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Rainwater harvesting and appropriate technologies at the Altos de Morelos, Mexico.

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Rural problems in Mexico

Terms of Marginality

- 6.1 million people do not have water from the public network (CNA, 2008)
- 9.6 million people do not have drainage (CNA, 2008).
- Intestinal infections are common mainly in children under 5 years old (SS, 2005).

Water-borne diseases

- 83.6% of infant mortality from intestinal infections take place on indians communities (FISANIM, 2003).

Schools

- From 69,365 elementary schools:
 - 26,000 do not have piped water
 - 23,000 do not have bathroom



Alternatives to address this problem :

- Transfer of appropriate technologies to solve at home and / or community, problems of supply, pumping, purification, treatment and use of water.
- **Appropriate Technology**, is one technology that is designed with special attention to the environmental, ethical, cultural,

Appropriate technologies

At household level:

Technology	Function
Rainwater catchment system	Collection and conduction of rainwater
Capuchin cistern	Storage of rainwater
Ecological toilette	Management of fecal matter
Ecological laundry	Treatment of laundry and gray water
Solar box	Disinfection of drinking water by solar radiation
Home garden	Production of vegetables
Download Tank Fund	Auto opetant irrigation system for the home garden
Bici-pump	Pumping water without electricity (using a common bicycle)
Wetlands	Wastewater treatment



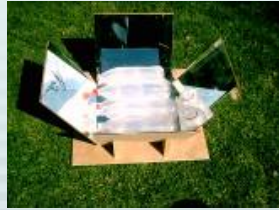
● **Catchment**
(Rainwater)



● **Storage**
(Capuchin cistern)



● **Supply (Bici-Pump)**



● **Purification**
(Solar disinfection)



● **Human consumption**



● **Use**
(Home garden irrigation)



● **Greywater Treatment**
(Ecological Laundry)



● **Sewage Treatment**
(Ecological toilette)

(Wetland)



Appropriate technologies

At community level:

- Cisterns of 500,000 liters
- "Ponds"
- Wetlands



Advantages and disadvantages of appropriate technologies

ADVANTAGES:

- Technological dependency free
- Easy maintenance and operation
- Constructed by the user
- Inexpensive
- Reproducible and adaptable to different scales.
- Generate self-employment in the towns.
- Constant innovation and adaptation according to the needs of the locality
- Sustainability of the water in region where appropriate technologies are installed.

DISADVANTAGES:

- In some applications the required area is large as in the case of artificial wetlands and ponds
- There is not an entity qualified to certify the quality of installed technologies.
- In cases where migration leaves women alone or elderly people is difficult to self-employed.
- Inadequate training and monitoring could lead to misuse of technology.

Appropriate technologies at the Altos de Morelos

Case of study

- Rehabilitation of 6 community
"ponds"
- Installation of 80 appropriate
technologies packages

Backgrounds

The region of the Altos de Morelos is characterized by a high rainfall, however, the type of soil allows runoff and infiltration into the middle and lower basin so several places lack surface sources and / or ground water

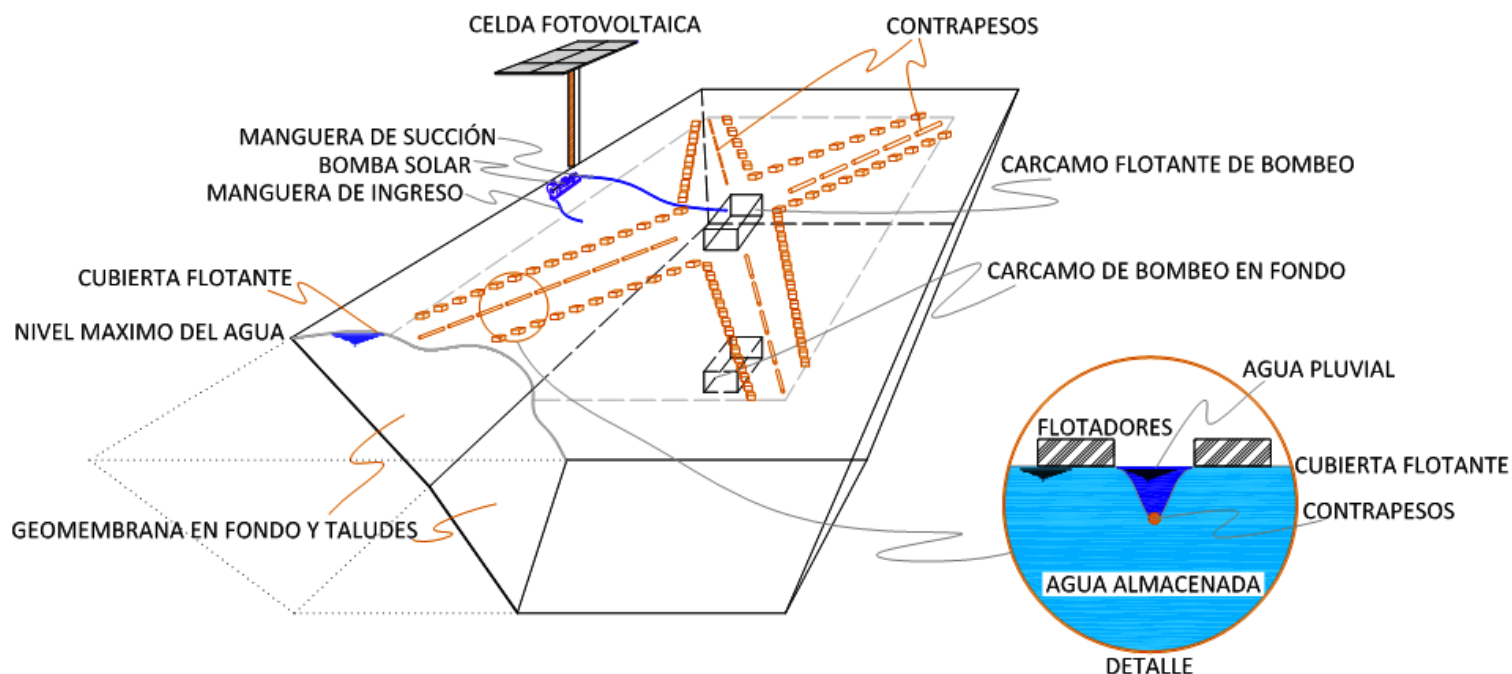


The people have to get water supply by purchasing water pipes during the dry season, in summer they harvest rainwater on the fly, storing it in small capacity containers and community reservoirs commonly known as "ponds" whose open-pit operation and lack of maintenance resulting in the storage of water contaminated by the intrusion of animals, trash and sediment, as well as the generation of algae by the incidence of solar radiation



To address this problem six community ponds were rehabilitated, to preserve the quality of the stored water were installed floating covers, which are made with geosynthetics and are rigged with floats and balances to allow drainage of rainwater from the surface inside the pot pumped using solar energy

ESQUEMA GENERAL DE CUBIERTA FLOTANTE





Before



After

Coajomulco, Vol= 8,200 m³

10 households were selected in eight localities to install appropriate technology packages: cisterns up to 50,000 liters for rainwater storage, ecological laundry for graywater treatment, ecological toilette, solar disinfection box, home garden with automatic irrigation tank and bike pump



Results

The volume of water stored in the cistern will provide the intermediate allocation recommended by the World Health Organization (WHO, 2006), 50 l / person / day

The people during the time of drought have had water to satisfy the needs of hygiene, food preparation, household cleaning and consumption inside the house.

With the rehabilitation of the six community ponds recovered a total capacity of 24,693 m³ storage thereby decrease the negative health impact by increasing the per capita water supply, benefiting a population estimated 3,396 people

Conclusion s

Derived from the geographical location of the region (volcanic rock with elevations greater than 2,000 meters above sea level) the only way to supply low-cost water is harvesting rainwater because groundwater extraction is difficult to perform due to the remoteness of sources of supply.

Now that the problem has been identified is necessary to continue the transfer of appropriate technologies because they are environmentally friendly and prevent damage to the ecosystem.

Under this context since 2007, the Mexican Institute of Water Technology in collaboration with government agencies and private organizations, has implemented projects, through research, development and transfer of appropriate technology for water supply, sanitation and rational of water resources in rural areas and communities most vulnerable with high levels of marginalization and for their demographic, socioeconomic and geographic has not been be addressed through traditional technological schemes.