



Rainwater Harvesting

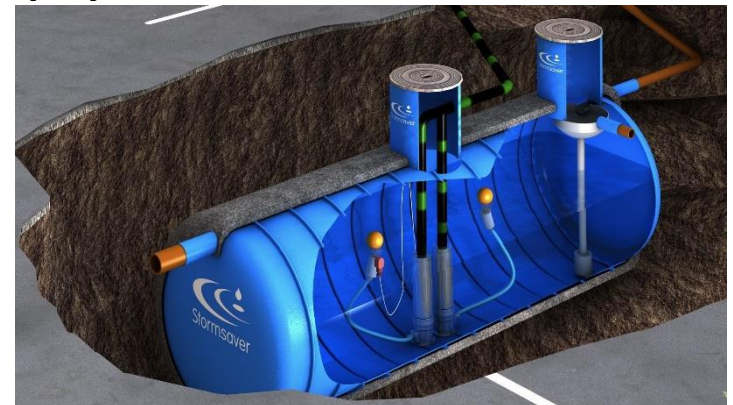
Rainwater Harvesting

It is expensive to install, but free to maintain, and it is totally green



What is Rainwater Harvesting?

- Everyone takes water for granted until there is none. Water is a natural resources that most people do not put a lot of thought into, but in order to continue enjoying that free supply of water for many more years, changes must be made. Rainwater Harvesting is the process of collecting rainwater from surfaces on which rain falls, filtering it and storing it for multiple uses – even drinking and cooking water. Rainwater harvesting helps put the supply of water in lakes, rivers, and springs, back to normal levels.





- In a normal scenario the rainwater is collected from roof building, filtered then and stored inside of a special tank. Rainwater harvesting systems are designed after assessing site conditions that include rainfall pattern, incident rainfall, subsurface strata and their storage characteristics. Rainwater harvesting is popular all across the world, and in countries that are very dry, such as Australia, it is even more popular.



Benefits of Rainwater Harvesting

- The collection of rainwater and harvesting it for everyday use has an ample number of exciting benefits.
 - Reduced dependency on water storage dams – Maintaining and building dams to supply communities water is expensive, therefore the communities that benefit from this water have to pay hard earned money for the right to use the water. What this means to this community is that by **Harvesting Rainwater** – we have no water bills.
 - Properly filtered rainwater can be used for every water chore around the house. This includes drinking and cooking.
 - Rain water is chemical free, taste better, and is better for you than City or well water.
 - Have you seen the calcium build up inside of a water pipe, an old water heater, around your toilet, on your faucets? That calcium comes from water that has been harvested from the land. The water cycle for land water includes many minerals that are detrimental to your water using appliances. Rainwater has a significant lesser amount of minerals than city water thus reducing the burden on expensive appliances.
 - By capturing rainwater we help prevent soil erosion by reducing storm flows that create urban flooding.
 - Rainwater Harvesting is a source of green energy living.



Methods of Rainwater Harvesting

- **Surface runoff harvesting**

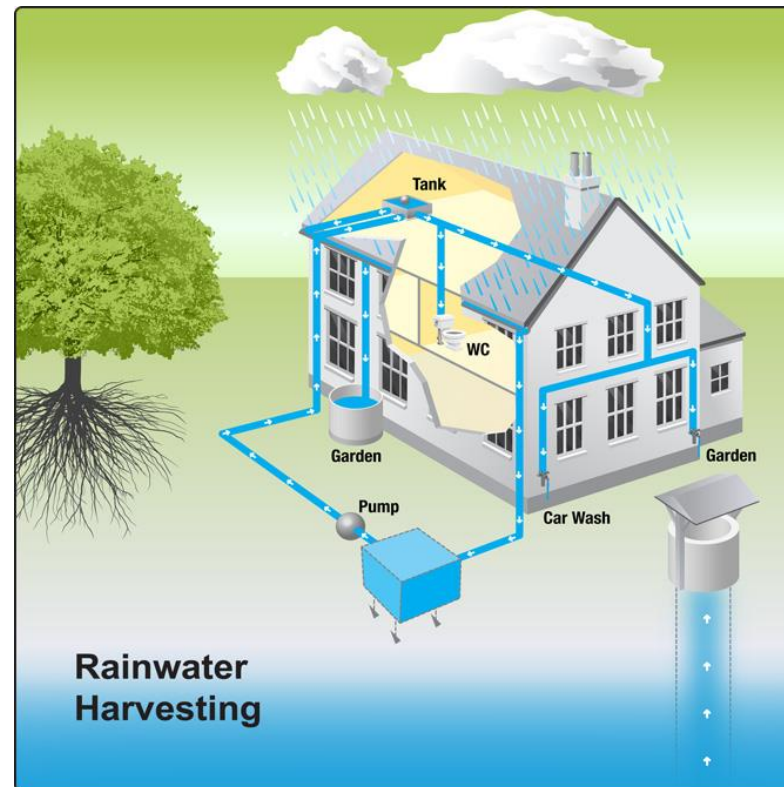
In urban area rainwater flows away as surface runoff. This runoff could be caught and used for recharging aquifers by adopting appropriate methods.

- **Roof Top rainwater harvesting**

It is a system of catching rainwater where it falls. In rooftop harvesting, the roof becomes the catchments, and the rainwater is collected from the roof of the house/building. It can either be stored in a tank or diverted to artificial recharge system. This method is less expensive and very effective and if implemented properly helps in augmenting the ground water level of the area.

Components of the roof top Rainwater Harvesting

- The illustrative design of the basic components of roof top rainwater harvesting system is given in the typical schematic diagram shown in the figure below. It shows the various ways a Rain Harvesting System can be beneficial.



Components Part 2

There are four components in a Rooftop Rainwater Harvesting System

Catchments

Transportation

First flush

Filter

Catchments

- The surface that receives rainfall directly is the catchment of rainwater harvesting system. The terrace may be flat RCC/stone roof or sloping roof. Therefore the catchment is the area, which actually contributes rainwater to the harvesting system.

Transportation

- Rainwater from rooftop should be carried through down take water pipes or drains to storage/harvesting system. Water pipes should be UV resistant (ISI HDPE/PVC pipes) of required capacity. Water from sloping roofs could be caught through gutters and down take pipe. At terraces, mouth of the each drain should have wire mesh to restrict floating material.

First Flush

- First flush is a device used to flush off the water received in first shower. The first shower of rains needs to be flushed-off to avoid contaminating storable/rechargeable water by the probable contaminants of the atmosphere and the catchment roof. It will also help in cleaning of silt and other material deposited on roof during dry seasons Provisions of first rain separator should be made at outlet of each drainpipe.

Components Part 3

Filter

- There is always some skepticism regarding Roof Top Rainwater Harvesting since doubts are raised that rainwater may contaminate groundwater. There is remote possibility of this fear coming true if proper filter mechanism is not adopted. Secondly all care must be taken to see that underground sewer drains are not punctured and no leakage is taking place in close vicinity. Filters are used for treatment of water to effectively remove turbidity, color and microorganisms. After first flushing of rainfall, water should pass through filters. A gravel, sand and 'netlon' mesh filter is designed and placed on top of the storage tank. This filter is very important in keeping the rainwater in the storage tank clean. It removes silt, dust, leaves and other organic matter from entering the storage tank. The filter media should be cleaned daily after every rainfall event. Clogged filters prevent rainwater from easily entering the storage tank and the filter may overflow. The sand or gravel media should be taken out and washed before it is replaced in the filter.

Average Rainfall in Houston

	Jan	Feb	Mar	Apr	May	Jun
Avg Rain in inches	3.7	3.23	2.4	3.43	4.45	3.82
Avg No Days w/ rain	10	10	9	8	8	8

	Jul	Aug	Sept	Oct	Nov	Dec
Avg Rain in inches	5.16	3.54	3.82	3.58	4.06	4.09
Avg No Days w/ rain	10	9	9	7	8	10

References

Climate Houston - Texas and Weather averages Houston. (n.d.). Retrieved from

<http://www.usclimatedata.com/climate/houston/texas/united-states/ustx0617>

How Much Water Will I Have Available

- The formula for calculating rainfall capture is:
- Each square foot of roof yields $\frac{1}{2}$ gallon of water

GAP Plumbing's building roof is 1800 square feet

$1800/2$ (each $\frac{1}{2}$ gallon) = 900 gallons per inch.

Average Rainfall	Jan	Feb	Mar	Apr	May	Jun
Avg Rain in inches	3.7	3.23	2.4	3.43	4.45	3.82
Avg No Days w/ rain	10	10	9	8	8	8
Possible Gallons Captured Per Month	$900 * 3.7 = 3330$	$900 * 3.23 = 2907$	$900 * 2.4 = 2160$	$900 * 3.43 = 3087$	$900 * 4.45 = 4005$	$900 * 3.82 = 3438$
	Jul	Aug	Sept	Oct	Nov	Dec
Avg Rain in inches	5.16	3.54	3.82	3.58	4.06	4.09
Avg No Days w/ rain	10	9	9	7	8	10
Possible Gallons Captured Per Month	$900 * 5.16 = 4644$	$900 * 3.54 = 3186$	$900 * 3.82 = 3438$	$900 * 3.58 = 3222$	$900 * 4.06 = 3654$	$900 * 4.09 = 3681$

Pro's and Con's

Pro's

- Never have a Water Bill
- Easy and cheap to maintain
- Can be used in drinking and cooking
- Water is not hard like well or city water
- System can be filled by a water service company
- No calcium build up on fixtures
- Reduced dependency on storage dams
- Reduced soil erosion
- Provides water for house, garden, and car wash station



Con's

- Expensive for homeowners to get into
- Filter must be cleaned after every rain
- Supplemental water will be needed



What is the Cost?

- Unfortunately water sources are never cheap. The average well can run anywhere between \$10,000 and \$13,000 to install. We have two problems with water in Continental Plaza:
 - The water, even deep in the ground, is poisonous – it is not even usable for watering grass.
 - MUD 109 charges \$15,000 to annex in a property and requires Continental LOA to install an infrastructure at a cost of several million dollars.

Rainwater Harvesting offers another option. The cost will vary from residence to residence but an average installation of a Rainwater Harvesting System should be no more than \$35,000.00.

To know more about the benefits of Rainwater Harvesting go to:

http://www.twdb.texas.gov/publications/brochures/conservation/doc/RainwaterHarvestingManual_3rdedition.pdf