Location

- Total drainage area contributing surface runoff = 30000 m²
- Daily average monsoon rainfall in the area = 0.02 m/day
- Surface runoff collected per day (50% of rainfall) = 300 m³
- Estimated recharge to sub-surface thru borewell = 250 m³
- Ratio of aquifer recharge to runoff collection = 250/300 = 83%
- Amount lost due to seepages, evapo-transpiration and other factors = 17%

Goa city is located along the western coast of India and the university campus is located on the outskirts of Panaji (the capital city) spread over nearly 173 hectares on the Taleigao plateau overlooking the Zuari river joining the Arabian Sea. The campus is located on a plateau in the island of Tiswadi and has unique geological features. The area has hard laterite rock of variable thickness on the top followed by a thick sequence of clays, and fractured and weathered basement rocks forming deep seated confined aquifers.

Context

There are not enough water supply facilities to meet increasing water usage due to growth of population, increase in number of tourists, and rise in living standards, resulting in serious imbalance in supply and demand of water in Goa. The current water supply is dependent on both groundwater and surface water. The groundwater contributes to over 33 per cent of the water supply in Goa and is considered as safe.

The depth to water level depends on the nature of aquifer. In shallow unconfined aquifer the water levels are less than 10 m bgl but in confined deeper aquifers the water levels are in range of 15-85 m bgl depending on the undulating nature of the basement rock and seasonal fluctuation. Due to steep hydraulic gradient and highly permeable phreatic aquifers, the dynamic ground water resource in and around campus gets depleted quickly rendering scarcity even for drinking water during summer months. The university has around 1500 staff and student population. The existing water demand of university is around 0.45 million litres per day. Around 50 per cent of the water supply depends on public water supply and remaining from the existing twelve bore wells on the campus.
During summer the public water supply is further reduced by almost 50 per cent. This results overexploitation of groundwater and has resulted in drying up of few bore wells on the campus.

Objectives

The key objective of the RWH project in Goa University is to arrest declining groundwater levels and recharge the aquifers to reduce dependence on the overstretched municipal water supply for a more sustainable water supply on the campus.

Timeframe

Year of Implementation: 2007

Project description

In 2007 the Goa University initiated the plan to develop RWH system for recharging the fast depleting aquifers. Keeping in mind the vast potential of harvesting rainwater on the campus a RWH system has been implemented at the university under supervision of Prof. AG Chachadi, Department of Earth Sciences, Goa University. The existing rainwater system has two main structures – one main structure for harvesting surface runoff constructed in year 2007 with a catchment of 1.5 hectare mainly unpaved area and second, rooftop harvesting system constructed in year 2008 for harvesting the runoff mainly from built up area on campus.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Details of the RWH system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total catchment area</td>
<td>173 hectares</td>
</tr>
<tr>
<td>RWH structure (2 no.s)</td>
<td>Recharge trench in natural depression/pond</td>
</tr>
<tr>
<td></td>
<td>Recharge bore well for rooftop water harvesting</td>
</tr>
<tr>
<td>Total volume of recharge</td>
<td>39 million litres</td>
</tr>
<tr>
<td>(in year 2010)</td>
<td>(38 million litres surface water from and 0.9 million from roof top run off)</td>
</tr>
<tr>
<td>Cost of system (in Rs)</td>
<td>0.16 million</td>
</tr>
<tr>
<td>Savings per annum (in Rs)</td>
<td>4.4 million per annum</td>
</tr>
<tr>
<td>Year of implementation of the</td>
<td>2007, 2008</td>
</tr>
<tr>
<td>RWH system</td>
<td></td>
</tr>
</tbody>
</table>

Source: AG Chachadi, 2013

The project is good example of private sector engagement. According to Prof. Chachadi RWH system of university was funded partly from his research fund and remaining generous contributions from – Sociedade de Fomento Industrial Pvt Ltd; Bhagavathi Ana Labs Ltd; Timblo Pvt Ltd; V M Salgaocar & Bro Pvt Ltd, Vasco (Goa) and Mineral Engineering Services and Coca Cola Ltd.

Strategies and Interventions

Site 1: Surface runoff harvesting

Catchment area and conveyance system
The total catchment area contributing to runoff for the surface runoff RWH structure is 1.5 hectare to the natural depression – a pond (see Photograph: Surface runoff catchment area of the RWH structure). In the beginning before creating RWH structure, the site was de-silted and leveled. To maintain clean and contaminant runoff recharging the aquifers a protective rubble wall was built around this natural depression pond as the pond receives mainly runoff from the unpaved surrounding catchment.
Site 2: Roof water harvesting

Catchment area and conveyance system
The roof areas of about 400 m² form presently the catchment for the RWH structure at this site. At present the conveyance for the runoff from the rooftop from boy’s hostel and the electronic building is complete and feeds to the existing recharge. The rooftop of the girl’s hostel, men’s hostel and remaining department buildings will be connected in next phase and work is under progress.
Outcomes of the Project

The university caters to water supply for 1500 both resident and non-resident staff as well as students.

The total groundwater recharge during 2010 from both the structures was 39 million litres. In 2010, Site 1 estimated recharge was 38 million litres. The roof area for the Site 2 is about 400 m². The site received a record recharge in the year 2010 due to heavy rainfall of 3.7 m.

The RWH has been contributing considerably in recharge of the local aquifer resulting in improved yield and sustainable extraction of groundwater. The water is now provided on sustainable basis particularly during summer when the public water supply also decreases to less than 50 per cent of the supply.

As a result since 2007-08 the water supply has not been interrupted or dependent on any alternate source of water supply. In terms of water availability the volume of groundwater recharged during 2010 can meet about 78 days of campus water supply.

Funding and costs

The project is good example of private sector engagement. According to Prof. Chachadi RWH system of university was funded partly from his research fund and remaining generous contributions from – Sociedade de Fomento Industrial Pvt Ltd; Bhagavathi Ana Labs Ltd; Timblo Pvt Ltd; V M Salgaocar & Bro Pvt Ltd, Vasco (Goa) and Mineral Engineering Services and Coca Cola Ltd.

The RWH system captures around 21.1 million litres of rainwater reducing the dependence on municipal water supply or groundwater extraction. The average cost of water tanker (10,000 litres per tanker) in Jodhpur is Rs 800–10,000. Thus by using the rainwater as alternative source of water about Rs 2.36 million is saved annually.

Key Learnings

The reduced pressure on the public water supply system and improved recharge has a positive environmental impact. At small scale, the system contributes toward the resource conservation.

The RWH system implemented on the campus has become a platform of creating awareness, information dissemination, and learning about groundwater conservation methods. Various stakeholders NGOs, government officers, school children, and citizens), industry representatives, researchers regularly visit the site.

Additional information:

References:

Rohilla, S.K. et al. (2014): URWH, case studies from different agro climatic regions. CSE. https://www.indiawaterportal.org/articles/goa-university