"Sustainability Stations" for Cleantech 2013

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ABSTRACT

The Sustainability Stations is a project focused in solving Mexico City´s problem of lack of water and floods. Both situations are related to the water extraction from the soil water table, which represents 71% the principal source of the city´s water supplement. The extraction of the water causes many settlement throughout the city producing the city´s flooding, so the sewerage network cannot maintain the necessary slope for the eviction of the waste water. The main purpose of the project will be the water harvesting in order to avoid water table extraction for supply.
The raining season varies through the year and for this reason, the project needs combines other recycling functions in which will let the facilities to operate thought out the whole year. By adapting other recycling program will allow to concentrate the labors in the non-raining periods. The use selected was one that also will also benefit the city, which is the recollection of the material that is used for packing like; paper, cardboard, glass, plastic and aluminium. This recyclable waste material will be collected, cleaned, compacted and prepared to be transferred to proper recyclable facilities for proper reuse. The paper will be the only waste material which will be recycled in the Station because it´s technological process is easy in comparison with the others and doesn't represent a risk for the water harvesting.

WATER PROBLEM

Mexico city´s has approximately 20.4 million of habitants, making it one of the cities with more population in the world. The number of inhabitants will increase in the next years and with it the lack of water. The 2.5% of water city supply comes from ground sources such as lakes that still remain in the city. Aqueducts provide 26.5% of the water which it is brought to Mexico City. The aqueducts system currently used to bring the water to the city must carry it from other state, having to travel 127 kilometers and pump it 1,100 meters. Finally the 71% of the water is obtained by the water table extraction. Because of the clay soil in the city, the extraction causes differentials settlements in the entire city, which are irreversible, and that causes many other consequences, such as: cracks in the streets, damage in buildings foundations, and the main consequence is suffered by the sewage networking, it no longer has the slope necessary for the eviction of the wastewater, producing floods. The lack of slope for evictions, cause a mayor problem and pumping systems were necessary to implement for the waste water expulsion. Both pumping systems of water, for bringing water and for eviction, utilize a lot of energy equivalent to the energy used in a reactor of 800 megawatts.

Therefore, they are expensive and require a lot of maintenance, so they do not represent a long-range solution for the future.
Water harvesting may be the solution for the lack of water and floods of the city, which does not harm the environment. The collection of rain water will decrease the water table extraction, and the environmental and urban consequences. Furthermore by collecting rain water will benefit the sewage system, which often is saturated with sewage and rain water. By separating rainwater sewage water the sewage system will be more controllable and easily maintain.

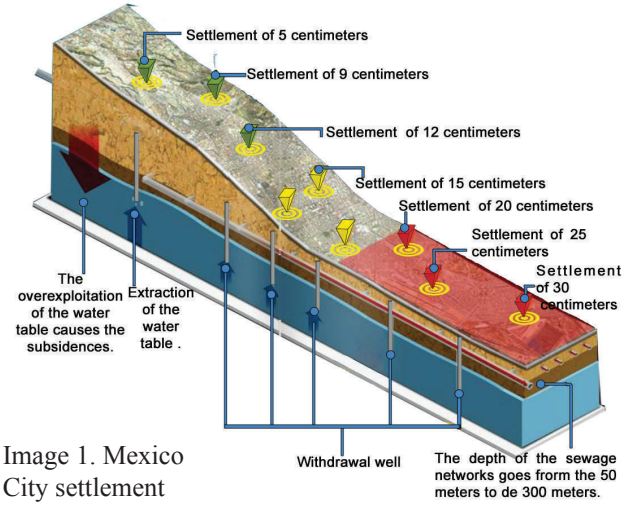

Image 1. Mexico City settlement

The purpose of combining the harvesting of water with the recollection of recycling materials is to allow the Station to be functioning throughout the whole year, and to generate employment all year long.

Mexico City also has a problem with the recycling materials production and management, because the city produce around of 18,000 tons of garbage daily, and only 3.3% of this is recycled. This is reflected in the overexploitation of sanitary landfills, having to construct more, which are one of the most important causes of atmospheric and subsoil contamination.
By promoting the recycle in the city, it will benefit the inhabitants and will also allow the Sustainability Station be multifunction.

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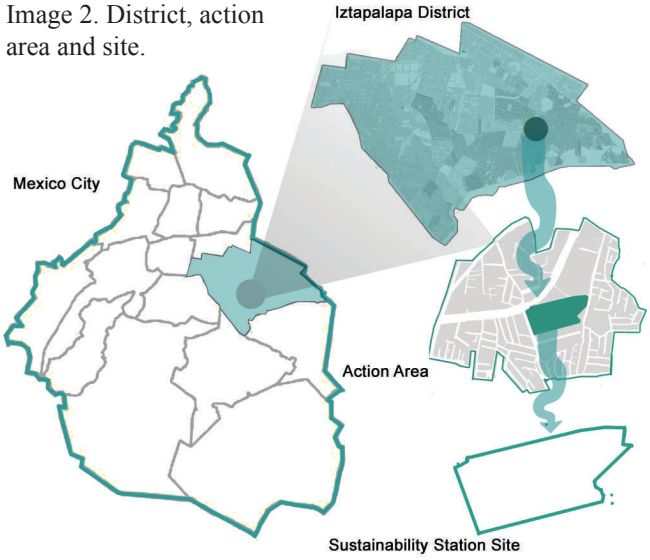
LOCATION

The project location was selected strategically base on geography, socioeconomic, and location. This district is named Iztapalapa, and it is located in the east of the city. This location chosen meets many of the demands of the program such as; altitude where water is difficult to supply because to its high elevation, poor areas where the infrastructure is not well connected, and the distance in which this areas are located. Additionally many of this areas government does not charge water fees to its citizens because they fail to provide this services.

The site selected for the Sustainability Station is in the center of the area in need of water. This project will supply with water an action area in Iztapalpa´s district and also will collect recycling material in the area.

Image 2. District, action area and site.



HOW DOES THE SUSTAINABILITY STATION FUNCTION?

Water Harvesting

The water harvesting will be held in two streets of the action area from a hills located in the area until to where the Sustainability Station will be found. The water will be routed with the help of the acclivity of the area.

For the street recollection it will be necessary incorporate ditches on one side of the garrison of the street. The ditches will have two sections, the first one for the gray waters that produce in the dwellings when washing cars, floors, etc.. And the other is for the rain water recollection of the street.

Image 3. Rain Water Recollection in Street

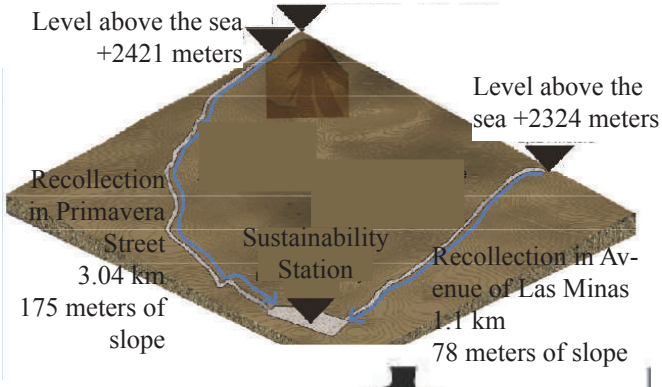


Image 4-5. Street Section and Floor

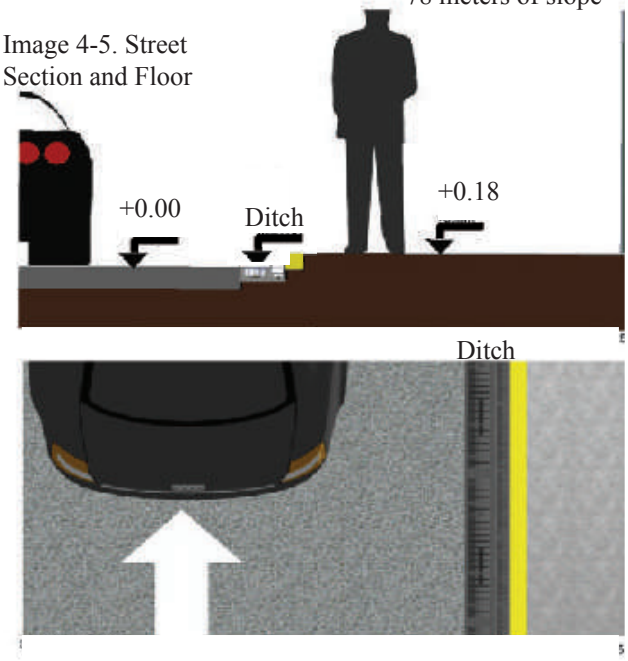


Image 6-7. Street Rain Water Recollection System

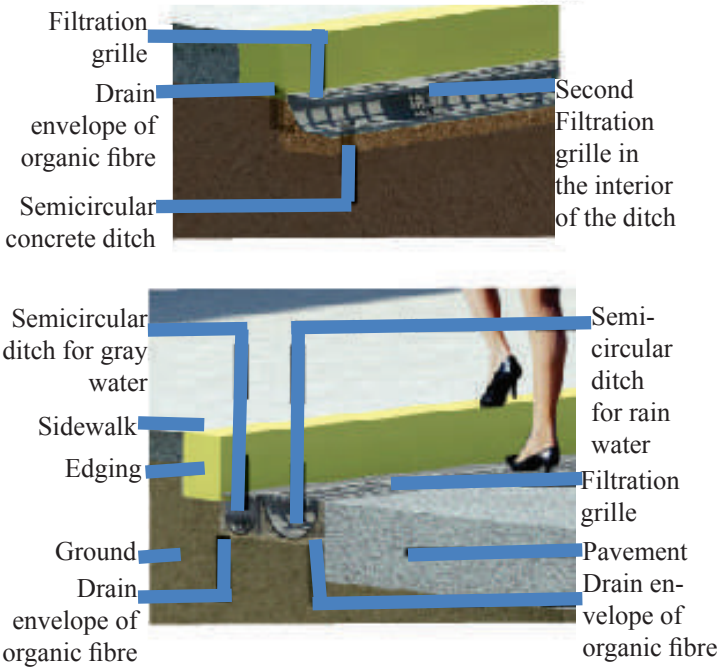
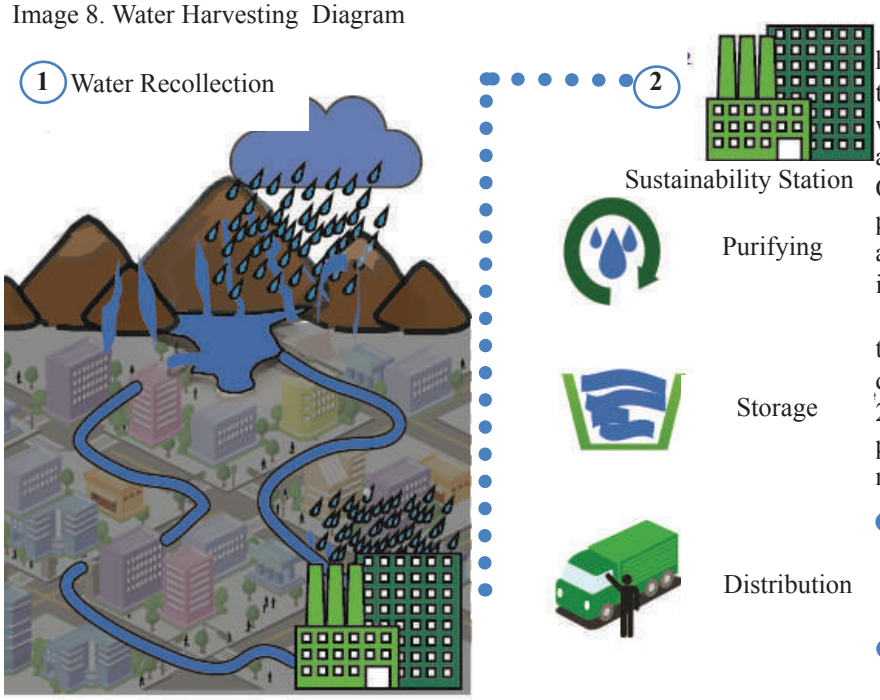


Image 8. Water Harvesting Diagram



The water harvesting will also be held in the Station installations, the buildings that are part of the project will collect the rain water in their roofs and the open areas will also have ditches for the water harvesting. Once the rain water of the street and from the project is captured, it will be treated, stored and distributed to the nearby areas what need it the most.

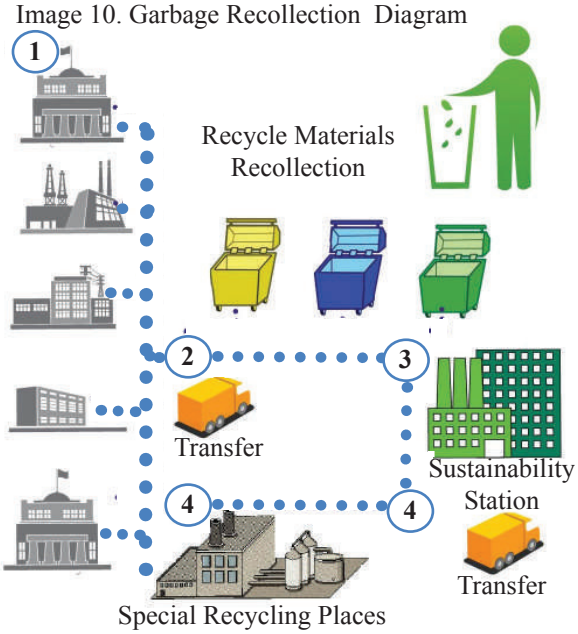
It is estimated through a parametric calculation that the project will benefit 2,700 residents who lack of water problems. Out of 2,700 residents, 680 dwellings will be impacted supplying water to homes for basic needs.

- System capable of storing the water collected in one and a half year 61,000,000 liters.
- System capable of purifying what it is collected in one week 2,600,000 liters.

Recycling materials recollection

In order to collect the recycle material small container will be given to schools, factories, malls, offices within a close distance to the site. Every third day the recycle material will be collected and transferred to the Sustainability Station. This will allow the organic and not organic material not to mixture, making the managing process more efficient. Furthermore after the material is collected it will be transported to the Sustainability Station. The recycle material will be cleaned, separated, compacted and once again transferred to special places for further reuse of the material. Paper will be the only material treated on site.

Image 10. Garbage Recollection Diagram



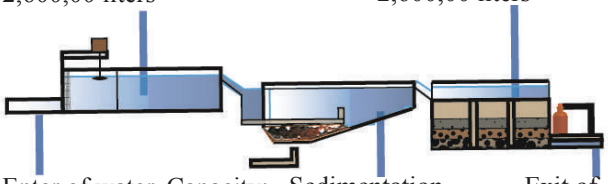


Image 9. Water Purifying System

Awareness and recreation

Public awareness is important for the water harvesting system and the public plays a big role. In order to educate and inform the public a Museum will be constructed inside the water plan facilities. It will focus on the importance of water and the reuse of waste material. Other areas of the buildings will be assigning for the sale of green products and services. The aim of this area is to involve the community, in order to strengthen its relationship with the project and allow it to be successful.

Administration

This area is the one that allow each employee to work on its own. It will coordinate and manage schedules, employees, materials, incomes, expenses, visits, etc.

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SUSTAINABILITY STATION

Image 10. Sustainability Station View

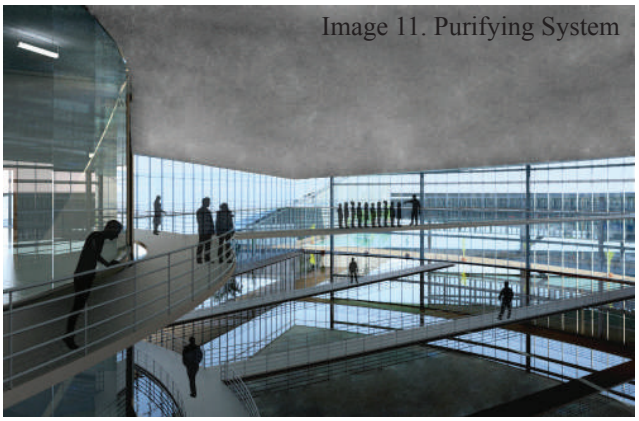
Image 11. Purifying System

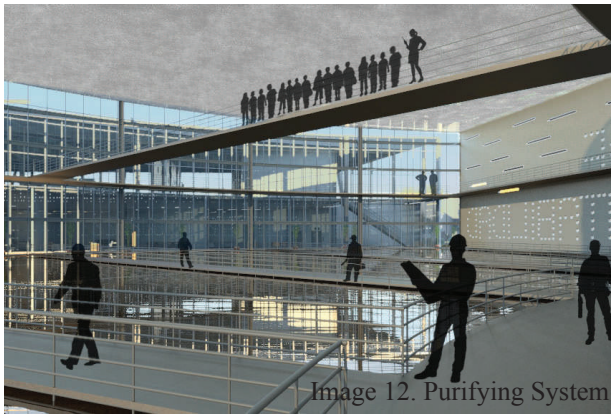
Image 12. Purifying System


Image 13. Plastic Collection Area


Image 14. Recycling Paper Area

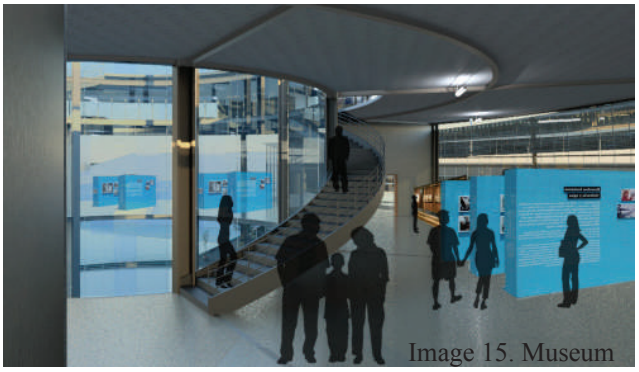
Image 15. Museum

Mexico City as many cities in the world need new processes based in long-range solutions that preserve the environment and that do not compromise the future of third parties. The Sustainability Station is focused in solving an actual problem to improve life quality of inhabitants by providing water, increasing the recycling awareness, and providing the community with recreational spaces without harming the environment. Thus, in order to make the project a detonator idea for replicating it in more points of the city.