydraulic simulation model using the computer program EPANET V2.0[6]. The model was used to evaluate the hydraulic operation of the proposed changes and the redistribution of flow and pressure in the network. The model simulated all parts of the network, and the optimum performance was achieved by making changes in response to the simulation results.

Figure 1: Changes in the Zoning of the Water Distribution System



Source: Alliance to Save Energy, Mexico

The project was implemented by SIMAS Monclova under the guidance of ASE's Mexico office. ASE staff provided rendered technical consulting and monitoring services, and was responsible for training the utility's staff to use the hydraulic simulation model. This ensured the project was implemented correctly and allowed for the monitoring and verification of results while providing technical expertise specific to the *Watergy* methodology. The purchase and installation of equipment, along with implementation of other project activities, was conducted by utility staff with the help of external contractors.

To undertake the extensive upgrades to the water supply network, SIMAS Monclova needed to periodically interrupt the water supply to customers during project execution.

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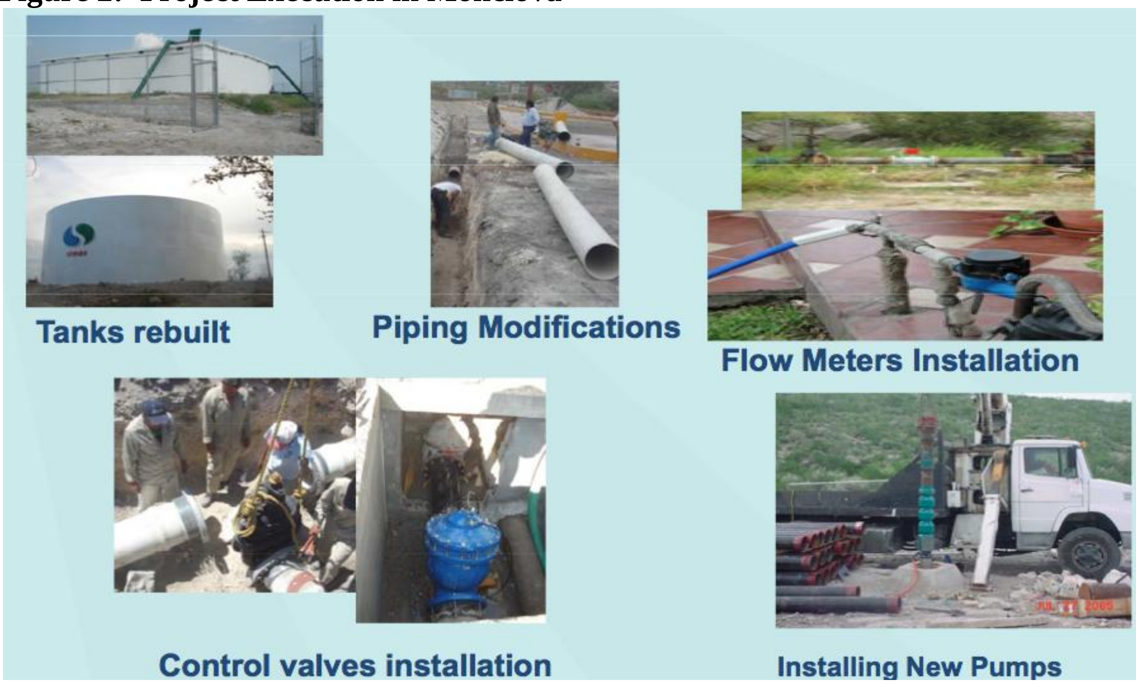
[6] Developed by EPA's Water Supply and Water Resources Division, EPANET is software that models water distribution-piping systems. It is a Windows 95/98/NT/XP program that performs extended-period simulation of the hydraulic and water quality behavior within pressurized pipe networks. EPANET provides an integrated computer environment for editing network input data, running hydraulic and water quality simulations, and viewing the results in a variety of formats. (More information and downloads are available at: http://www.epa.gov/nrmrl/wswrd/dw/epanet.html.)

Thus, the utility launched an extensive outreach program in its service territory to inform residents about the project activities and expected results. SIMAS Monclova was able to gain public support for this project through a well-organized communication campaign with the residents, who were eager to cooperate if it would lead to significant improvements in the water supply in the future.

Figure 2: Project Execution in Monclova



Source: Alliance to Save Energy, Mexico

3. Cost, Financing, Benefits, and Effects

Total capital investment for this project was US$5.3 million. Of this, US$2.2 million was allocated to actions recommended by ASE. This included changes to the network, improvements to pumping systems efficiency, and other technological upgrades. The remaining US$3.1 million was invested in complementary system upgrades, such as replacing old distribution pipes, purchasing of leak detection equipment, making improvements to the sewage system, acquiring maintenance equipment and software, training of personnel, and the financing of other operational costs. SIMAS Monclova applied for federal aid to arrange for the capital for this project under the 'Water Supply, Sewerage and Sanitation in Urban Areas Program' (APAZU)[7]. This program allowed the project's financial costs to be equally shared between SIMAS Monclova and CONAGUA.

The annual energy consumption after the project's completion in 2009 was reduced to 12.70 GWh, compared to a baseline average of 17.45 GWh in 2006. The 4.75 GWh/year savings (27% reduction) resulted in equivalent annual cost savings of US$380,000 for the utility[8]. The optimization of the hydraulic system, by regulating the flow and reduction

[7] APAZU Program is a financial aid program launched in 1990 by Mexico's federal government. It supports increased coverage of potable water, wastewater collection and treatment, rehabilitation and construction of water infrastructure and support for institutional development actions.

[8] Price of electricity 1.01 MXN/kWh (US$1=12.71 MXN, Mexican pesos)

of system leakages, allowed SIMAS Monclova to extend water supply to 7,040 new households (about 40,000 residents), while extracting 1.94 million m^3 less water from the aquifers (see Table 1).

Table 1. Project Results Summary

Indicator	2006	2009	Savings	
Number of Households (1,000)	71.607	78.647	7.040*	
Water Supplied (million m^3/yr)	35.61	33.67	1.95	5.46%
Energy Consumed (GWh/yr)	17.45	12.70	4.75	27.24%
Energy Index (kWh/m^3)	0.49	0.38	0.11	23.04%
SIMAS Monclova Revenue (US$ million)	8.07	10.35	2.28	28.27%

* About 40,000 people

The use of leak detection equipment such as geophones and correlators to repair all visible leaks in the water supply network resulted in the efficiency of the system increasing by 80%, well above the average of 54% for other parts of Mexico. Another significant project achievement was that SIMAS Monclova resolved the issue of intermittent and unreliable water supply, and was able to provide continuous water service to all its consumers. Despite adding thousands of additional customers, and extending water supply from 10 to 24 hours/day, SIMAS Monclova was able to reduce the energy intensity of its water network by 23%, to a total of 0.38 kWh/m^3. All this was achieved by better utilization of the existing water supply infrastructure and adoption of measures that eliminated water loss and optimized the network's operation. The improvement in water delivery resulted in increased revenues for the water utility. In exchange for continuous and reliable water service, consumers agreed to the installation of advanced metering equipment in their homes and collections increased by 35%. SIMAS Monclova also implemented a comprehensive management system, which controlled standardized procedures for the processes of reading, billing and collections—increasing the organization's operational efficiency. A geographic information system (GIS) was also linked to the water network, which allowed tracking of water usage, payment history, compliant records, etc., according to the location of each consumer. The improvements in the water distribution system, increased operational efficiency, reduction in water losses and energy consumption led to an improvement in the revenue stream—company revenues increased from US$8.07 million in 2006 to US$10.35 million in 2009, a 28% increase. With the significant increase in revenues and the operational cost savings, the project had a simple payback period of less than two years (see Table 2).

Table 2. Project Cost Benefit Summary

COST BENEFIT ANALYSIS			
	Costs	**Benefits**	**Payback**
ASE Recommended Actions	$2,200,000		
Other Complimentary Actions	$3,100,000		
Energy Cost Savings		$380,000	
SIMASM Increase in revenue		$2,280,000	
Total	$5,300,000	$2,660,000	
			1.9 Years

Source: Alliance to Save Energy, Mexico

4. Project Innovation

The project was unique and innovative in its effort to maximize energy and water efficiency while minimizing capital costs. The project partners made every effort to utilize the distribution system's existing infrastructure by repairing leaks, regulating water pressure, and optimizing the hydraulic performance of the existing system. In this way, SIMAS Monclova was able to improve its service levels and even expand access service while still reducing its water and energy use.

The project was also innovative in how simulation technology was used by a water utility in Mexico. Hydraulic modeling was used to evaluate all potential efficiency measures available to implement the most cost-effective decision. The use of a simulation tool allowed SIMAS Monclova to make significant changes to the basic zoning of the distribution system, achieved through minimal capital investment. At the same time, this helped maximize the system's overall efficiency. The sector's optimal pressure and flow range were also determined using hydraulic simulation tools. Hydraulic simulation was also adopted for the system's evaluation and daily monitoring to maximize the operational efficiency and effectively address failures and complaints.

Another innovative aspect was the holistic nature of the project. Not only did the project involve equipment upgrades and modeling, but also improvements in the operational efficiencies and institutional development of the organization. Linking SIMAS Monclova's accounting system to a GIS based mapping tool allowed the utility to increase the operational efficiency and billing collection for the department. Further training helped institutionalize these improvements.

5. Lessons Learned

The project is a good example of how water access can be expanded, and the overall efficiency of the distribution system can be enhanced, quickly and inexpensively, by implementing simple efficiency measures and eliminating waste—thus deferring the need for additional infrastructure investments. By incorporating efficiency into existing and planned infrastructure systems, costs can be controlled, service delivery can be improved, and access expanded without necessarily adding to the cost of the service. A previous cost estimation had shown that SIMAS Monclova would have to invest US$9.3 million to provide continuous and reliable water services to everyone within the city. Additionally, it was estimated the utility would have to pay an additional US$3.5 million in energy costs per year under the improved water supply scenario. Yet, the optimization and efficiency improvement project undertaken only cost US$5.3 million and has largely met the initial objectives. The commitment of utility management to energy and water efficiency was a key factor to allow the project to move forward and grow to a municipal-scale water and energy efficiency project.

The project also highlights the need for strong technical expertise to help realize such projects. The presence of ASE to act as a technical advisor and project agent was instrumental in the project's conception. The project provided extensive staff training to SIMAS Monclova, including implementation of the *Watergy* methodology, energy audits, water leak detection and repair, hydraulic modeling, and guidelines on best practices. This successful knowledge transfer has helped the project become more sustainable, and the utility will now be able to continue to manage its networks and operations without further support from ASE.

Another important lesson learned is the importance of establishing a strong social contract between the utility and its consumers. SIMAS Monclova initiated a strong communications campaign within its service area to gain customer support for short-term disruptions during construction in exchange for improved service. Consumers also consented to upgrades in their electronic water metering in exchange for more reliable and continuous service. The GIS integrated electronic metering system allowed for close monitoring of payment histories and water consumption patterns and helped improve bill collection for the utility. This willingness of consumers to accept paying their bills in exchange for better service represents the crucial element of the contract between utilities and their customers. Without it, the utility would not have been able to recover its investment costs and the project would have been perceived as a failure. This lesson has been borne out in water reform projects around the world: Customers are significantly more likely to accept higher costs if service levels and reliability improve.[9]

6. Financial Sustainability, Transferability, and Scalability

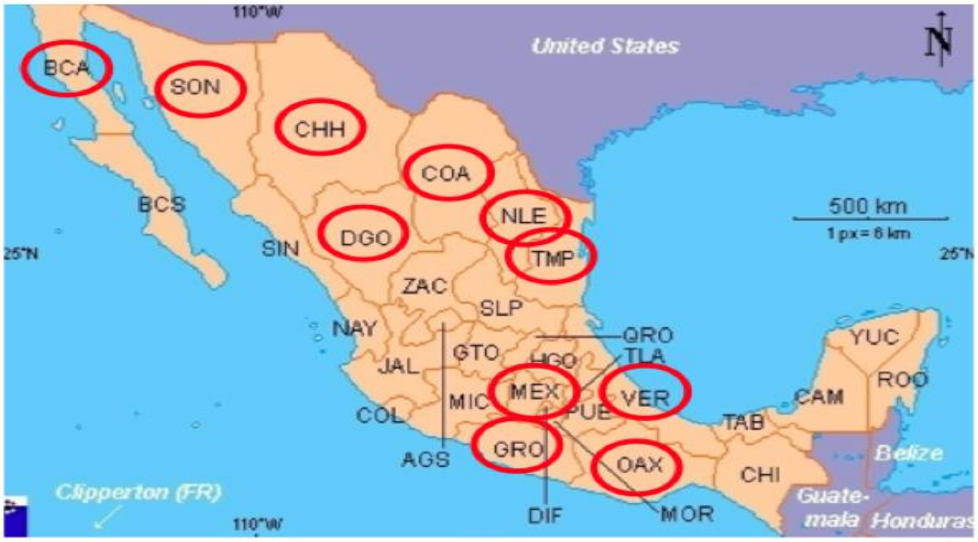
Due to the successful implementation, the *Watergy* methodology has been adopted as part of the National Water Policy in Mexico. Currently, apart from the Monclova project, other *Watergy* projects have been implemented in 11 of the 39 Mexican states (see Figure 3). However, there remains great potential for future applications and the *Watergy* methodology is being extensively promoted by CONAGUA and ASE. These efforts include eight national seminars, 89 workshops, and approximately 4,000 utility technicians trained to implement this methodology. It is expected that such efforts will help create the political will and make available the financial mechanisms needed for the widespread application of future water and energy efficiency projects in Mexico. Apart from Mexico, ASE has implemented *Watergy* projects in more than 40 cities around the world and is currently active in five other countries—Brazil, India, the Philippines, South Africa, and Sri Lanka.

The *Watergy* approach can be effective in bridging the growing gap between the need for water and the capacity to provide it. ASE case studies have shown that typical energy efficiency measures can result in savings of 10-40%, with payback periods ranging from immediate to two years. The significant revenue stream available through efficiency can be invested back into the sector to make further operational improvements and to pay for infrastructure needed to meet growing supply and demand needs. Also noteworthy is the fact that system inefficiencies are responsible for typically one-third to one-half of the volume of water lost.[10] The project can also be replicated by other municipalities, which delay or fail to implement energy efficiency related system improvements due to misperceptions about upfront capital costs, risks or uncertainties about the savings.

[9] See, for example, World Bank *Communication for Water Reform: A Guide for Task Team Leaders* (at: http://siteresources.worldbank.org/EXTDEVCOMMENG/Resources/commwaterreformfinal.pdf).

[10] Water losses can be significant. Select water losses include: 33% for Mexico, 44% in Brazil, 40% in South Africa. Indian cities lose about half of their water to leakage, on average, with the figure about 40% in large metropolitan cities but often 50-60% in smaller cities.

Figure 3: *Watergy* Projects in Mexico



City	Current Energy Index	Expected Energy Index	Total Energy Savings
	kWh/Cu.Mt		%
Parral, Chih.	1.46	0.92	36.99%
Metepex, Edo.de Mex.	0.72	0.62	13.89%
Guaymas, Son.	1.18	0.7	40.68%
Nogales, Son.	1.53	1.12	26.80%
Lerdo, Dgo	0.52	0.35	32.69%
Matamoros, Coah.	1.02	0.56	45.10%

Sources: Alliance to Save Energy, Mexico; Pedraza, 2010

There is also the potential to finance such projects using the Clean Development Mechanism (CDM). The SIMAS Monclova project alone is estimated to offset emissions equivalent to 2,640 tons CO_2e, and the estimated emissions reduction potential from energy and water savings in water systems providing service for urban areas is immense, for Mexico and other Latin American countries. In Mexico alone, calculations indicate that similar projects implemented by water utilities could result in 2.09 million tons of CO_2e reduction with implementation of similar water and energy efficiency projects within their jurisdictions[11].

ASE's holistic approach, which takes into consideration the integral relationship between water and energy, has considerable potential for adoption globally. Unfortunately, the water-energy connection is not widely understood nor sufficiently exploited through coordinated projects. The water-energy relationship is based on the reality that treating water for human consumption and moving treated water to the consumer is an extremely energy intensive undertaking. Surface and ground-water sources require expensive pumping, treatment, and conveyance systems. Globally, energy is among the top three cost items among water utilities, often coming second only after labor costs. In developing countries, energy is usually the highest cost associated with water supply. This also means that lowering energy costs can greatly reduce pressures for water utilities to increase costs to consumers—a highly politically sensitive issue.

[11] Using the methodology approved by the CDM, AM0020 "Water Pumping Efficiency Improvements", available at: http://cdm.unfccc.int.

Water investment decisions that neglect energy needs can have a domino effect that increase investments in other sectors (like power plants), operating costs, and environmental costs. An estimated US$30 billion is required for new electric generating plants needed to power the new water infrastructure to serve the approximately two billion under-provided urban inhabitants expected around the world by 2025.[12] Efficiency in water supply and wastewater treatment can decrease the need for new power plants; improve a country's energy security; reduce infrastructure bottlenecks; reduce operating expenses for water distribution and treatment; defer additional investments to extract and transport the additional fuel; and lower environmental impacts associated with power generation and declining water and hydrocarbon reserves.

By 2020, more than 50% of the population in developing countries will live in urban areas, yet the cost of using traditional approaches to provide this population with water infrastructure is well beyond the means of most communities, and places an increasing strain on national and provincial governments. The Millennium Development Goals also call for aggressive action to bring water to the world's poor. The official goal for water seeks to halve the number of people without access to drinking water from 2001 through 2015. Most of the work needed is in developing countries faced with an exponential increase in water demand while infrastructure development lags behind due to limited resources. Observational records and climate projections made by the Intergovernmental Panel on Climate Change (IPCC)[13] indicate that over the forthcoming century, climate change will make freshwater resources vulnerable, via changes in precipitation, evaporation and temperature. Climate change is thus expected to affect the quality and quantity of water availability for municipal supply, food production, power generation, industrial use, and other vital services in many geographical locations—having wide-ranging consequences for human societies and ecosystems. In light of increasing water demand along with supply vulnerabilities, projects will need to be designed according to the socioeconomic conditions and requirements of each country. Priorities should be waste elimination, increased efficiency within the existing infrastructure, and the building of local capacity.

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ANNEX: CITY AND PROJECT PROFILE

CITY PROFILE

1. Name of the City	**Monclova**
2. Area	**NA**
3. Population	**300,000 (Metro region)**
4. Population Growth Rate	**NA**
5. GDP of the City	**US$25,716 million (Coahuila State, 2006)**
6. GDP Growth Rate	**3.5% (Coahuila State, 2004)**
7. GDP per Capita	**US$10,737 (Coahuila State, 2006)**

PROJECT PROFILE

1. Project Title	**Monclova Water and Energy Efficiency Project**
2. Sector	**Water**
3. Project Type	**System optimization to improve water and energy efficiency in water supply**
4. Total Project Capital Cost	**US$5.3 million**
5. Energy/Cost Savings	**4.75 million kWh/year (27.2%)**
6. Simple Payback	**2 Years**
7. Project Start Date	**July 2006**
8. Project End Date	**2009**
9. % of Project Completed	**100%**

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