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Review Article

Water, Energy and Food Security in Mexico City

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Abstract

Population growth, climate change and accelerated economic activity will increase the demand for food, water and energy. As these three issues are interlinked and interdependent, securing them is central to alleviating poverty and creating climate-resilient and robust green economies. As engines of economic growth and social development, cities are at the forefront in creating innovative solutions to such challenges. In turn, this paper will first examine how Mexico City is securing its water resources by focusing on the Programme of Sustainable Water Management in Mexico City for 2007–2012. Moreover, the Mexican government is realizing that issues of water security are closely linked to food and energy security as reflected in the various government plans, particularly in the Climate Action Programme in Mexico City 2008–2012 (PACCM). The PACCM proposes both mitigation and adaptation strategies in areas of water management, energy, transport and waste management. Finally, this chapter concludes that as urbanization and planning in cities becomes more complex, Mexico City will have to act under the coordination of planning agencies and will have to work on the creation of appropriate legislation with the strength of civil society.

Keywords: Civil Society; Institutional Coordination; Long-Term Planning; Urban Growth; Water Supply and Sanitation

Introduction

Due to their economic and social importance, cities play a critical role in creating solutions to the impacts of climate change.

For historical and political reasons, Mexico is a highly centralized country. Along with the Metropolitan Area of Mexico (MCMA), Mexico City accounts for 45% of the national industrial activity, produces 38% of the gross national product and contains 20% of the total Mexican population. The city is home to almost all government offices, business centres, national and international cultural activities, universities and major research institutes. The rapid growth in the last 50 years has been characterized by both expansion of urban and residential areas and illegal land invasions and informal settlements in peripheral areas.

Mexico City registers a total of 8.8 million inhabitants in an area of 1.484 km2, 59% of which is conservation land, that is, rural areas. It has 2.54 million homes and 2.9 million vehicles, which in sum make 12 million trips a day. In addition, the Metropolitan Area of Mexico City (MCMA), comprising 16 municipalities of the federal district, 59 municipalities of the state of Mexico and 29 municipalities of the state of Hidalgo, has a population of 21.3 million. The MCMA has a vehicle fleet of 4.5 million vehicles all of which make 21.6 million trips a day.

No doubt that the great challenges that urban areas are facing are access to food, water and energy. These three issues are closely related and, therefore, they require comprehensive solutions in order to make our cities more resilient.

This chapter will focus primarily on the issue of water, looking particularly at the initiatives and process that are already in place to deal with water security in Mexico. Subsequently, we demonstrate how water is intrinsically linked to the issue of energy and food security.

Water security: Mexico city

Throughout the years, government authorities have attempted to address population growth by providing urban services from a supply perspective, that is, always looking for new sources of supply to meet the growing service requirements for the city of Mexico.

Water services have not been an exception. It began with the exploitation of the aquifer and subsequently with the development of large hydraulic infrastructure projects to bring water from Valle de Lerma (state of Mexico) and from the Cutzamala System (state of Mexico and Michoacan). Despite such efforts, there are many areas in Mexico City that still lack adequate water services. For example, in the MCMA, water is supplied at 63 m^3/s, while in Mexico it is supplied at 32 m^3/s.

The search for new sources of water, along with the overexploitation of the current sources as the only ways to resolve the water demand of Mexico City, is closely related. According to the Programme of Sustainable Water Management in Mexico City for 2007–2012, there are no records of when the overexploitation of the aquifer began; it is in the 1940s that the effects are manifested in the city by way of subsidence. The latest estimates of the aquifer show a negative 30% water balance, meaning that for each cubic metre that is removed, only 300 l can be recharged.

With regard to the important issue of water, the Federal District Government has identified five main guidelines for its management in the federal district:

1. Aquifer recharge and protection of the conservation land
2. Consumption of potable water
3. Leak detection and suppression
4. Sewage, treatment and reuse of treated wastewater
5. Parks and lake areas of high environmental value.

According to figures provided by the United Nations, 884 million people lack access to drinking water sources, while 2.5 billion lack access to sanitation facilities. The root causes of the current crisis in water and sanitation can be traced to poverty, inequality and unequal power relations. This is further exacerbated by social and environmental problems such as rapid urbanization, climate change and increased pollution and depletion of water resources.

Water is and will be a central theme in urban systems as it directly affects people in their private lives. However, people also require reliable and affordable energy as it is essential to generating income and providing basic social services such as good lighting, clean drinking water, health services and agricultural activities. Moreover, without water and energy, our cities could not meet the food requirements of the world's population.

Energy security: Mexico City

Given the increasing risks related to the security of energy supplies and climate change, the long-term energy security scheme should focus not only on renewable energy but also on how to move away from our dependence on oil. It is time to take a step forward and incorporate energy sources and clean technologies to ensure energy supply for future generations. Investment in science and research to develop clean technologies must have an important role in the development of our cities.

In Mexico City, about 88% of greenhouse gas emissions are attributed to the consumption of energy as fossil fuels and electricity used in transport, industry, commerce or services. The challenge is to balance economic and population growth with environmental sustainability through improving and expanding the public transport system; transforming vehicle technology; efficient use of energy in buildings and in industrial plants, on lighting systems, in water pumping systems and households; the use of renewable energy and rational use of water (including savings and water reuse and aquifer recharge).

In order to address these three challenges, local governments need support from citizens. Involving citizens in the governing process will ensure that a joint consensus is reached on the dangers and solutions to water, energy and food security. To achieve this collaboration, it requires that policies, finance and technology get harmonized to achieve synergies.

On 5 December 2006, assuming the responsibility of the head of Federal District Government, a set of public commitments were made to citizens expressing a desire to lead the development of Mexico City's new horizons of equity, welfare and economic growth. The General Programme of Development 2007–2012 of Mexico City offers a planning framework to meet this commitment.

The General Programme of Development 2007–2012 of Mexico City, which is based on a public commitment to society, has seven axes of action:

1. Political reform: full rights to the city and its inhabitants
2. Equity
3. Safety and swift justice
4. Competitive and inclusive economy
5. Intense cultural movement
6. Long-term sustainable development
7. New urban order, efficient services and quality of life for all.

Each axe has set objectives, strategies and lines of action. For example, for axe 6 on sustainable development, local governments designed and implemented the Climate Action Program of Mexico City 2008–2012 (PACCM).

The Climate Action Program (PACCM) of Mexico City

The implementation of the Climate Action Program aims to integrate, coordinate and promote public action in Mexico City to reduce the environmental, social and economic risks of climate change and promote the welfare of the population by reducing emissions and capturing greenhouse gases (GHGs).

The PACCM has two overarching goals: (1) to reduce seven million tons of carbon dioxide equivalent in the period 2008–2012 and (2) to conduct a comprehensive climate change adaptation plan for Mexico City and have it fully operational by 2012.

The specific objectives are:

- Influence the behaviour patterns, habits and attitudes of Mexico City's population to contribute to climate change mitigation and adaptation
- Attract investment and funding for GHG mitigation projects to overcome barriers to implementation
- Promote technological innovation related to combating climate change
- Position the government and Mexico City as a national and international leader for its efforts to mitigate GHG emissions in the context of the commitments made by Mexico to the United Nations Framework Convention on Climate Change
- Set the example for public policy in mitigating and adapting to climate change in Mexico and generate a multiplier effect on the country and the world.

The PACCM has 26 mitigation actions in the categories of water, energy, transport and waste; 12 shares on adaptation and 6 shares on communication and education. In turn, the Government of Mexico City has made significant progress in efficient use of water and energy.

The Climate Action Program represents set actions that the Government of Mexico City has openly decided to take to deal with the impacts of climate change. Since its publication in June 2008, this program has been the definition of priority actions aimed at reducing greenhouse gas emissions and adaptation to climate change.

With the certainty that climate change represents the greatest environmental challenge, Mexico City has made it a priority to implement public policies to mitigate and adapt to climate change with the aim of increasing the city's resilience and minimizing vulnerability. This has lead the Secretariat of Environment/Ministry of Environment of the Federal District Government to create a record of GHG reductions to report the progress made with the Climate Action Program of the city of Mexico in order to promote accountability and transparency.

Today, the goal of reducing GHG emissions has been achieved. From January 2008 to June 2011, there has been a reduction of 5,772,033 tons of carbon dioxide equivalent (CO2e Ton) accumulated, representing 82% improvement over the goal of seven million tons of CO2e accumulated, which was set by the Program of Action Climate 2008–2012 [1].

With the creation of the Interagency Commission on Climate Change in the Fed- eral District (CICCDF), which is represented by 36 GDF agencies, the Secretariat of Environment has been able to institutionalize public policies to address climate change and encouraged the active participation of citizens, the academia, NGOs and even the industry.

The commitment to face the climate threats in a more secure way for the population enables to report the following progress:

- During the period January 2008 to June 2011, the greatest GHG reduction was in the transport sector, where emissions were reduced to 4,851,783 tons CO2e.
- The energy category (covering energy efficiency and renewable energy) reported a reduction of 183.425 tons of cumulative CO2eq. While water management contributed to the reduction of 1.804 tons of CO2e, waste management reports a reduction of 127.175 tons of CO2e and reforestation activities a reduction of 607.846 tons of CO2e.
- The main hydrometeorological threats for the city are heavy rainfall that generate flooding, heat waves and cold waves, high winds, hail, snow and atypical frosts or droughts. It is clear that disasters do not come only because of the threat itself but because of a high vulnerability that creates a greater risk.
- Consequently, the Programme of Measures for Adaptation to Climate Change promotes a set of short- and long-term actions for climate change risk reduction in Mexico City. It also promotes the generation of adaptive capacities that reduce vul- nerability and moderate the potential damages, taking advantage of the opportunities arising from changes in climate in Mexico City and the surrounding areas.

The Programme of Measures for Adaptation to Climate Change includes the following:

1. Identification of the main threats and vulnerability analysis – This includes studies which aim to understand and evaluate the different aspects of Mexico City's climate change vulnerability.
2. Integration of the adaptation perspective to enhance existing capabilities – Var- ious government areas (environment, civil protection, health, rural development and water systems) have functions related to the social adaptive capacity and should make this explicit in their activities. This line of action includes the creation of intra- or interlinkages on the basis of civil protection system and environmental system. It will be necessary to consider both the increase in risk and in vulnerability.
3. Implementation of adaptation actions – This refers to all actions that involve changes to infrastructure (water and roads), to buildings, to urban planning and to crops and biodiversity, in order to lessen the impacts of the manifestations of climate change on the basis of early warning systems and climate modelling.

On the issue of water, the Ministry of Environment has five programmes

1. Water Conservation Program in Federal District Housing
2. Water Conservation Program in Government Buildings and Offices of the Federal District
3. Energy Improvement Systems Pumping Equipment
4. Environmental Statement which states the obligation to submit Emergency Program Water Savings
5. Wastewater Treatment Program.

On the issue of energy, there are four major programmes

1. Sustainable Housing Program
2. Certification Program for Sustainable Buildings
3. Renewable Energy Program in Mexico
4. Energy Efficiency Program in the Federal District Government.

Conclusion and Recommendations

As urbanization progresses and planning in cities becomes more complex, Mexico City will have to act under the coordination of planning agencies and will have to work on the creation of appropriate legislations with the strength of civil society.

It is important to note that part of the urban population lives in precarious economic conditions, lacking basic health, water supply, education, housing, employment, etc. This reality requires that the limited resources available to the city are directed to solve the most urgent and basic problems of the population, among which are issues of water quantity and quality, energy supply and food security. Therefore, it is crucial to have the appropriate institutional framework and informed participation of all society members to address the problems and challenges associated with food, water and energy security.

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