

## **Improving stormwater management in the context of Mexican middle-sized cities. Case study in Tepic, Mexico.**

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### **Abstract**

Mexico is an emerging nation where basic water and wastewater management is developed at a high degree. It is estimated that currently around 95% of the population in urban areas count with access to drinking water and are connected to sanitary sewer. Furthermore, a rain sewer usually complements the sanitary sewer in a separated or in a mixed scheme. Nevertheless due to the high sealing degree in the cities and to blockages in the sewers, problems appear when the rain events are intense and the consequence is flooding in the cities. The climate change may affect the rain events in certain regions of the country, by making them more intense than before. This increases the flooding risk as the installed sewers may collapse with the increasing water volume to be conducted. It may also increase the infiltration of rain water to the sanitary sewers. The situation calls for creative improvements in the rainwater management to relieve the pressure on the sewers, to avoid or reduce the negative impacts of flooding and to ensure a proper operation at the WWTPs.

In order to suggest improvements for the stormwater management in the urban context of middle sized Mexican cities, the present case study was carried out for the city of Tepic in Mexico, where the population by 2030 it is estimated to be 470,000 Inhabitants. The study is based on the simulation of the water (including rain) and wastewater management in the city in year 2030 and the objective of the suggested alternatives was to relieve the pressure on the rain and sanitary sewer after rain events and thus to help to avoid flooding. On the other side, groundwater is the main source of drinking water in the city. The aquifer named *Valle de Matatipac* provides water for Tepic, nearby rural settlements and for the local agriculture. In 2003, the groundwater demand in the region had already exceeded the recharge of the aquifer by 12 Millions of m<sup>3</sup>. The situation nowadays is expected to remain unchanged or have worsened as no comprehensive water saving measures have been implemented and

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the demand has growth in the last years. Therefore, it was a parallel objective of the study to provide for stormwater alternatives that could improve the groundwater recharge.

The alternatives considered as appropriate for the city included the reconditioning of disused groundwater abstraction wells as recharge shafts, the construction of dry wells and of infiltration trenches coupled with vegetated swales and the use of pervious pavements. Three implementation scenarios were simulated in the model in direct relationship with the level of engagement of the decision makers:

- a) Modest scenario: realistic changes estimated by low engagement.
- b) Medium scenario: larger changes and greater investments by higher engagement.
- c) Challenging scenario: maximum estimated achievable improvements.

The presentation will deal on the results of the carried out simulations focusing on the factors that could promote or hinder the implementation of the suggested measures in this and other similar Mexican middle-sized cities.