**Problem Statement**

Currently, for roof top rain water harvesting, people install water storage tanks individually per building/apartment which results in high cost for individuals/groups. No mechanism/application is available to find out where such installations are beneficial, which installations can share storage tanks and what would be the required capacity of these shared tanks. Given map and housing data, optimize the location of centralized tanks for rain-water harvesting.The following data should be sufficient to design and implement a model to solve the problem: 1. Estimating rainwater harvesting capacity: a. Rainfall estimation: Historical data from rainfall gauges at different places in the target area. b. Catchment area: Masterplan of the city to estimate the catchment area available, e.g open areas like rooftop, courtyard, etc. 2. Optimizing Water tank placement: a. Water demand/Use capacity: Water supply data can be used to estimate the consumption of harvested rainwater for non-drinking purposes b. Underground map: Underground map with stability study to identify locations where the shared tank can be built The system should provide the following output from its analysis: 1. Plan for laying out the underground tanks with input and output points defined 2. Cost-benefit analysis justifying the plan 3. Plan for distribution of build and maintenance cost of a tank for the parties involved

**Presentation**

[Link](https://docs.google.com/presentation/d/1f0UqGlQ2xnw-W-hObcE5DM-aZ2EYk-08KCOv67_84Y8/edit?usp=sharing)

**Resources:**

* [best sites to choose RWH's](https://ac.els-cdn.com/S2095633915301118/1-s2.0-S2095633915301118-main.pdf?_tid=0ff2ab1c-5fe2-4004-a000-1584ccb502d6&acdnat=1547659035_1e8dad351f71c1c0e46b89cd518ebf59)
* [RWH in developing countries](https://www.mtu.edu/peacecorps/programs/civil/pdfs/jean-charles-theses.pdf) ( see formula in this -37)
* [RWH in india](https://ageconsearch.umn.edu/bitstream/47964/2/paper06-01.pdf)
* [seski material](https://www.researchgate.net/publication/283565222_Selection_of_rainwater_harvesting_sites_by_using_remote_sensing_and_GIS_techniques_A_case_study_of_Kirkuk_Iraq)
* [County scale RWH](https://onlinelibrary.wiley.com/doi/epdf/10.1111/1752-1688.12607)
* [Storage](https://www.mwe.go.ug/sites/default/files/library/Rain%20Water%20Harvesting%20Handbook.pdf)
* [seski site](https://rainharvesting.co.uk/types-of-rainwater-harvesting-systems/)
* <https://www.youtube.com/watch?v=1t5uL7BzCJY>
* <http://greatplainslid.org/lid-resources/rainwater-harvesting/>
* <https://www.slideshare.net/D4Z/j3s259>
* [gawd level](https://publications.csiro.au/rpr/download?pid=csiro:EP126329&dsid=DS2)
* <https://www.rainwaterautomation.com/> - bhht sahi kia hai kaam banda
* <https://www.rainwaterautomation.com/app/download/5295521/White+Paper.pdf>
* [run off coefficients dekh lena](http://greencleanguide.com/rainwater-harvesting-potential-calculation/amp/)
* [catchment estimation solved](http://iopscience.iop.org/article/10.1088/1755-1315/47/1/012027/pdf)

**Evaluation Criteria**

* Novelty
* Complexity
* Clarity
* Feasibility
* Practicability
* Sustainability
* Scale of impact
* User experience
* Future growth possibility

**Terms to focus on**

Terms to focus:

* Time series rainwater prediction model
* Cost benefit analysis study
* Rain water harvesting system in depth
* Large scale rainwater harvesting system in a locality
* Water distribution system and storage tanks location systems
* Optimization of tank locations
* Build and maintenance cost model for involved parties

**Presentation topics**

* Entitling Idea with Impact word
* Idea Presentation
* Technology stack description
* Use cases - Applicability, Sustainability,
* Stoppers/Bottlenecks
* Future growth possibility

**Methodology**

Rainfall data for a local spot (city/town)

Blueprints of layout for the optimization plan

Layout of water supply system

**Prediction/Optimization of rainfall and area → Input of precipitation → Storage/Melting/ → Distribution → Application**

Main Question: ***Should we install a RWH system at the specified site?***  If so, then only how. If not, maa chudao.

Factors used to predict rainfall:

* Historical rainfall data
* Historical temperature variance data
* The **quantitative precipitation forecast** (abbreviated **QPF**) is the expected amount of melted [precipitation](https://en.wikipedia.org/wiki/Precipitation) accumulated over a specified time period over a specified area. We need to predict the QPF for the site.
* The forecasting of the precipitation within the next six hours is often referred to as *nowcasting*. Nowcasting can be one of the major factor to affect the RWH system.
* Problems/Blockers for rainfall harvesting -
  + Reliability of rainfall is needed to be assured for a region.
  + Very few catchments areas
  + Not very effective in urban areas vs rural area
  + Ineffective rain harvesting system i.e Poor/unfriendly design/ineffective equipments
  + High system & maintenance cost
  + High maintenance & servicing work
  + Mosquito breeding
  + Inconsistent water quality-Poor/no filtration system
  + Unpredictable rain fall
  + Prolong dry seasons
* Use difference in pressure systems for delivery of water (in most cases, to save up on motorized system). Psiphon-like system is one option where a constant pressure difference is maintained. Larger diameter pipes are used (4’’ to 6’’) to maintain larger amount of water at constant pressure.
* Predict the amount of rainfall to occur as well. This way we can estimate how much water to hold and how much to let go into the irrigation/cleaning purposes.
* That’s a lot of pros for active collection, so what are the cons? Probably the biggest is since there is some pumping involved, power does have to be available during rainfall for the staging system. It also requires some float switches and pump control.
* An optimum system should be engineered to factor in roof size, usage, rainfall records & storage capacity.
* Regular cleaning of inlets required - Manual or back flush cleaning.
* Active collection systems to be used to remained
* Water harvesting potential = Rainfall (mm) x Area of catchment x Runoff coefficient
* or
* Water harvesting potential = Rainfall (mm) x Collection efficiency
* Runoff coefficient (Cr) = Volume of runoff/volume of rainfall
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