**How much water can be harvested?**

1. **Urban scenario**

The total amount of water that is received in the form of rainfall over an area is called the *rainwater endowment* of the area. Out of this, the amount that can be effectively harvested is called the *water harvesting potential*.

Water harvesting potential = Rainfall (mm) x Collection efficiency

The *collection efficiency* accounts for the fact that all the rainwater falling over an area cannot be effectively harvested, because of evaporation, spillage etc. Factors like runoff coefficient and the first-flush wastage are taken into account when estimated the collection efficiency.

The following is an illustrative theoretical calculation that highlights the enormous potential for water harvesting. The same procedure can be applied to get the potential for any plot of land or rooftop area, using rainfall data for that area.

Consider your own building with a flat terrace area of 100 sq m. Assume the average annual rainfall in your area is approximately 600 mm (24 inches). In simple terms, this means that if the terrace floor is assumed to be impermeable, and all the rain that falls on it is retained without evaporation, then, in one year, there will be rainwater on the terrace floor to a height of 600 mm.

1. Area of plot = 100 sq. m. (120 square yards)
2. Height of the rainfall = 0.6 m (600 mm or 24 inches)
3. Volume of rainfall over the plot = Area of plot x height of rainfall
4. Assuming that only 60 per cent of the total rainfall is effectively harvested
5. Volume of water harvested = 36,000 litres (60,000 litres x 0.6)

This volume is about twice the annual drinking water requirement of a 5-member family. The average daily drinking water requirement per person is 10 litres.

1. **Rural scenario**

Community based rainwater harvesting in rural areas have in it as much strength today as it ever did before. It is, in fact, only with this rudimentary technology that people are able to survive in water scarce areas. Recognizing this fact, our ancestors had learnt to harvest water in number of ways:

* They harvested the rain drop directly. From rooftops, they collected water and stored it in tanks built in their courtyards. From open community lands, they collected the rain and stored it in artificial wells.
* They harvested monsoon runoff by capturing water from swollen streams during the monsoon season and stored it various forms of water bodies.
* They harvested water from flooded rivers

Assuming that the average population of in one village in November 2023 is approximately 1200. The average rainfall is about 1170 mm. If even only half this water can be captured, though with technology this can be greatly increased, an average village needs 1.12 hectares of land to capture 6.57 million litres of water it will use in a year for cooking and drinking. If there is a drought and rainfall levels dip to half the normal, the land required would rise to a mere 2.24 hectares. The amount of land needed to meet the drinking water needs of an average village will vary from 0.10 hectares in Arunachal Pradesh (average population 236) where villages are small and rainfall high to 8.46 hectares in Delhi where villages are big (average population 4769) and rainfall is low. In Rajasthan, the land required will vary from 1.68-3.64 hectares in different meterological regions and, in Gujarat, it will vary from 1.72-3.30 hectares.  And of course any more water the villagers catch can go for irrigation.

Does this sound like an impossible task? Is there any village that does not have this land availability? If total land area of one country is over 300 million hectares. Let us assume that the country has 587,000 villages can harvest the runoff from 200 million hectares of land, excluding inaccessible forest areas, high mountains and other uninhabited terrains, that still gives every village on average access to 340 hectares or a rainfall endowment of 3.75 billion litres of water. These calculations show the potential of rainwater harvesting is enormous and undeniable.

**Independent water supply**

Rainwater harvesting provides an independent water supply during water restrictions. In areas where clean water is costly, or difficult to come by, rainwater harvesting is a critical source of clean water. In developed countries, rainwater is often harvested to be used as a supplemental source of water rather than the main source, but the harvesting of rainwater can also decrease a household's water costs or overall usage levels. Rainwater is safe to drink if the consumers do additional treatments before drinking. Boiling water helps to kill germs. Adding another supplement to the system such as a [first flush](https://en.wikipedia.org/wiki/First_flush) diverter is also a common procedure to avoid contaminants of the water.

**Supplemental in drought**

When drought occurs, rainwater harvested in past months can be used. If rain is scarce but also unpredictable, the use of a rainwater harvesting system can be critical to capturing the rain when it does fall. Many countries with arid environments, use rainwater harvesting as a cheap and reliable source of clean water. To enhance irrigation in arid environments, ridges of soil are constructed to trap and prevent rainwater from running downhills. Even in periods of low [rainfall](https://en.wikipedia.org/wiki/Rainfall), enough water is collected for crops to grow. Water can be collected from roofs and tanks can be constructed to hold large quantities of rainwater.

In addition, rainwater harvesting decreases the demand for water from wells, enabling groundwater levels to be further sustained rather than depleted.

**Life-cycle assessment**

[Life-cycle assessment](https://en.wikipedia.org/wiki/Life-cycle_assessment) is a methodology used to evaluate the environmental impacts of a system from cradle-to-grave of its lifetime. Devkota et al, developed such a methodology for rainwater harvesting, and found that the building design (e.g., dimensions) and function (e.g., educational, residential, etc.) play critical roles in the environmental performance of the system.

To address the functional parameters of rainwater harvesting systems, a new metric was developed – the demand to supply ratio (D/S) – identifying the ideal building design (supply) and function (demand) in regard to the environmental performance of rainwater harvesting for toilet flushing. With the idea that supply of rainwater not only saves the potable water but also saves the stormwater entering the combined sewer network (thereby requiring treatment), the savings in environmental emissions were higher if the buildings are connected to a combined sewer network compared to separate one.

**Cost-effectiveness**

Although standard RWH systems can provide a water source to developing regions facing poverty, the average cost for an RWH setup can be costly depending on the type of technology used. Governmental aid and NGOs can assist communities facing poverty by providing the materials and education necessary to develop and maintain RWH setups.

Some studies show that rainwater harvesting is a widely applicable solution for water scarcity and other multiple usages, owing to its cost-effectiveness and eco-friendliness. Constructing new substantial, centralized water supply systems, such as dams, is prone to damage local ecosystems, generates external social costs, and has limited usages, especially in developing countries or impoverished communities. On the other hand, installing rainwater harvesting systems is verified by a number of studies to provide local communities a sustainable water source, accompanied by other various benefits, including protection from flood and control of water runoff, even in poor regions. Rainwater harvesting systems that do not require major construction or periodic maintenance by a professional from outside the community are more friendly to the environment and more likely to benefit the local people for a longer period of time. Thus, rainwater harvesting systems that could be installed and maintained by local people have bigger chances to be accepted and used by more people.

The usage of [in-situ](https://en.wikipedia.org/wiki/In_situ) technologies can reduce investment costs in rainwater harvesting. In-situ technologies for rainwater harvesting could be a feasible option for [rural areas](https://en.wikipedia.org/wiki/Rural_area) since less material is required to construct them. They can provide a reliable water source that can be utilized to expand agricultural outputs. Above-ground tanks can collect water for [domestic use](https://en.wikipedia.org/wiki/Domestic_technology); however, such units can be unaffordable to people in poverty.