Potential of Rooftop Rainwater Harvesting Systems

MSc Research

Problem statement and Objectives

This study was conducted in Manakhah town which suffers from water shortage and scarcity. Manakha is located at 2,353 meters above the Sea Level and served by only a public water system. The water source is located in Wadi Mousna, located at an elevation of 1,245 m.a.s.l. The distance between the wells and the town is nearly seven kilometers, and the water needs to be lifted over a depth of 1,000 meters increasing the already enormous costs of operation and maintenance.

The goal of the research is to analyze the potential of Rooftop Rainwater Harvesting Systems to supply Manakha area with water; through assessing the technical, economic and social feasibility, and introducing these systems to meet domestic water needs and reduce the pressure on groundwater resources and households’ financial resources.

Methods

1. Socioeconomic survey methodology:
   - Literature review
   - Interviews
   - Households
   - Existing RTRWH
   - Public buildings
   - Data analysis using SPSS program

2. Potential harvested rainwater quantity methodology
   - Digitizing
   - Zoning
   - Satellite image
   - Isohyets map
   - ArcGIS
   - Water quantity (isohyetal method)

Results

- Water Demand in Manakha

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Year</th>
<th>Population</th>
<th>max. demand m³/y</th>
<th>avg. demand m³/y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water production m³/y</td>
<td>2010</td>
<td>12000</td>
<td>573</td>
<td>327</td>
</tr>
<tr>
<td></td>
<td>2010</td>
<td>15000</td>
<td>700</td>
<td>373</td>
</tr>
<tr>
<td></td>
<td>2010</td>
<td>20000</td>
<td>800</td>
<td>400</td>
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<td>400</td>
</tr>
</tbody>
</table>

- Potential of harvested water quantity and cost

<table>
<thead>
<tr>
<th>Area Name</th>
<th>Annual Rainfall (mm/year)</th>
<th>Roof Area (ha)</th>
<th>Harvested Water (m³/year)</th>
<th>Water value (MSEK by vendor)</th>
<th>Total Rainwater Harvested (MSEK)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manakha</td>
<td>100-350</td>
<td>0.138</td>
<td>32952.67</td>
<td>2.666</td>
<td>82,163.78</td>
</tr>
</tbody>
</table>

- Willingness and ability to participate in RTRWH projects (participation types)

- Different local uses of rainwater in RTRWH projects

- Most women (54%) are fetching water and making an effort to supply water from a long distances (5 km)

- Many women in the area are educated and have careers in their communities.

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