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Renovation of traditional ponds by community participation: A case study of Tamil Nadu

Regional Workshop on “Water Resources Conservation : Village Ponds and Lakes

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by Centre for Science and Environment

Presented by
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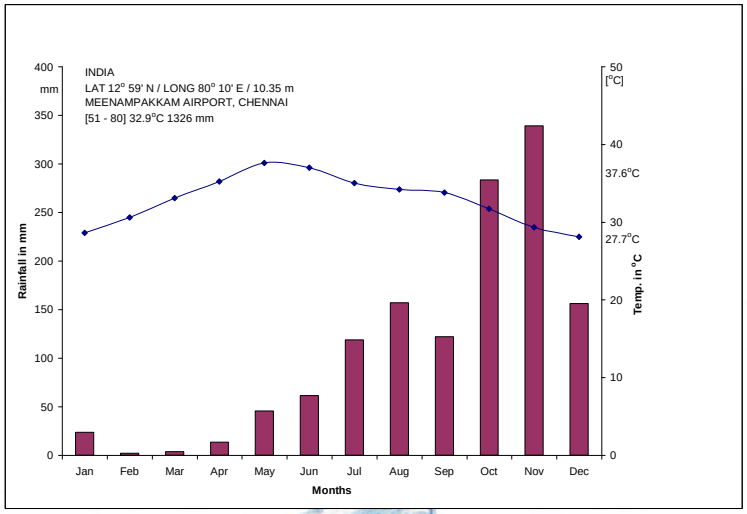
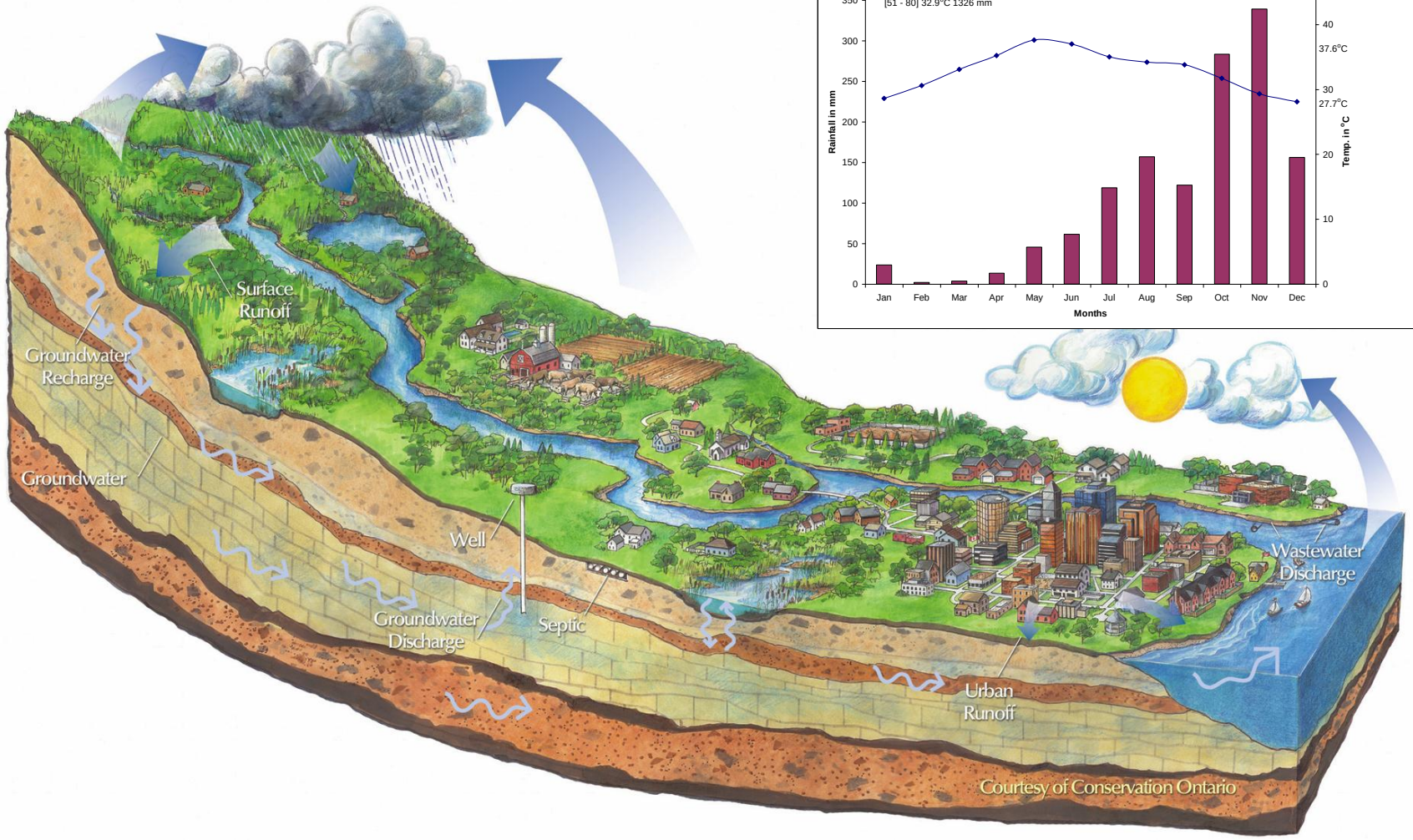
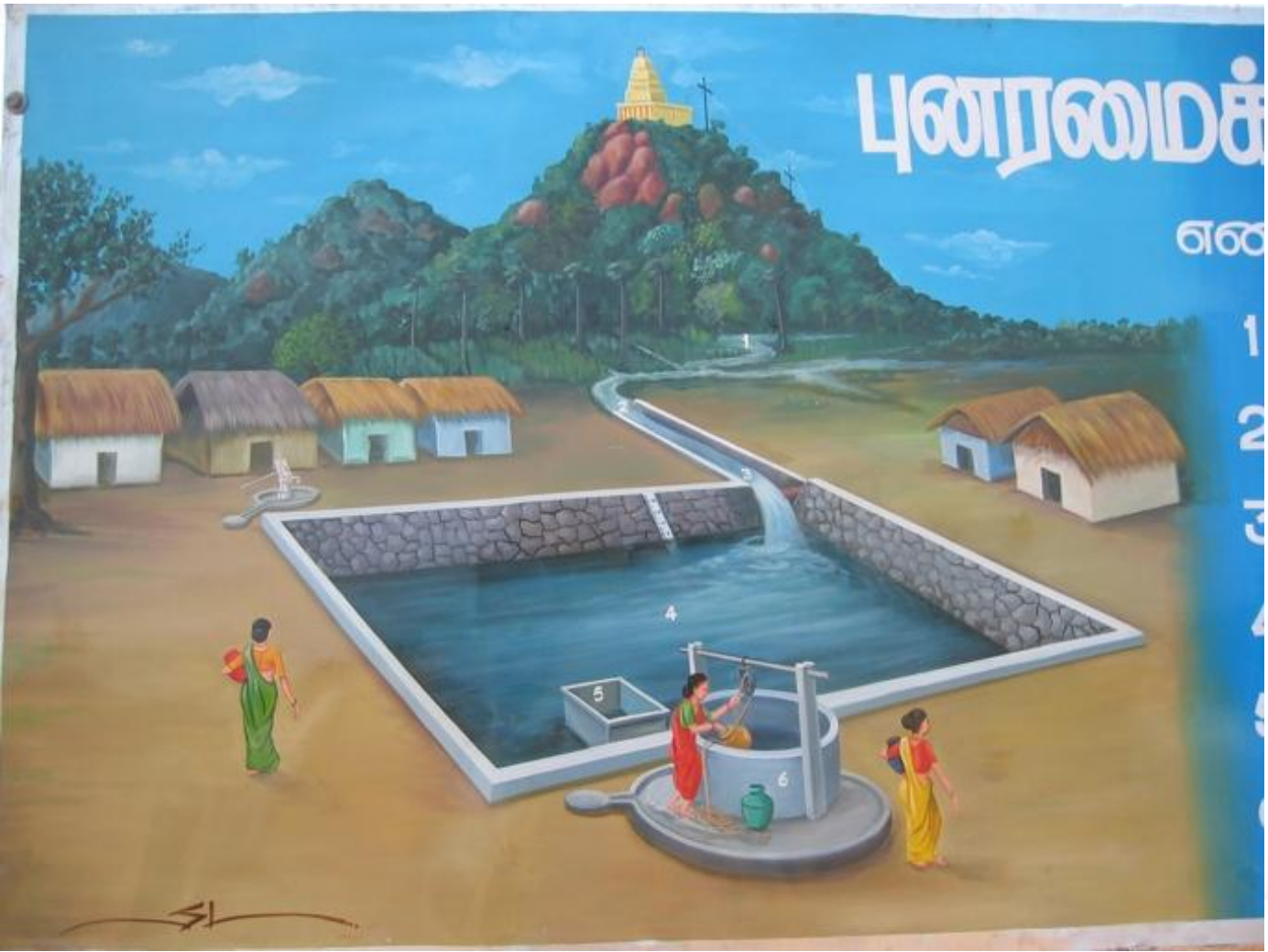
Catch water where it falls!





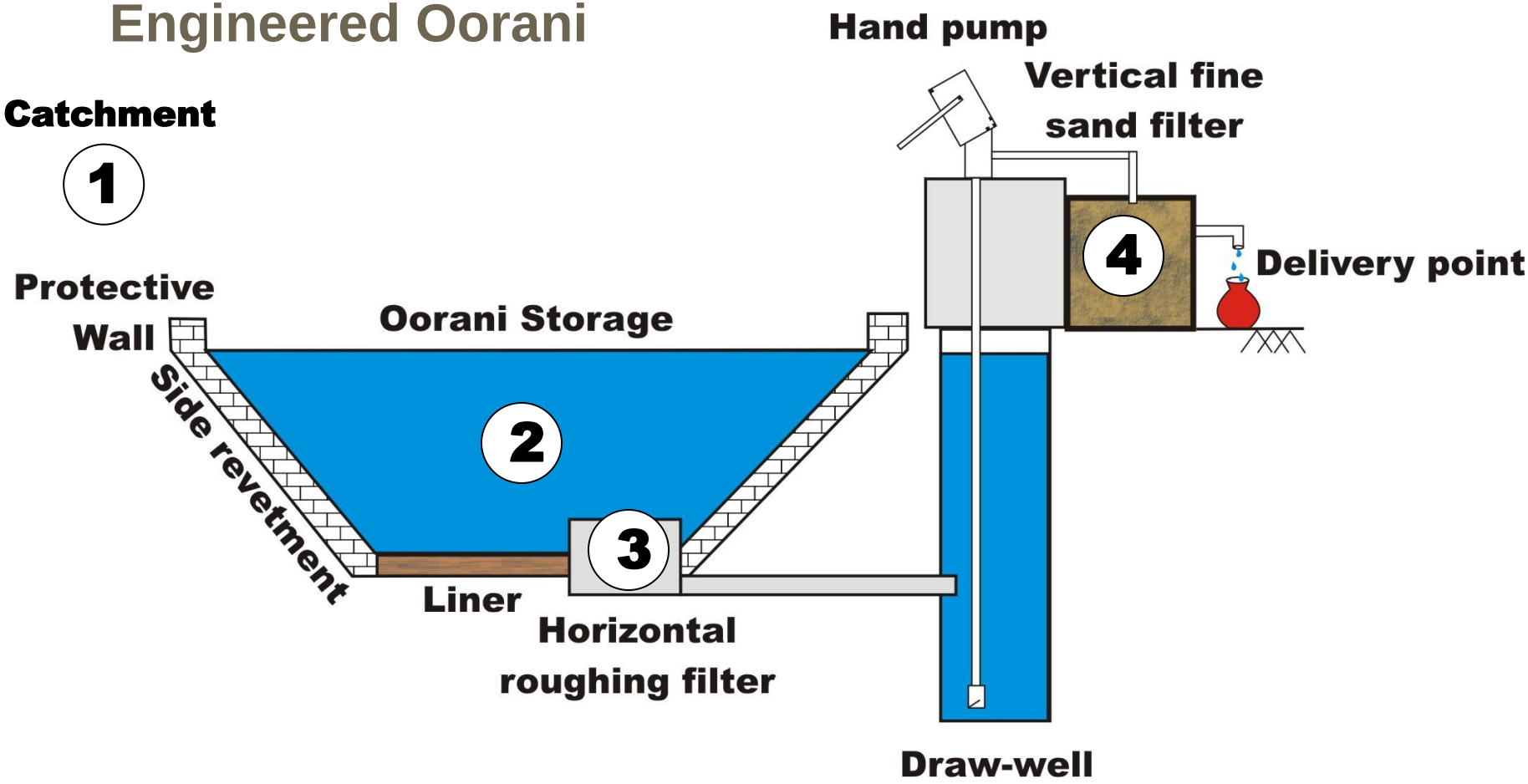
What is an Oorani?



System boundaries

1. Provide a secured water supply system to supplement existing supply schemes
2. Involvement of the local community (Panchayatiraj)
3. Use of locally available material and know-how
4. No use of electrical energy

Engineered Oorani



Design principles

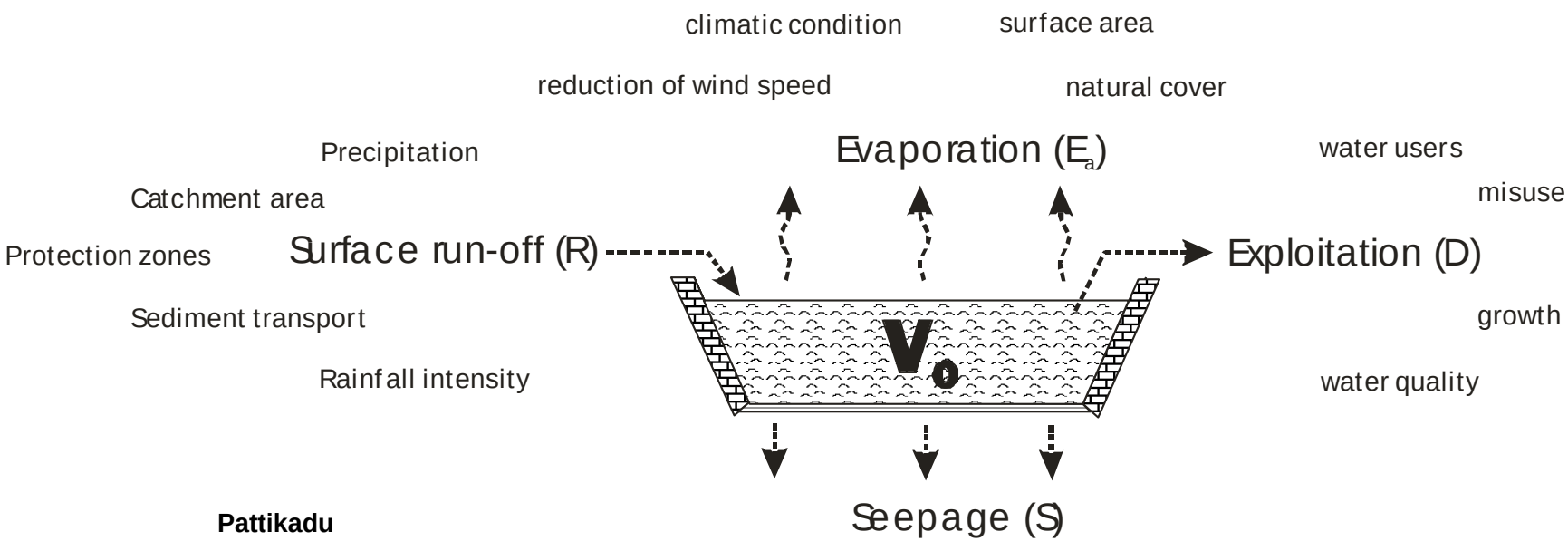
Multi-barrier concept:

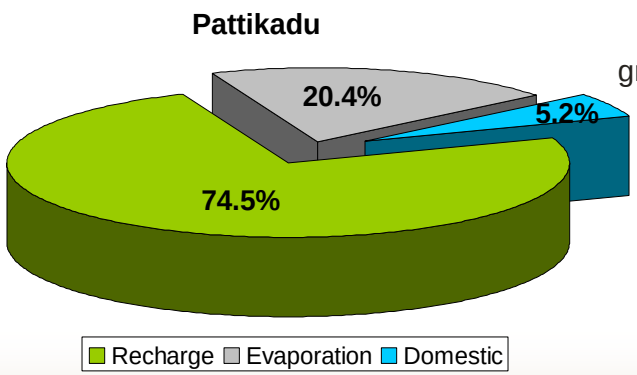
a) risk prevention and management
b) technical interventions
c) monitoring and compliance
d) individual action

Technical intervention:

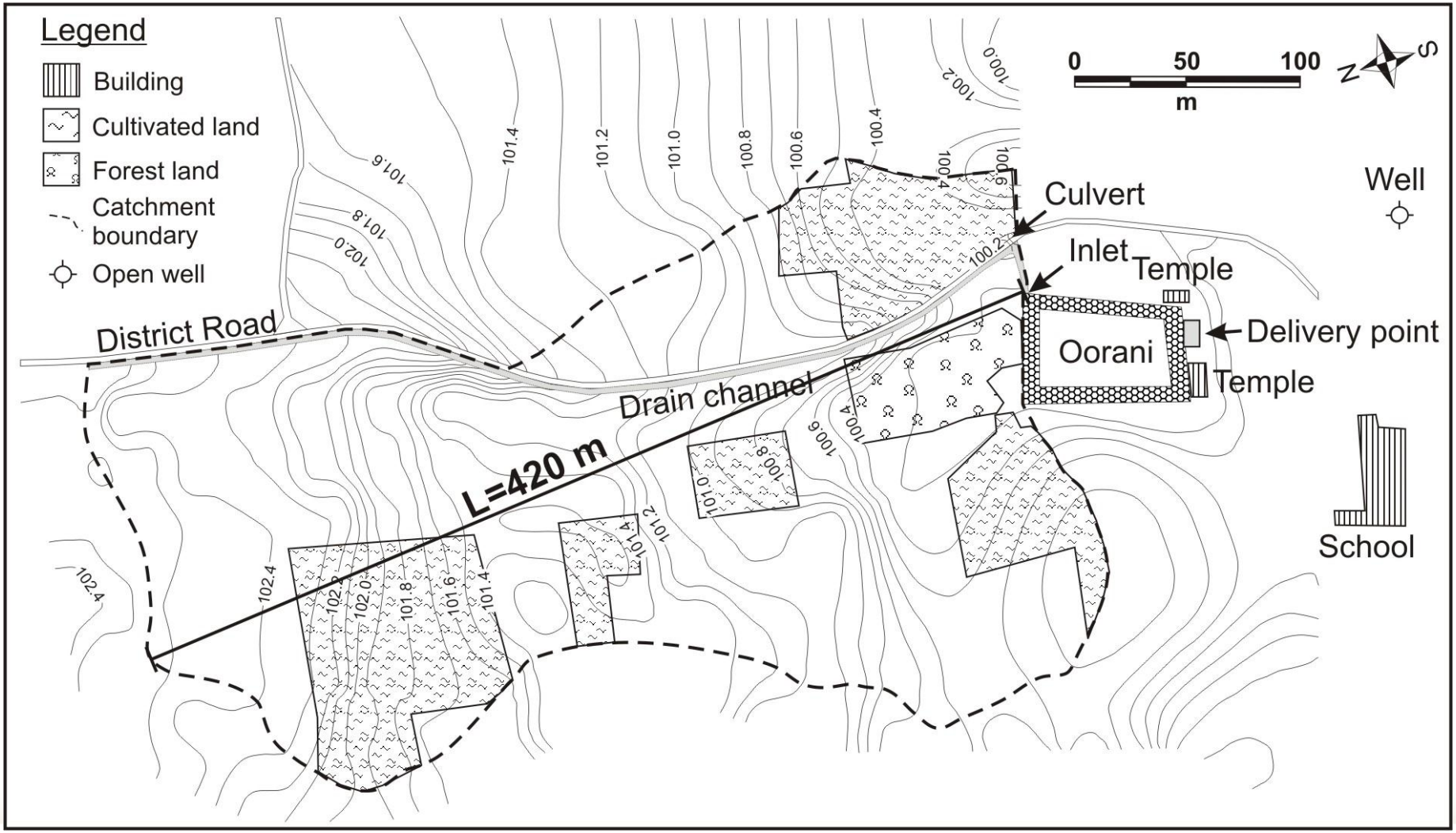
1. Grit chamber inlet
2. Storage tank
3. Horizontal Roughing filter
4. Draw well with Vertical Fine Sand Filter

The Oorani water balance

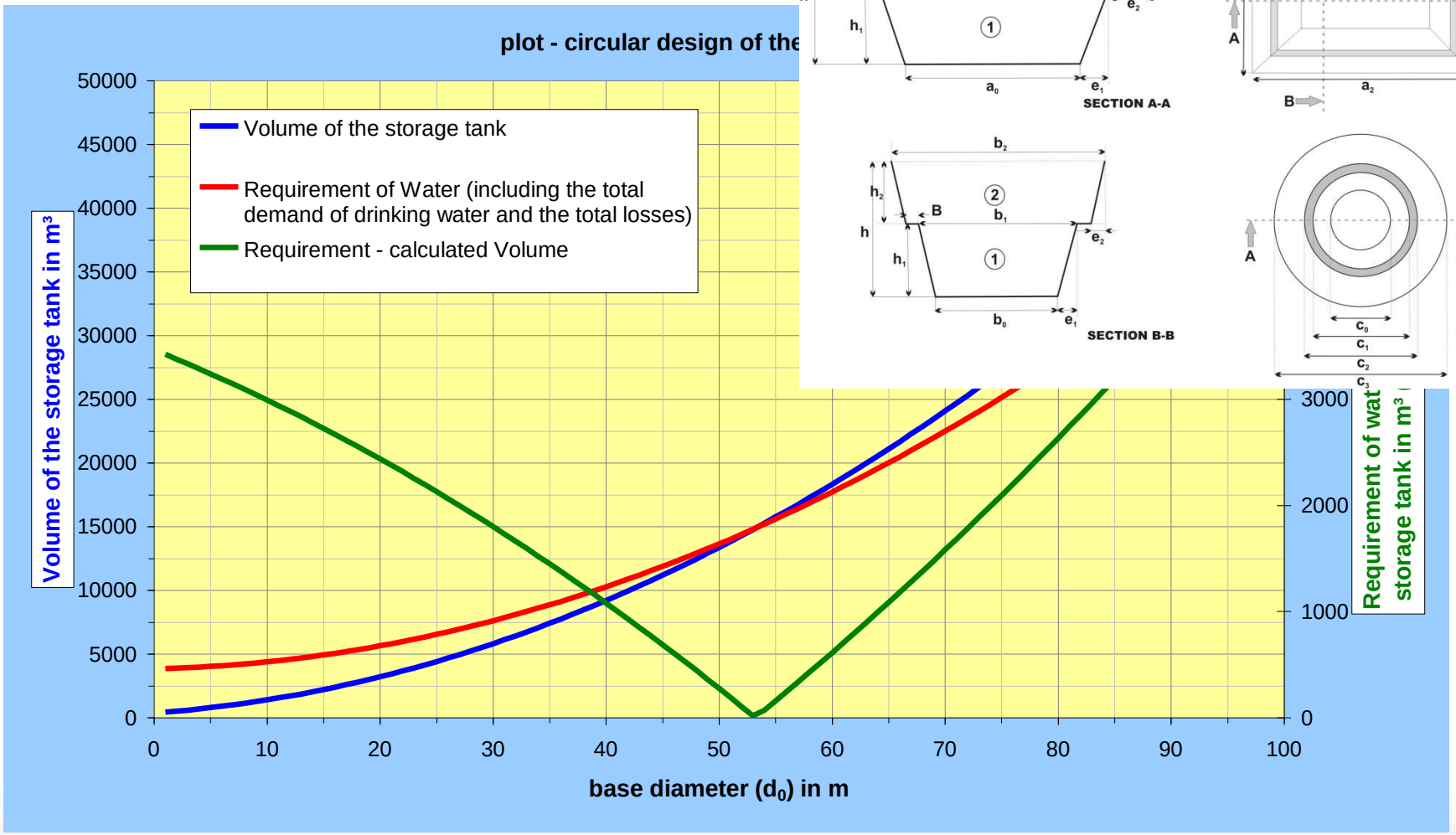


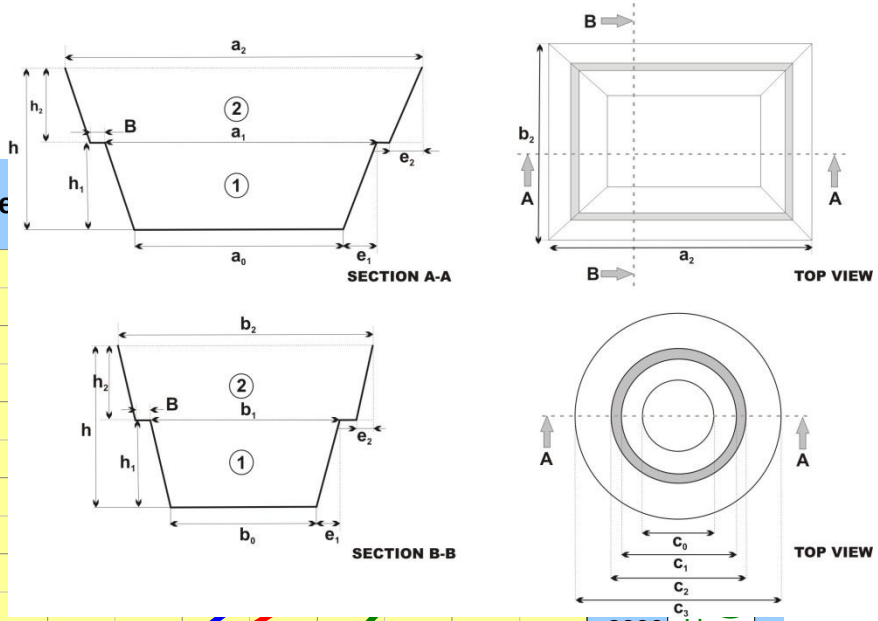


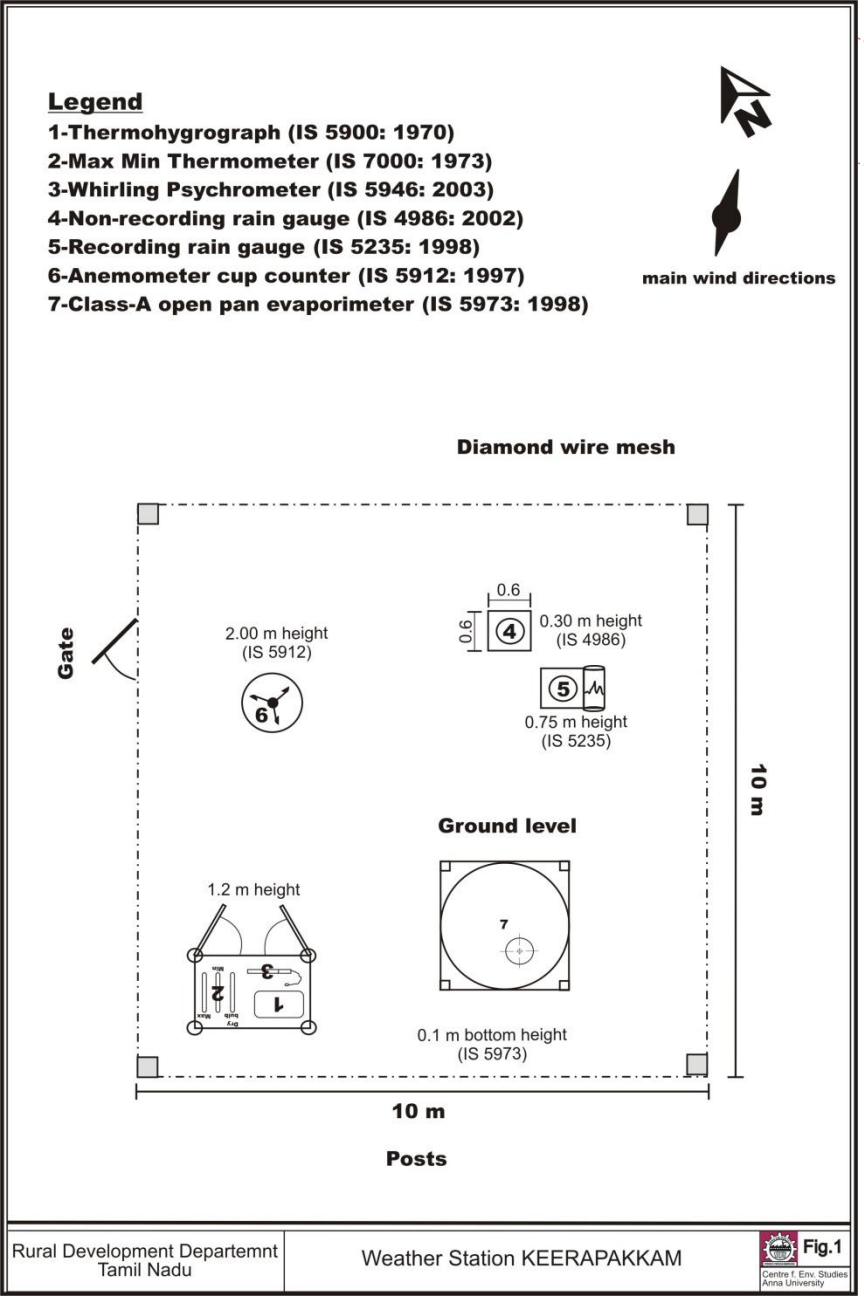
Catchment design



Storage design







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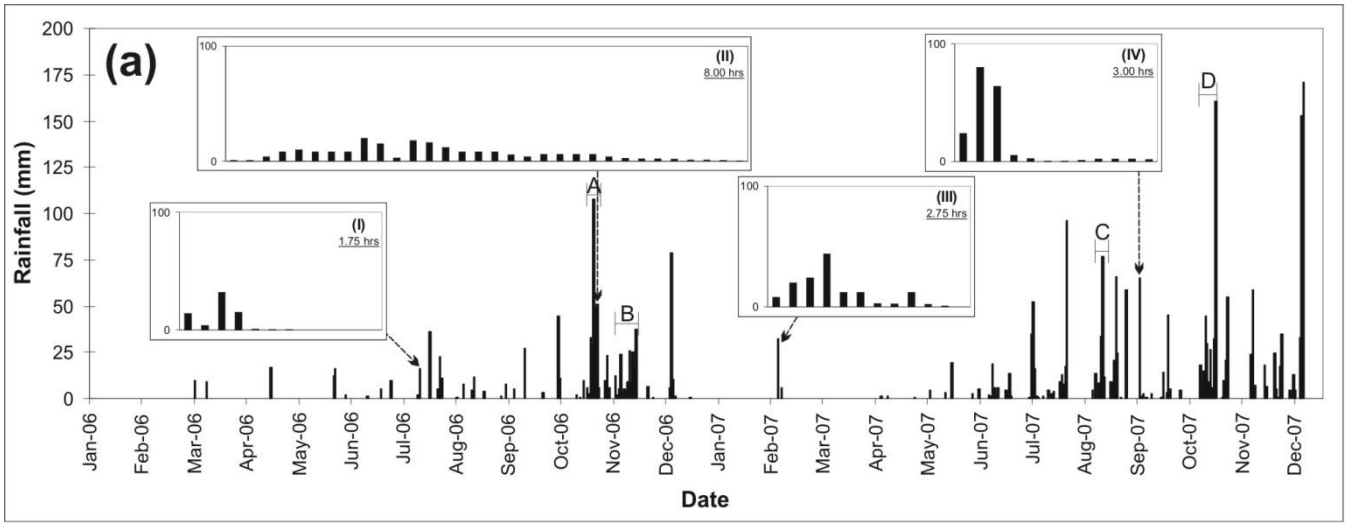
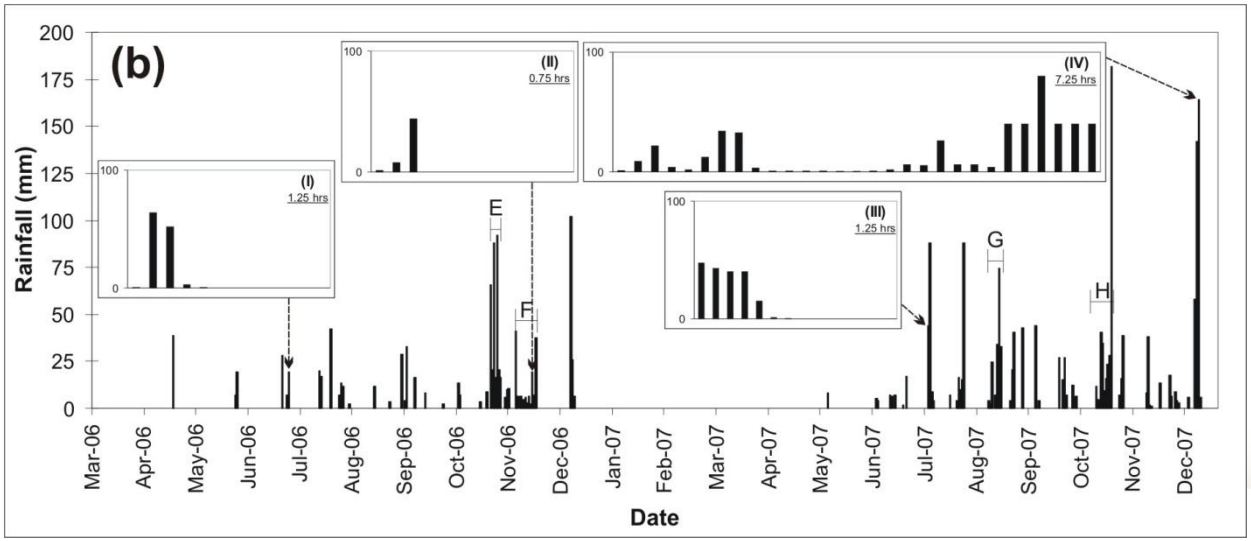
Pic. 2: Pattikadu station

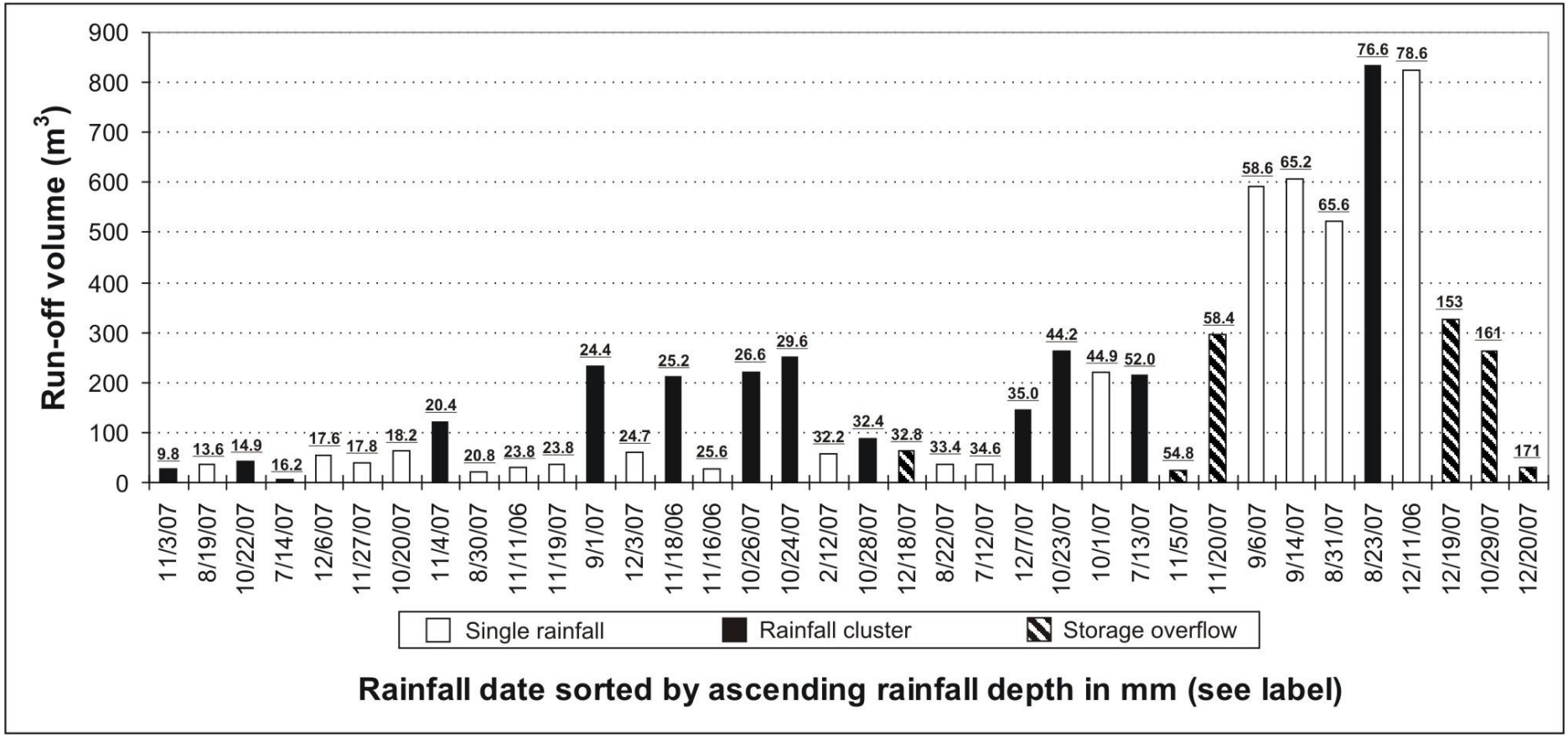
Pic. 3: Edaiyur station

Rainfall characteristics

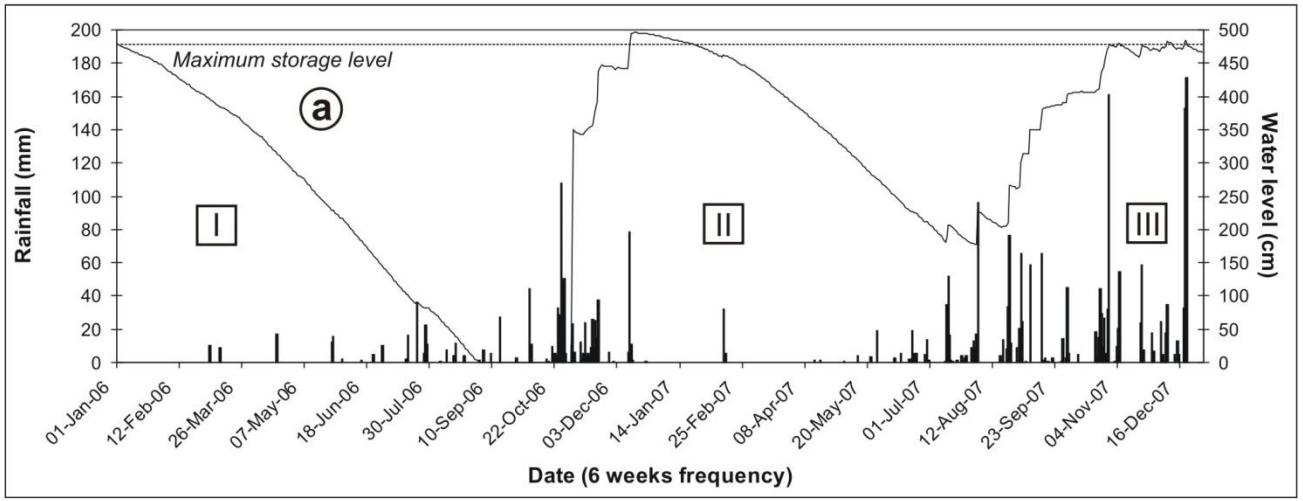


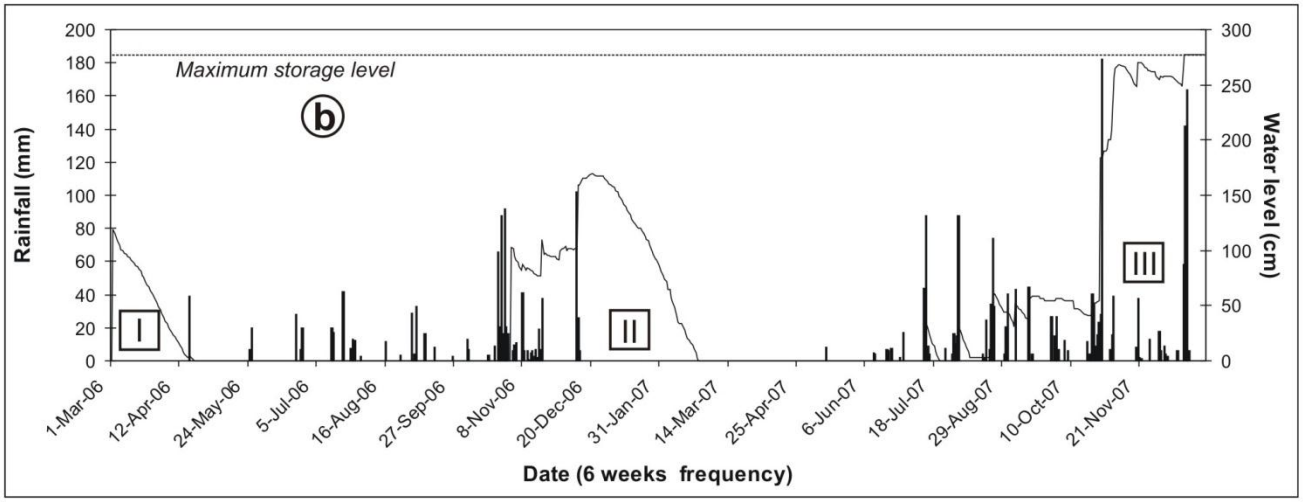


Rainfall vs runoff volume



Storage characteristic





Field Survey

Delineation of catchment

The catchment area has to be delineated from the contour map in order to identify the catchment contributing the runoff to the Oorani (see pic. below). The delineation of catchment can be done using the compass survey and leveling. The runoff obtained from this catchment for 365 days should meet the total annual water requirement of the people or the total required storage capacity of the Oorani.

If the above case may happens to fail then the additional catchment area has to be identified in and around the Oorani by the above method and it should be added.

Water demand

The percapita water supply will vary from place to place depending on the type of habitation, such as urban or rural. Generally, urban people require more water than the rural because of the living conditions and standards. The World Health Organization as well as the Central Public Health Engineering Organization of the Government of India have specified norms, which are given as (CPHEEO): For rural centre 40 lpcd; and For urban centre 90 lpcd.

The above rates are for domestic purposes. The percapita water consumption for drinking and cooking alone can be assessed through a Questionnaire Survey taken from the users (see pic. above). In this study, this value comes to 16-18 lpcd. With a factor of safety, a value of 25 lpcd is assumed.

Construction

-Community action-

Community based approach

It is assured by the NGO that the local people are involved from the beginning of the project. Together with the engineers they can give their own opinions during the design discussion stage.

Users participation

Around 15% of the total cost of the project will be shared by the users. Their contribution can be either in terms of money or labour. Latter allows them to do some basic works and support skilled labour from outside e.g. for putting the revetment (Bottom left pictures).

-Appropriate construction technology-

Tools

To deepen and widen the Oorani modern excavators have been used for construction (top-right pic.). For consolidating the clay-liner in the Oorani, simple equipments were more applicable as modern compacting machines, were not available (top-left pic.).

Materials

A prior task is the use of local materials. Sand samples from major rivers in Tamil Nadu have been taken to test their feasibility as filter sand. Their usage after washing and sieving is possible (top-right picture). Clay for the bottom liner of the Oorani has been collected from nearby tanks, which provides a good quality impermeable stratum after proper compaction.

-Technical set-up-

Inlet arrangements

The inlet provides protection against siltation preventing coarse and medium sand to enter the Oorani. And a baffle wall helps against floating materials like leaves, branches and plastic to be washed inside the Oorani. These materials together with natural grit will be caught in the collection chamber (top-right), which will be cleaned by the Water User Association (WUA). If the Oorani is not directly connected with the catchment a supply channel replaces the grit-chamber (bottom-left). The entering run-off water passes through a shoot inside the Oorani, splashing into the settling-basin, which protects the clay-liner from erosion at the bottom of the Oorani (top-left pic.).

Vertical and horizontal roughing filter

Previous studies of Ooranis by Anna University revealed that there are major problems with the water quality due to high turbidity and amount of pathogen bacteria. To improve the water quality a natural filter system inside the Oorani will take care for the turbidity (bottom-left pic.) and an additional polishing filter provides basic treatment for pathogen bacteria (bottom-right pic.).

Fine screening filter

The fine screening filter is a fine sand filter reducing turbidity and content of pathogens in the water. It is put adjacent to the draw well and has to be cleaned frequently.

Protection & Monitoring

-Advanced Oorani set-up-

Clay-liner

As the Oorani is storing water, no seepage should be allowed. Locally available clay which mostly can be found in traditional irrigation tanks has been used to provide a clay-liner at the bottom of the Oorani. This can reduce the hydraulic conductivity by 1000 times (bottom-left pic)

Side-revetment

Pointed stone-revetment protects the side walls of the Oorani from further seepage and erosion if the sidewalls exceed an 1:2 slope (bottom-left pic.).

Hydrological monitoring

To improve the Oorani set-up, parameter, like water level in the storage (bottom-left pic.), evaporation, rainfall and temperature are monitored.

Protection

Basically no unauthorized person is allowed to enter into the Oorani due to high risk of contamination. A dwarf wall protects from direct surface run-off into the Oorani without passing the grit-chamber and a diamond-mesh wire fence keep people and animals outside but still allows a beautiful sight on the Oorani (top-upper-right pic.).

The draw-well is placed outside the fencing of the Oorani (top-lower-right pic.) so that the users have not to enter inside the protected area, which would automatically mean a risk for contamination.

There are steps are provided for emergency cases if someone falls accidentally into the water and for doing maintenance work inside the Oorani like general cleaning Oorani or change of filter material in the rapid-sand-filter (top-left pic.).

Operation & Maintenance

Maintenance

For the basic maintenance the local Water User Associations (WUA) is responsible for. They have to be trained and execute the frequent cleaning of the grit chamber (see Pic. bottom right), which is required to prevent the Oorani from siltation. The collected grit can be used as manure for the agriculture as the material is not polluted.

As soon as the speed of the filtration is strongly declining the sand of the fine screening filter (see Pic. top left) is to be cleaned from silt and clay. This may also happen to the roughing filter inside the Oorani but here only after the water level dropped below the height of the filter.

More sophisticated repair work is to be undertaken by the block engineers and fitters who have to be trained how to exchange filter material and do the fixing of

Operation

The local user associations (WUAs) are responsiblle for the operation and functioning of the system. Misuse of the structure should be prosecuted by them.They shall also check the functioning of the single units in particular the filter systems.Finally the WUA is taking charge for the frequent data collection as there are rainfall and water storage level inside the Oorani.

Governmental engineers will regularily check the performance of the Oorani set-up and discuss further improvements with the lokal WUA. For sophisticated problems the involved institution like university or college can be consulted to find a praticla solution.

Beautification and Landscaping

The Oorani at Keerapakkam has been constructed with a broad protective bund. To develop and stabilize the slope of the bund, Mr. Joss Brooks from Pitchandikulam Forest Consultants, developed a landscape design planting endemic herbal plants and trees. Apart from stabilizing the bund it serves for screening the runoff water from fine grit.

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