

# Urban Wastewater for Peri-urban Agriculture in Northwest Mexico: Health Risk, Water Resources, and Sanitation Policy Challenges

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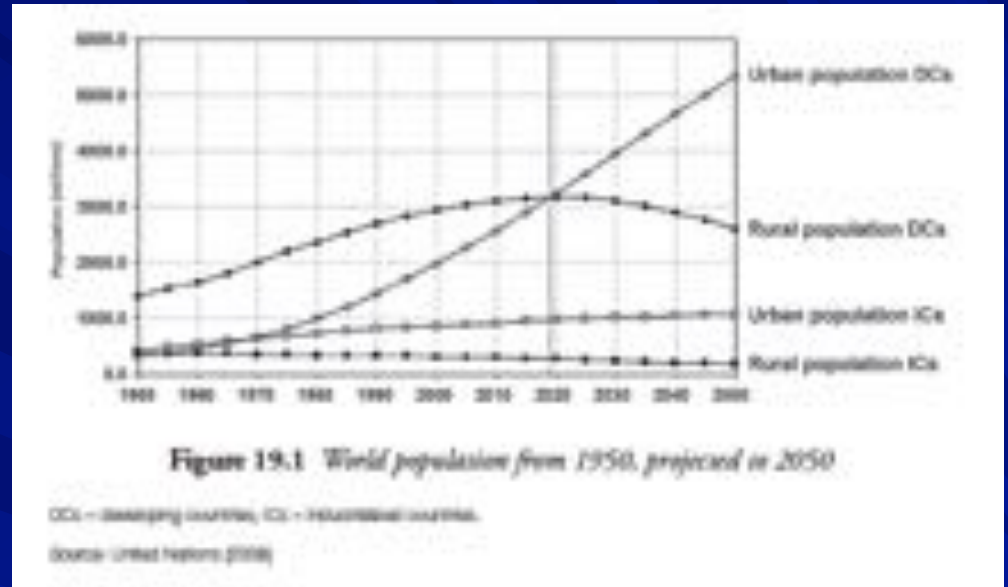
El Colegio de Sonora, Hermosillo, Sonora, Mexico

# Wastewater boom

- Urbanization
- Water supply + latent (unmet) water demand
- Expanding sewerage (collection & “disposal”)
- Results of Millennium Development Goals, and present Sustainable Devel. Goals investments
- **Yet, wastewater (treated effluent & raw sewage):**
  - profound public health, poverty, and livelihoods implications
  - a traded commodity (informal and formal markets)
  - regulated using overly simplistic, antiquated frameworks
  - research emphasis on case study documentation
  - receives inadequate investment, management & policy

# Global population explosion

- Vast majority of all demographic growth now occurs in developing country cities



- India has crossed the 50-50 urban-rural population threshold... **750 million urban Indians by 2050**, most without adequate sanitation
- China actively plans for **cities each with more than 100 million** population... infrastructure nightmare
- **Africa's** urban population growth rates are the **highest in the world**
- **Latin America** has been **predominantly urban for decades**

# AGRICULTURAL REUSE INEVITABLE



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# Kumasi, Ghana



# Hyderabad, India



# Faisalabad, Pakistan



# Hermosillo, Sonora

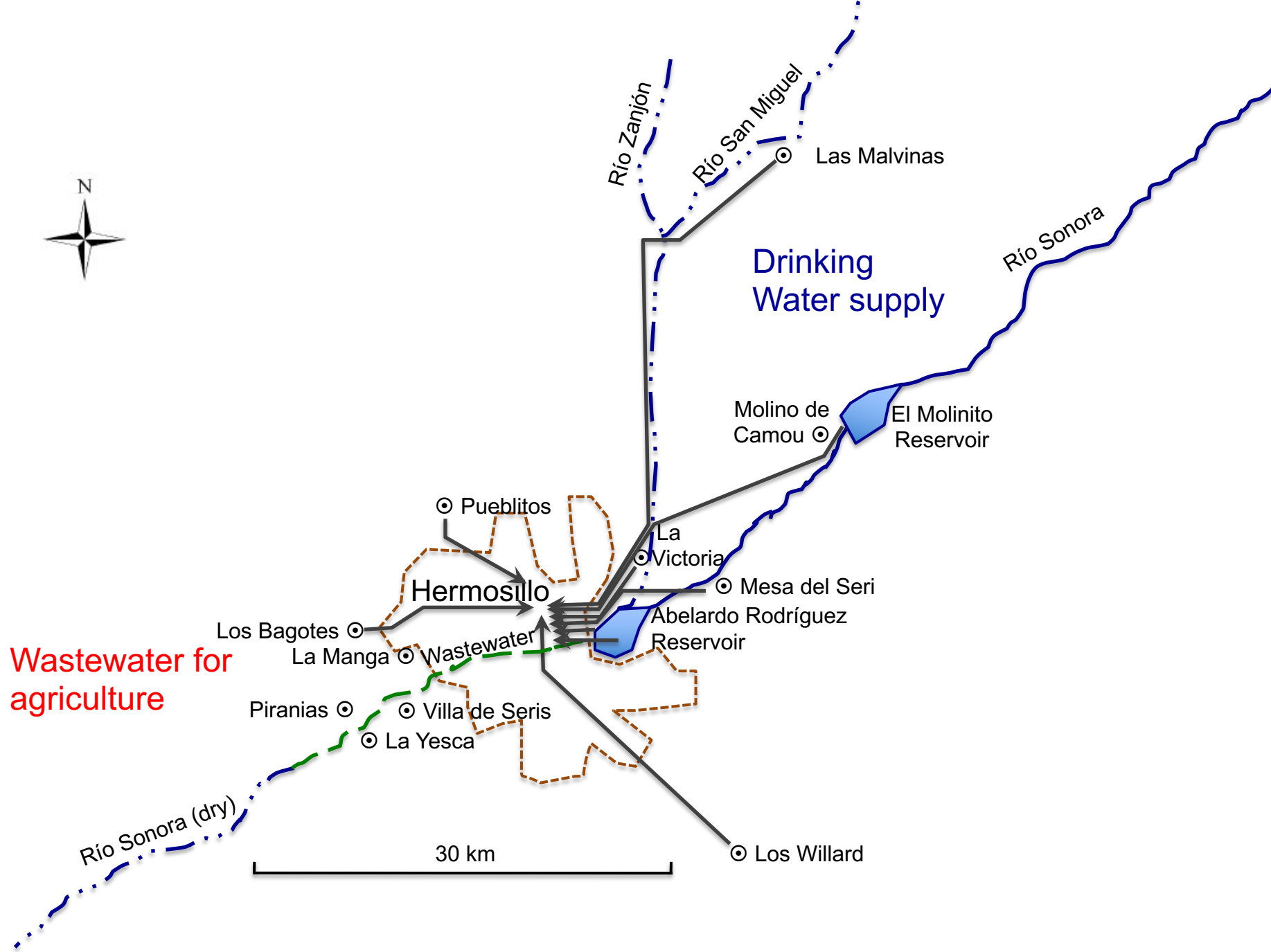




# Northwest Mexico

## Wastewater Case Studies





Wastewater for agriculture

Drinking Water supply

Hermosillo

30 km

Río Zanjón

Río San Miguel

Río Sonora

Las Malvinas

Molino de Camou  
El Molinito Reservoir

La Victoria

Mesa del Seri

Abelardo Rodríguez Reservoir

Los Bagotes  
La Manga

Piranias  
Villa de Seris  
La Yesca

Pueblitos

Los Willard

Río Sonora (dry)

# Hermosillo - 3 periods

## ■ 1970s-2016

- No operating wastewater treatment plant (WWTP) – agriculture use of raw wastewater

## ■ 1994-2014

- Bumpy road to political will, finance, design and build WWTP

## ■ 2016

- WWTP operation

# 1970s-2016 Agriculture use of raw wastewater

- Unregulated and unplanned (informal organization by ejido growers)
- Wastewater used to grow fodder for cattle
- Contamination, bad smell, and health risks
- Wasted opportunity (cost)

# 1994-2014 Bumpy road to WWTP construction

- WWTP construction devised and cancelled several times
  - 1994-1996 big project cancelled due to Mexico's economic crisis of 1995 -wasted money and legal feud in courts.
  - Political bias to assign and choose construction firm and operator (BOT for 20 years)
  - 2000s Single large plant (by sole contractor) chosen instead of numerous, distributed small WTTTPs.
  - Contested project – put off several times (went to court for final decision).
  - Planned as an isolated project with no reuse consideration.
  - Isolated from the rest of the urban water system

# 2016 - WTTTP operation

- Late and made to comply with legal obligation due since 1996
- Water rates sharp increase due to the operation of WWTP (water users pay for WTTTP but don't see the benefit – plant out of town)
- No reuse consideration or planned
  - Current raw wastewater farmers now have to pay to pump water (conflict)
  - New prospects of effluent water considered (cement plant or new more modern farmers) – conflict with old farmers.
- Operation is not financially sustainable
  - Too expensive operation costs and not enough and certain revenue
  - Bankrupt city water utility is to pay for the operation
  - No income from sale or reuse of treated wastewater
- Paradoxical challenge for sanitation policy

# La Paz and Mexicali – Generic findings

- Managerial capacity of WWTP operator (within municipal, public utility company) needs to be strengthened
- Financial cost recovery of WWTP and operating costs pose huge challenges locally
- La Paz has especially important ecological and tourism-related needs for effective treatment – no downstream agricultural reuse opportunities such as in Mexicali or Hermosillo

# Commodity, resource, or hazard?

## *Water security/ human security tradeoff*

- Wastewater value high in water-scarce regions
- Latent irrigation and environmental demand
- Increases land values
- Growing resource-value for urban reuse
- Wastewater markets & informal trading expected to increase
- Current regulation absent or highly disarticulated (minimizing hazard impact; little attention to wastewater resource or “service”)



# Wastewater regulation

- Multiple uses, multiple users
- Overlapping jurisdictions
  - Water supply
  - Urban development
  - Public health
  - Environmental protection
  - Agriculture/ irrigation
  - Civil society
- Need coherent institutional framework
  - Promote beneficial reuse while mitigating risk
  - ‘Polluter pays’ principle to mobilize funds
  - Stockholm Framework - adaptive, evolutionary

# Major findings

- In Mexico (representative of many middle-income countries)
  - National level treatment only 50% despite 20+ years of sanitation investments and regulation (NOM ECOL 001 – 1996)
  - Sanitation policy has stagnated, in part due to inadequate institutional and financial models at local level
- Wastewater treatment should be integrated with the rest of:
  - Urban water cycle – to support supply and city uses
  - Water cycle in general –w-water feedback loop.
- Financial sustainability of WWTP is critical – reuse could be a source of income to pay for operation
- Reuse must be planned, encouraged and furthered according to their economic and social value.
  - Agricultural – crops
  - City uses – nurseries, park irrigation
  - Industrial – many possibilities

# Thanks

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[www.lrfoundation.org.uk](http://www.lrfoundation.org.uk)

## ■ For further information, see:

<http://aquasec.org/wrpg/waterreuse.html>



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