



Final Opportunity to Rehabilitate an Urban River as a Water Source for Mexico City

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Abstract

The aim of this study was to evaluate the amount and quality of water in the Magdalena-Eslava river system and to propose alternatives for sustainable water use. The system is the last urban river in the vicinity of Mexico City that supplies surface water to the urban area. Historical flow data were analyzed (1973–2010), along with the physicochemical and bacteriological attributes, documenting the evolution of these variables over the course of five years (2008–2012) in both dry and rainy seasons. The analyses show that the flow regime has been significantly altered. The physicochemical variables show significant differences between the natural area, where the river originates, and the urban area, where the river receives untreated wastewater. Nutrient and conductivity concentrations in the river were equivalent to domestic wastewater. Fecal pollution indicators and various pathogens were present in elevated densities, demonstrating a threat to the population living near the river. Estimates of the value of the water lost as a result of mixing clean and contaminated water are presented. This urban river should be rehabilitated as a sustainability practice, and if possible, these efforts should be replicated in other areas. Because of the public health issues and in view of the population exposure where the river flows through the city, the river should be improved aesthetically and should be treated to allow its ecosystem services to recover. This river represents an iconic case for Mexico City because it connects the natural and urban areas in a socio-ecological system that can potentially provide clean water for human consumption. Contaminated water could be treated and reused for irrigation in one of the green areas of the city. Wastewater treatment plants and the operation of the existing purification plants are urgent priorities that could lead to better, more sustainable water use practices in Mexico City.

Citation: Mazari-Hiriart M, Pérez-Ortiz G, Orta-Ledesma MT, Armas-Vargas F, Tapia MA, et al. (2014) Final Opportunity to Rehabilitate an Urban River as a Water Source for Mexico City. PLoS ONE 9(7): e102081. doi:10.1371/journal.pone.0102081

Editor: Judi Hewitt, University of Waikato (National Institute of Water and Atmospheric Research), New Zealand

Received: December 25, 2013; **Accepted:** June 15, 2014; **Published:** July 23, 2014

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Funding: The authors would like to acknowledge the financial support of Gobierno del Distrito Federal, Secretaría de Medio Ambiente in conducting the project Plan Maestro de Manejo Integral y Aprovechamiento Sustentable de la Cuenca del Río Magdalena del Distrito Federal, through the Programa Universitario de Estudios sobre la Ciudad, Universidad Nacional Autónoma de México (2008–2009), and the project Sistema de Indicadores para el Rescate de los Ríos Magdalena y Eslava, Distrito Federal through the Programa Universitario de Medio Ambiente, UNAM (2009–2010). As well as the support of the Dirección General de Asuntos del Personal Académico through the Programa de Apoyo a Proyectos de Investigación e Innovación Tecnológica, PAPIIT IN219809. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Competing Interests: The authors have declared that no competing interests exist.

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Introduction

In megacities with populations exceeding ten million inhabitants, water is a scarce resource that is in high demand. The exploration and application of new, more sustainable water use and reuse approaches are urgently needed. Water managers must change the perspectives and policies that assume that water can only be used once by considering the benefits obtained from the natural environment surrounding the urban areas.

In emerging economies, cities grow before sufficient hydraulic infrastructure has been developed to handle the water supply and wastewater disposal requirements [1]. This lack of infrastructure

significantly affects the surface and groundwater systems, making waterways vulnerable to pollution and leading to deleterious effects on water sources and human health. There is a need for more adequate approaches regarding processes that occur at the basin level, in addition to directly considering hydrological ecosystem services, such as water provision and water quality.

During the evolution of what is now the Mexico City Metropolitan Area (MCMA), lakes and rivers have been transformed into drains or converted into sewers in the vicinity of modern avenues, and freeways transit over piped waterways [2]. The hydraulic system of the Basin of Mexico, where the MCMA and its 22 million inhabitants are located, has been irreversibly