

The 35th Energy-System, Economics, Environment Conference

The Energy-Water Nexus in Mexico

December 13, 2018

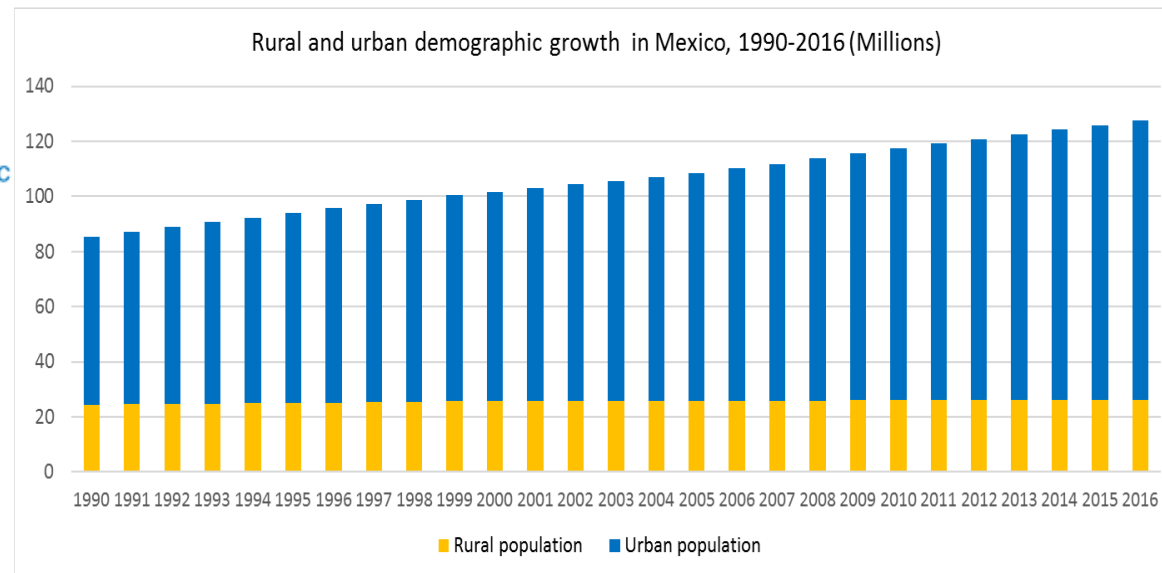
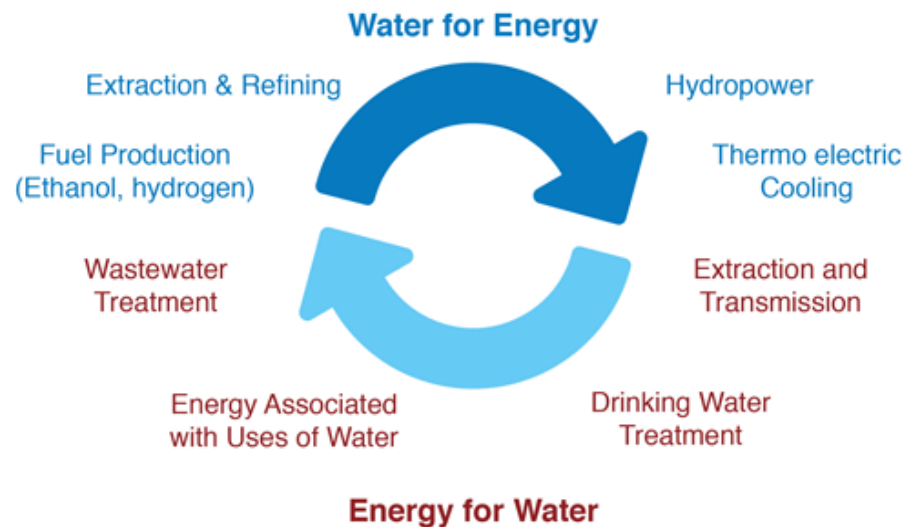
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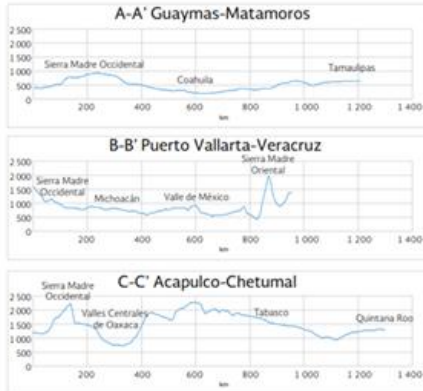
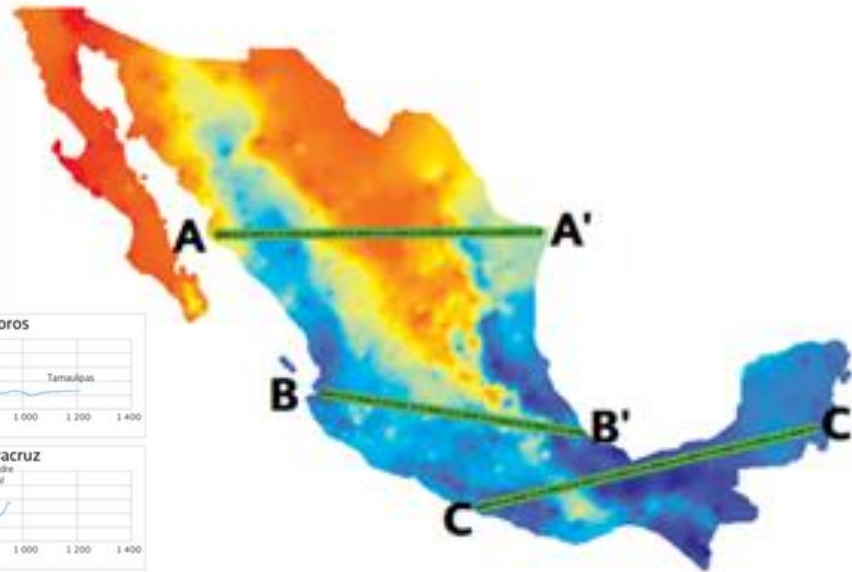


The Energy-water nexus in Mexico



- *Globally, population expansion and urbanisation have put stress on both water and energy demand.*
- *Providing access to water and energy are tightly related policy problems with interwoven challenges and issues.*
- *In Mexico, the water-energy nexus is not a key priority for either sector.*
- *The institutional frameworks and policies of both energy and water management work in a fragmented way.*
- *Three case studies: Water in the energy sector, electricity and public water consumption, and electricity and water consumption in the agriculture sector.*

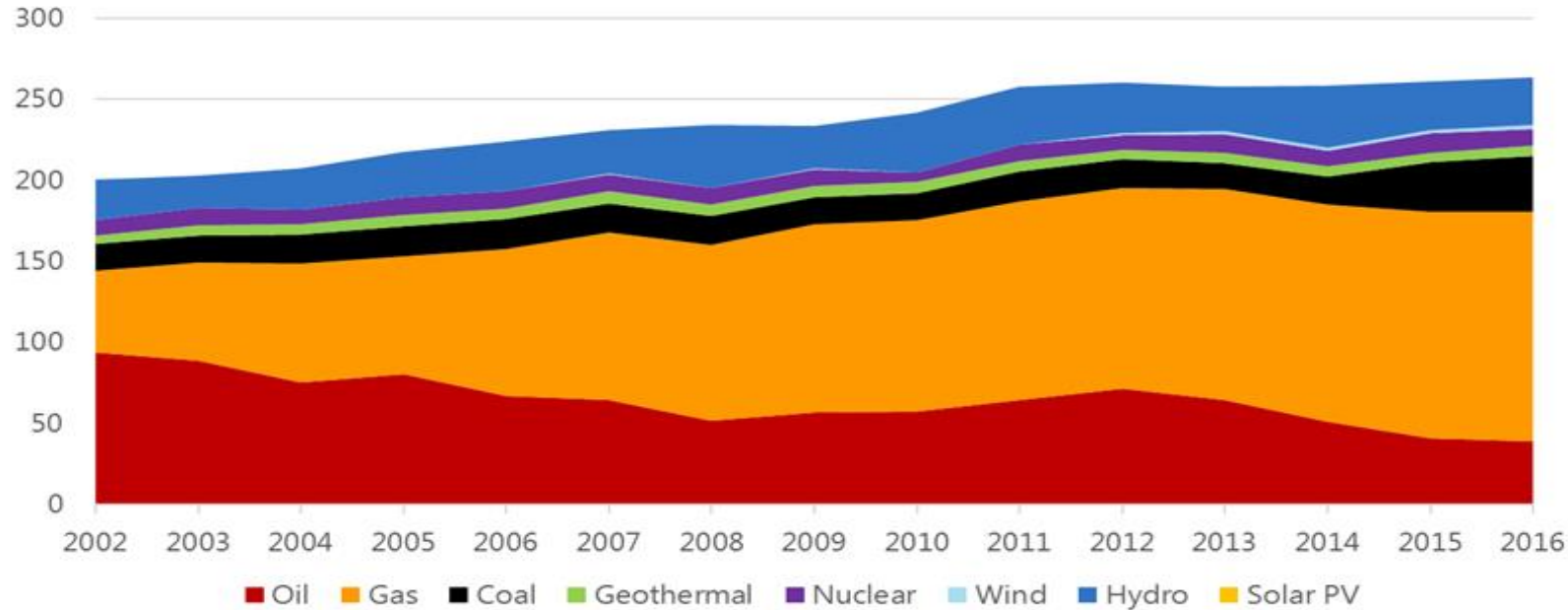
Mexico, different realities for water and energy access...



- *In Mexico, about 67% of rainfalls are between June and September and only a handful of Southern states (least inhabited region), receive about half of total rainwater.*
- *Income extreme inequality, 44% of the population was living in poverty in 2016.*
- *1.85 million people have no access to electricity.*
- *Around 6 million without access to piped water.*
- *9 million Mexicans do not count with sewage in their households.*

Water in the energy sector in Mexico

Power generation in Mexico by fuel, 2002-2016 (TW/h)



- *Relevant for all sectors but most intensive for electricity generation.*
- *Fossil fuels account for over 80% of power generation; water used as cooler.*
- *Equivalent to 5% of total water consumption in Mexico (world average; 18%).*
- *Due to lower coal share (10% vs 38%, globally).*

Water in the energy sector in Mexico



- *However, power generation projects in areas with low water availability or scarcity, have troubles with both the operation and the development of new infrastructure.*
- *Water is critical for 90% of electricity generation.*
- *An integrated approach for analysis, planning and decision-making process is required.*

Electricity and public water consumption

Water prices by use in Mexico's 6 largest cities, MXN/m³

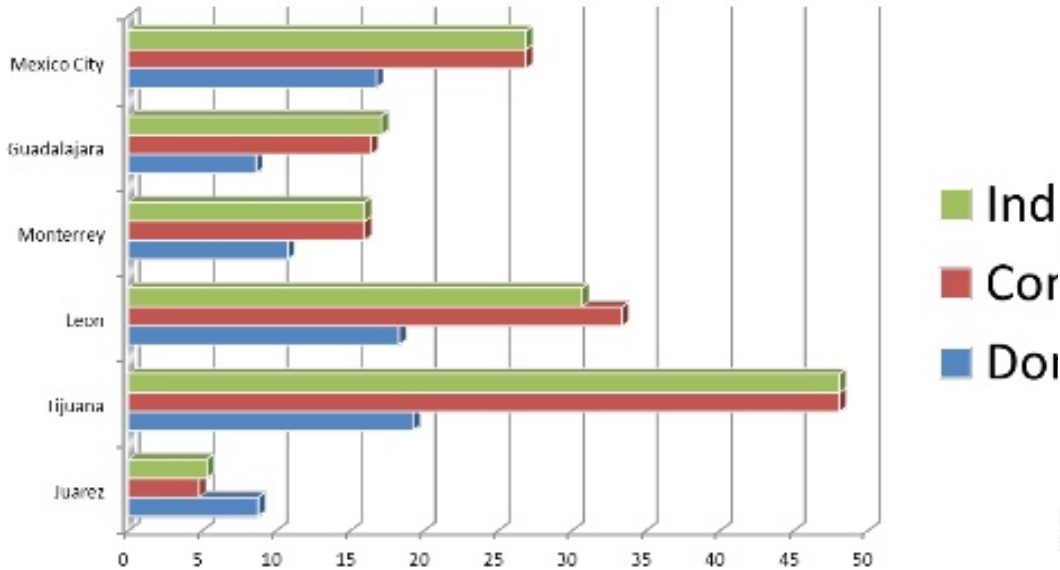
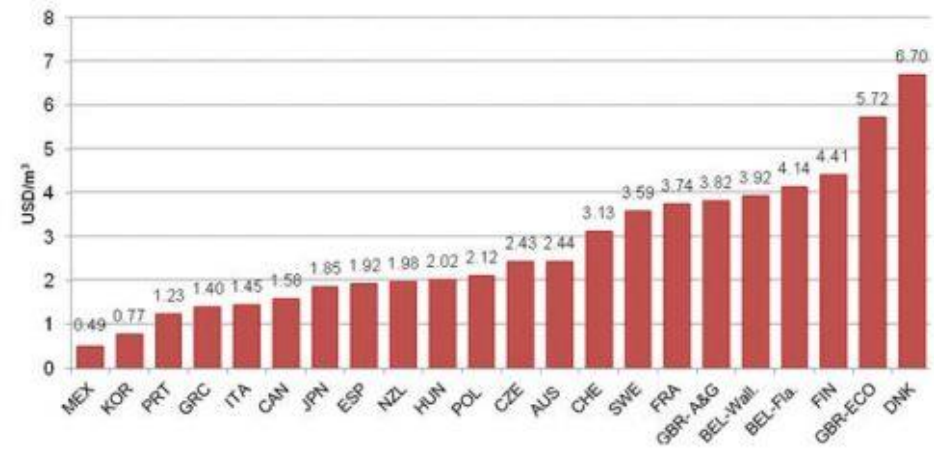


Figure 2. Unit price of water supply and sanitation services to households, incl. taxes (USD/m³)



Source: OECD estimates based on country replies to the 2007-08 survey when available, or public sources validated by the countries

- Cities and towns require substantial amounts of energy (mostly electricity) for water pumping, pipeline transportation, purifying, sewage treatment, etc.
- Public water consumption is the second largest use with 15% of the total.
- A complex legal and management framework on water use and the structure of the electricity sector have resulted in poor and ineffective water governance in Mexico.
- Weak municipal water utilities and poor management at the federal level.
- Water bills very rarely represent real costs of extraction, transportation, purifying, sewage, treatment, infrastructure maintenance, etc.

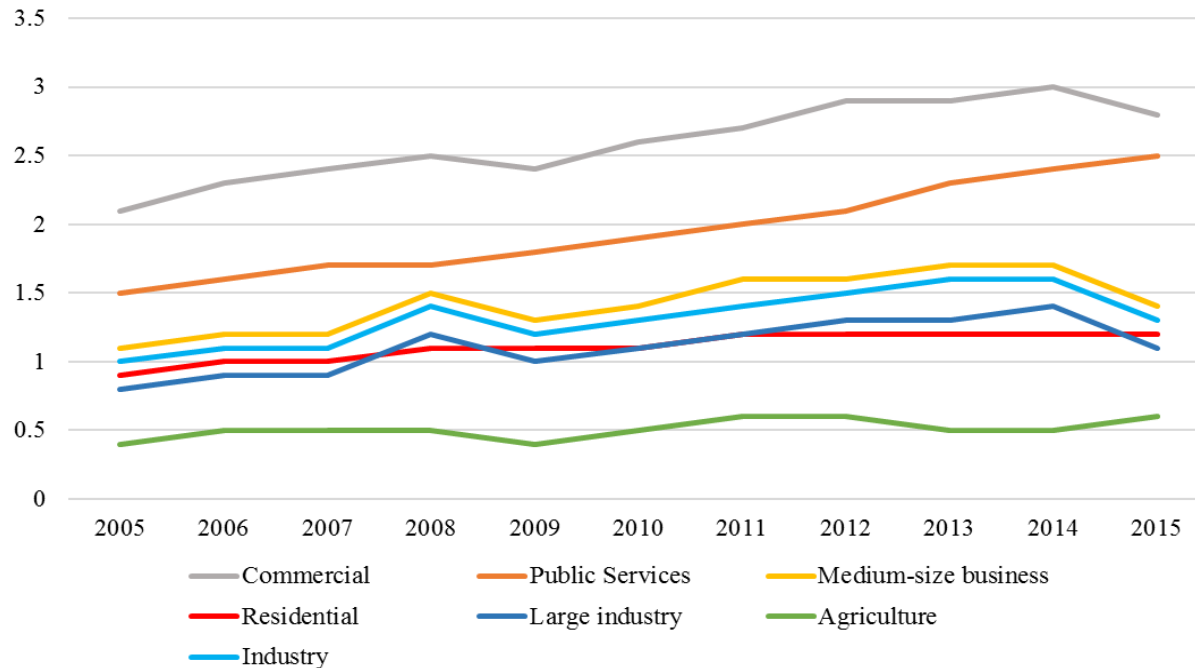
Electricity and public water consumption



- *Only 44% of water use is treated, the rest is simply discharged directly to rivers, agriculture fields, lake or seas.*
- *40% of total water treatment capacity remains idle or is out of service due to lack of repair or poor maintenance*
- *CFE, state-owned power utility, and municipal water utilities; vicious cycle.*
- *Water rates subsidies, really benefit the lowest-income population?*

Electricity and water consumption in agriculture

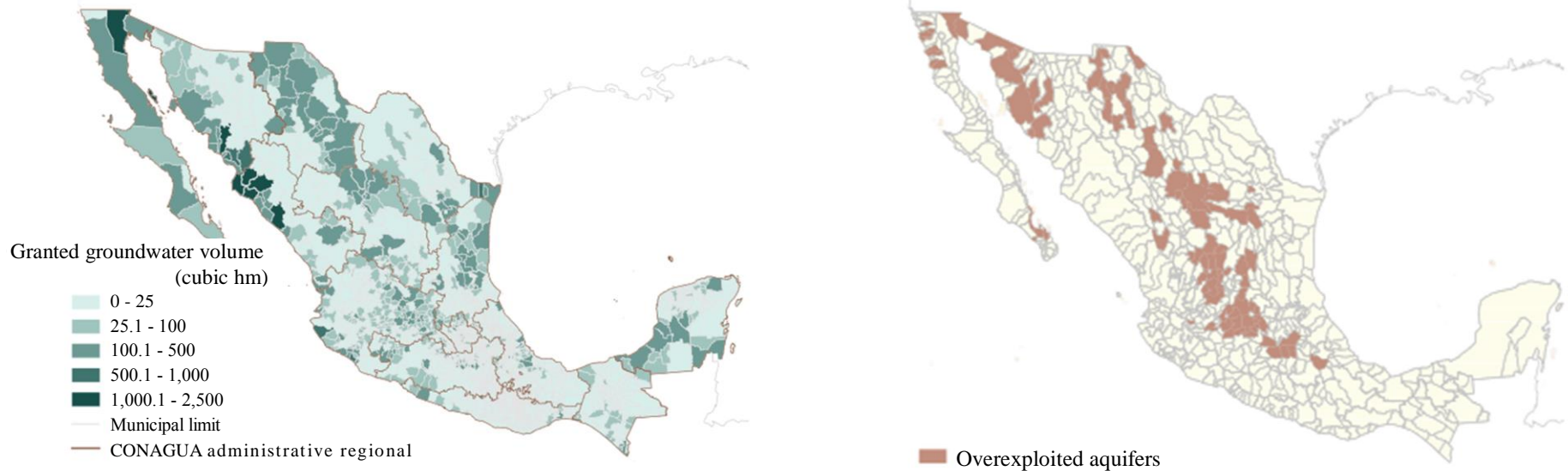
Average electricity prices by sector in Mexico (2005-2015, MXN/KWh)



- *Agriculture accounts for 76% of water consumption but only 4% of GDP.*
- *1/3 of these volumes come from groundwater (27% of total). All of them pump water with electricity.*
- *Key driver: heavily subsidised rates for agricultural users (0.02 USD/KWh).*
- *Subsidy to benefit impoverished farmers, but actually the 33 largest users benefit by USD 25,000 each year, while the 17,000 smallest users only benefit by USD 25.*

Electricity and water consumption in agriculture

1,000.1 - 2,500
Municipal limit
CONAGUA administrative regional



- *Moreover, 105 of Mexico's 653 aquifers are overexploited.*
- *Most of these overexploited aquifers are located in the 4 states with larger agriculture production.*
- *This subsidy has lead to wasteful consumption and lack of rules enforcement from CONAGUA, the federal water authority.*
- *Despite the longstanding and severe environmental, energy and budgetary consequences, this issue has received little political and media attention. Powerful lobbying.*

Conclusions

- *These three different issues show the increasing interdependence of the energy-water nexus in Mexico.*
- *Each case highlights how the planning and policy approach have failed so far to consider the energy and water sectors jointly.*
- *The consequence have been higher electricity generation costs, aquifer depletion, higher CO2 emissions, hygiene and health problem in some communities and damage to ecosystems.*
- *Urgent problems that require attention and deep policy changes from key actors. e.g. investment on non-hydro renewables, electricity transmission grids, water transmission networks, revision of subsidy structures, re-structure of water management schemes.*



Thank you!

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