Civil, Environmental and Geomatic Engineering
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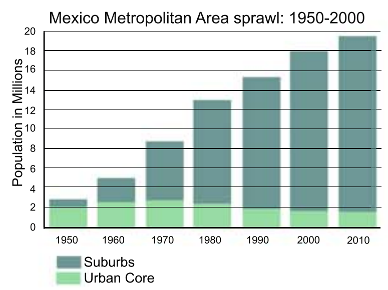
MEXICO CITY´S BLUE PATTERN

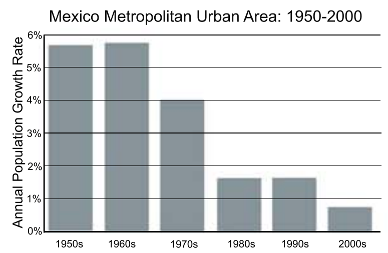
UCL

Introduction

Mexico City and its Metropolitan Area is one of the biggest urban settlements in the world, having about 20 million of inhabitants (Tortajada, 2006). The city by itself is incapable to supply basic services to its citizens, such as fresh water. To ensure the water supply to Mexico City´s population, it is getting necessary to get and transport water from further places. However, the construction work would be inefficient because the population is still growing. (Mazari Hiriart, 2001 and Dominguez Mora, 2000)

Mexico City rapid growth happened between 1940's and the 1980's, forming the peri-urban area conformed basically by informal settlements "asentamientos irregulares" or "colonias populares"(Connelly, 2003). However, during the last 60 years these settlements have change or have upgraded while other have been created. These areas change as the cities evolve, creating a diverse pattern in the informal peri-urban area. Because of its rapid or informal conception, these irregular settings experience several deficiencies and problems. The OECD Economic Surveys of Mexico (2015) pointed out that the main problem of the city is its segregation or socio-economic fragmentation.

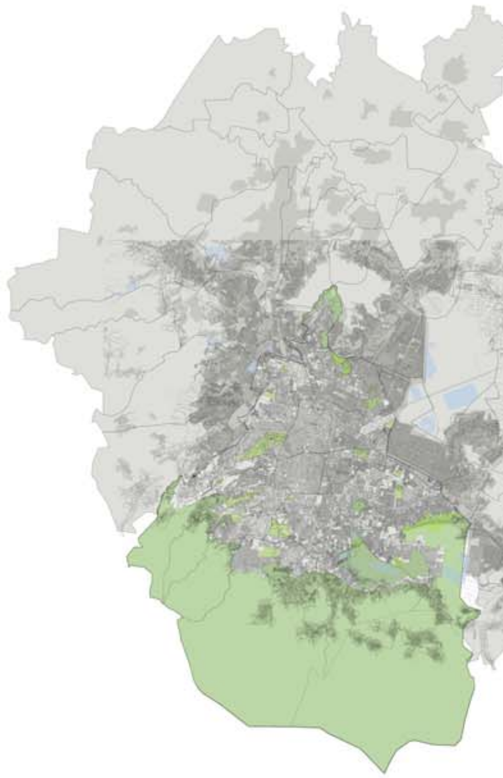




Wendell Cox (2011) The Evolving Urban Form: The Valley of Mexico

Mexico City was originally settled over a network of lakes. Through the time these lakes disappeared in order to provide "resilience" to the city against floods. Finally, the lakes were dried out at the beginning of the Twenty Century, surviving just some aquifers in the city (Legorreta, 2006).

Images by Tomás Filsinger on Mexico. City of Lakes: Searching for Pantitlan (2010). Mexico City over time: 1520, 1850 and 2000.



Urban sprawl 2010

Mexico City Metropolitan Area

Federal District

From 1970 to 2000
- 600 ha of forest and
- 8,842 ha of conservation land were lost because urbanisation process

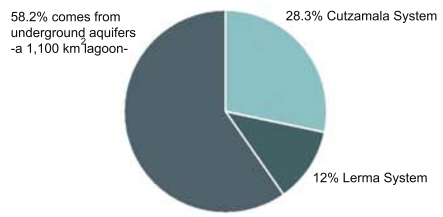
- 3,457 ha of illegal settlements
- 179 legalized settlements

85,986 ha conservation land and natural ecological communities (Diaz-Chavez, 2006, p.257-258)
- 35 rural settlements (400,000 people) are located in conservation areas

- 160 million gallons of storm water lost
the water that used to be infiltrated into the subsoil, it is disposed as polluted water (Fox, 2002).

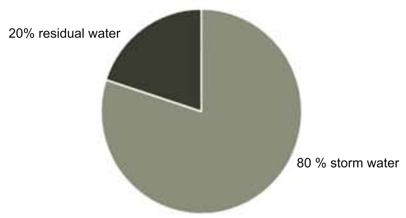
Based on 2005 map by Clemencia Santos-Cerguera on La zona metropolitana del Valle de México: Transformación urbano-rural en la región centro de México (2012)

Mexico City consumes 62 thousand litres of water per second.



Tortajada (2006) and Centro Virtual de Información del Agua (http://www.agua.org.mx)

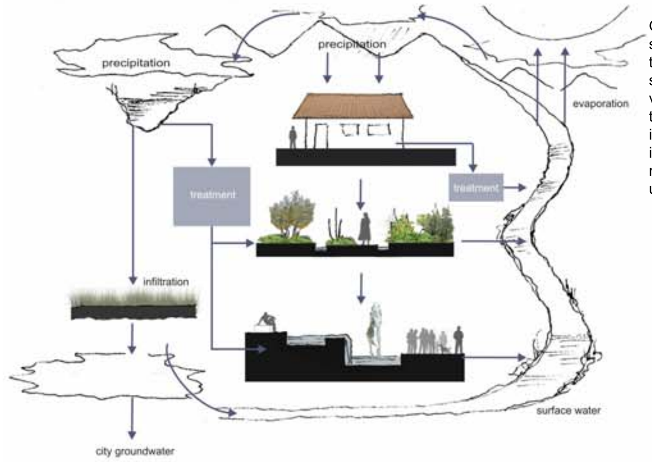
In Mexico City rains about 700 mm of water/year
Water disposed is 210 m³per second



Merino (2000).

Methodology

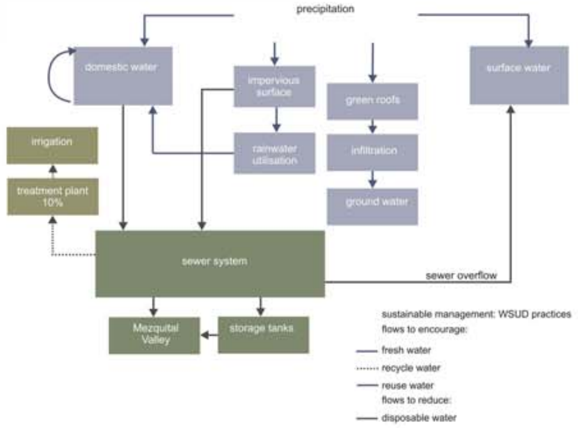
Water Sensitive Urban Design (WSUD) takes water as the main driver in the urban planning, managing it as an asset instead as a hazard (Lundy et al., 2013). This method also aims for a better water use, promoting alternative sources to provide drinking water, such as water recycling and storm water harvesting (Sharma et al., 2012). WSUD accomplishes the water balance through an integrated framework that rehabilitates the entire urban water cycle —supply, sewerage and storm water— within the urban development (Fletcher et al., 2014). Encouraging a city that simultaneously embraces liveability, sustainability and resilience through urban water planning and management (Ferguson et al., 2013); while the community adopts a sensitive involvement towards efficient water use behaviours (Wong & Brown, 2009).



One of the main goals of WSUD is to restore the water cycle within the urban pattern. For that reason, it is important to consider the network between public and private spaces and to reinforce the interaction between human and water, emphasizing the water recycle and re-use before reincorporate it into the nature. That means, reincorporate several small cycles of water use in the everyday activities.

In addition, it is important to make WSUD feasible, therefore human involvement and economies incentives (energy reduction, food production, amenities, among others) should be use to preserve the water cycle for a long time. That means, develop a Green Infrastructure.

Green Infrastructure (GI) creates green spaces and corridors among the whole city, improving the social equity through amenity hubs (Fletcher et al., 2014), and comprises ecological and social processes simultaneously, improving the society wellbeing and the ecosystem health (Young et al., 2014). GI encourages the site's resilience through the maintenance of its ecosystem services (Sussams et al., 2015).



Considerations

water cycle

It is important to restore this cycle in order to maintain the city´s underground aquifer, reduce energy in supplying and disposing water; as well, it is vital to restore the ecosystem in the southwest peri-urban area to maintain the city´s underground water. Recycle and reuse water is a main principle.

aquifer restoration

This mean to keep the aquifer level or underground water lagoon balance. The aim is keep the equilibrium, in order to continue using this water instead of importing fresh water for external basin springs, which represents a high cost. Reduce energy and avoid subsidence in city centre.

water quality

Because of the water of the underground is used as domestic water for the city, a proper use of sustainable drainage has to be use to avoid any kind the pollution to infiltrate to the underground. Aim: protect water quality instead of treat it.

urban pattern

Urban planning and improvement proposals overcome the upgrading like statistic remedy for a dynamic environment. In peri-urban areas the dynamic is even more complex, because this areas are transitional zones between urban and rural systems (Allen et al., 2005). They have different urban characteristics as they are in different stages of growth.

social coherence

Social consistency is important to create a common goal, which is WSUD. Also, it is important for the community to be aware of the benefits that can obtain as a team, especially to promote and maintain the water cycle and the ecosystem service for a long time.

allotments

Urban orchards are a good solution to incorporate water sustainable management practices into a community. In that way, water harvesting or water recycling can be use and produce an asset that can promote well-being into a settlement with a low cost.

community involvement

Even though community participation projects, the government tends to create a traditional urban development where new houses do not fulfil the occupant's necessities. Koster & Nuijten (2012) explain that it fails due that this upgrading force people to live in a political and economic order, when they may be excluded from such order.

conservation areas

The map shows how urban sprawl had damage the conservation area. It is important to maintain this area because the ecosystem services it provides. WSUD is a good planning method, because it promotes a new philosophy among the communities, supporting water cycle through sustainable activities. This can include land conservation.

open space

Amenities and recreational spaces are also services. The lack of them in the peri-urban not only shows the informal urban growth, it also reflects the authorities´ blur responsibilities in that area. Spatial segregation is a big problem in Mexico City, but with the creation of green networks this problem can be alleviated.

green infrastructure

Green spaces can easy become neglected areas perceived as treats. The transformation of this areas into neglected zones are the result of a planning process that fails to understand urban complexity (Kaika, 2005) It is important to understand the social-nature character into the design process (Young et al., 2014).

Discussion

Mexico City has two main problems concerning to its urban structure: an environment neglected urban design, and the continuing of urban sprawl, especially in the Metropolitan Area (State of Mexico). Even though, many settlements have evolved and growth into the urban pattern, because of their precarious or informal origin, they still remain having some inefficiencies, such as the lack of recreational, social and cultural facilities. Urban infrastructure plays an important role shaping the urban form. In that way, this project will try to reverse the urban problems through the incorporation of a green infrastructure, within an existing metropolitan irregular pattern, focusing in the storm water management.

Traditionally, Water Sensitive Urban Design (WSUD) encourages a better water management. But a social measure of this approach should get done in order to study the real benefits to introduce this system, as a Green Infrastructure. Existing proposals indicates that community participation is essential to deliver neighbourhood improvements, while the conventional planning is failing to succeed in this task. For that reason it is important to rethink urban planning to accomplish an environmental and social cohesive approach.

In that way, it is important to answer the next questions:
- Is it possible to **mitigate** the water problems in today cities through a Water Sensitive Urban Design (WSUD) within non-traditional urban planned sites?
- Does a Water Sensitive Urban Design (WSUD) can contribute to deliver a proper informal area **upgrade**?
- Has a Water Sensitive Urban Design (WSUD) the necessary **flexibility** to provide an infrastructure that moves within the settlement´s dynamics?

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