

#### Dr. Anil LALWANI

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A self made professional geologist in a real sense. With varied interests and research at graduate and post graduate level in College and the University after achieving a Master's Degree in Science in Geology, in 1985 he has evolved himself and acquired most of the working skills in an area that has been prone to water shortages and water mismanagement.

Currently engaged as a Resource Consultant & Proprietor of 'Facilitators', & 'Sujalam Services', Pune, India and Chief Technical Officer (CTO) at Well & Water Works.

He had been regular contributor on the India Water Portal-Ask the Expert responding to queries sent in by people from all over, in an effort to find an amicable and practical solution to their water related problems.

He has also been contributing important information regarding the technical aspects of Rainwater harvesting in daily news papers, and seminars and workshops to which he gets invited to.

Recently in 2022 Authored a Book entitled "Rainwater Harvesting In Urban Centers within the Deccan Basalts of India". Published by Springer Nature Switzerland AG



Presented By-Dr. Anil LalwaniM. Sc. Ph. d. Geology, Advance Studies Germany & Austria

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## WATER – the essence of life!

Water regardless of its quality is always in DEMAND

Till date there has been no technological alternative for "WATER"





# Rain is the ultimate source of fresh water.

With rapid urbanization the ground area around houses and buildings are being cemented, this increases surface run off.

Due to this, precious rainwater is squandered, and it is eventually drained into the sea

Hence Rainwater harvesting Is our moral & Social Responsibility

# IS RAINWATER HARVESTING APPLICABLE EVERYWHERE ?

## A Popular Answer is "YES"

# **Technically Speaking**

**"NO"** 

## **PREVAILING COMMON MISCONCEPTIONS 1. Aquifers Everywhere are the same**



Saturated zone below the water table

(Ground water)

2. BASALTS, GRANITES, QUARTZITES, LIMESTONE ETC. ARE ALL HARD ROCK AND THE AQUIFERS FORMED WITHIN THEM ARE DUE TO VERTICAL TO SUB-VERTIGAL JOINTING AND FRACTURING ONLY.

In reality Basalts forming Aquifers are nothing like Limestone, or Granites or Quartzite, They each have their own Unique characteristic identity and hence must not be clubbed in to a single category of hard rock.

## THE BASALTIC TERRAIN



Multilayered, almost horizontally

disposed lava flows

comprising of Alternate layers of

compact & amygdaloidal flow units

#### **TYPICAL AQUIFER SYSTEM IN BASALTS**





## Dug Well exhibiting 'SHEET JOINTS'

#### SHEET JOINTS SEEN IN AN UNCASED BOREWELL



### **INFLOW ZONES OBSERVED IN WELL**



#### 3. IT IS ESSENTIAL TO ACHIVE 100% RAINWATER HARVESTING

The actual amount of water that can be harvested by collecting in a tank or recharging the ground is limited by the size of the storage tank that is viable and/or the Aquifer free space influenced by Geology & Geomorphology of the area.

Secondly, In the absence of any monitoring system which measures the quantum of water being discharged from the Property in to the storm drains one can never know how much water really gets Harvested in case of groundwater recharge.

Last but the Most Important, If every one achieves 100% recharge, there will be no surface flow and it will affect the river ecology and there by the Environment

4. RAINWATER HARVESTING BY GROUNDWATER RECHARGE IS THE NEED OF THE HOUR AND SHOULD BE COMPULSORY

As Per CENTRAL GROUNDWATER BOARD (CGWB), Rainwater harvesting by Groundwater Recharge should be attempted only in areas where the Groundwater depth is more than 6 m if Groundwater level is less than 6 m Artificial Groundwater Recharge should not be attempted.

5. IF RAINWATER HARVESTING BY GROUNDWATER RECHARGE IS NOT FEASIABLE THEN RAIN WATER HARVESTING SHOULD BE ACHIEVED BY CREATING A STORAGE TANK ON SURFACE

The fewer the annual rainy days or longer the dry period the more is the need for rainwater collection in a region. However, if the dry period is too long, big storage tanks would be needed to store rainwater. Hence in such regions, it is more feasible to use rainwater to recharge groundwater aquifers.

Average Annual Rainfall (In mm)	Roof Size ( in meter <sup>2</sup> )		RAIN WATER HARVESTING POTENTIAL (In meter <sup>3</sup> )	TANK SIZE (In meter <sup>3</sup> )		Number of Tenements (8 floor Bldg 8 flats / floor	Cost , ( ) 2(	Cost of Tank (@ Rs 20/liter)	
2000	1000		2000	600		64	1200	12000,000.00	
No of Tenements	No of	Daily water	Monthly Water	2 Summer Month	Yearly wate	r Cost of	Deficit In	Deficit In	
	people	Requirement (@135 l/ p/day) (in meter <sup>3</sup> )	Requirement (In meter <sup>3</sup> )	Water Requirement (In meter <sup>3</sup> )	Requiremen (In meter <sup>3</sup> )	storage t tank Household ( Rupees)	summer water (In meter <sup>3</sup> )	yearly water (In meter <sup>3</sup> )	
		, ,					· · · ·	, ,	
1	4	0.54	16.2	32.4	194.40	120 lacs	667.60	505.60	
2	8	1.08	32.4	64.8	388.80	60 lacs	635.20	311.20	
4	16	2.16	64.8	129.6	777.60	30 lacs	570.40	-77.60	
8	32	4.32	129.6	259.2	1,555.20	15 lacs	440.80	-855.20	
16	64	8.64	259.2	518.4	3,110.40	7.5 lacs	181.60	-2,410.40	
32	128	17.28	518.4	1036.8	6,220.80	3.75 lacs	-336.80	-5,520.80	
64	256	34.56	1036.8	2073.6	12441.60	1.875lacs	-1,473.60	-11841.60	

Approximately 70 sq m of area is required to collect yearly water requirement for 1 person

6. ONCE RAINWATER HARVESTING IS IMPLEMENTED BY RECHARGING THE GREOUND WATER THERE WILL BE AN UNLIMITED SUPPLY OF GROUNDWATER WHICH CAN BE PUMPED OUT FROM THE EXISTING WELLS/ TUBEWELLS

Truth is that Groundwater similar to Surface water is always in a dynamic state and the water that we recharge during the monsoon season is no longer in that well during the Summer months, due to the movement of groundwater which may be slow as compared to the movement of surface waters but it always moves in the downstream direction too.

For e.g. If Groundwater movement very slow at only 0.5 m per day hence the water recharged at the end of monsoon in November would be around 75 m down stream in April (after 150 days)

7. THE RECHARGED RAINWATER WILL REMAIN IN THE SUBSURFACE ONCE IT IS RECHARGED

Truth is that in the Basaltic terrain which is made up of layers of basalt flow units, Rainwater injected at upper levels tend flow out as springs at lower elevations where the flow contact is exposed in slope.



8. ROOFTOP RAINWATER HARVESTING IS THE SOLUTION TO OVERCOME WATER SCARCITY IN SUMMER MONTHS

Truth is that the extent of area that is required for recharge to meet one persons Yearly requirement (at 135 Litres Per day) is nearly 70 sq. m. Hence in Urban areas with the high population density , ROOFTOP Rainwater harvesting cannot be a viable solution to over come water shortages in summer.

All the same it is our Moral and social responsibility as it will help in other ways such as reducing floods.

8. RAINWATER HARGVESTING IS THE SOLUTION TO OVERCOME WATER SCARCITY IN SUMMER MONTHS

With the current trend digging deeper to provide for multiple Basements for providing Parking, leads to a lot of Groundwater that gets dewatered during construction, to replenish this quantity by rainwater harvesting take nearly 2-3 decades of normal rainfall.

A solution to stop this wastage is to incorporate Use of groundwater after treatment of daily use

#### **EXCAVATION BEING DEWATERED**



#### EXTREME CASE OF INFLOW



9. MAKING SHALLOW PITS Pits 2m x 3m x 2m Depth WITH SHALLOW BOREWELLS of 10 to 15 m DEPTH IS SUFFICIENT TO ACHIEVE GROUND WATER RECHARGE

Truth is with the current trend of Multiple Basements, Shallow recharge should not be attempted, as the recharged water would cause problems of uplift, and water damage to the basement slab and walls.

10. DRILLING BOREWELLS AT LOCATIONS WHERE ROOF DOWNTAKE PIPES ARE PRESENT FOR RECHARGE PURPOSE WILL HELP IN GROUDNWATER RECHARGE

Truth is that the Basaltic Aquifer system is Heterogeneous in nature, both Vertically as well as Horizontally and hence it requires a proper detailed study to identify locations where borewells are in hydraulic continuity with the aquifer to achieve the desired recharge.

NO HYDRAULIC CONNECTIVITY WITH AQUIFER

HYDRAULICALLY CONNECTED





11.ROOF TOP WATER IS CLEAN HENCE ONLY ROOFTOP WATER SHOULD BE HARVESTED

Truth is rooftop water too has contaminants such as f lead from paints, hydrocarbon from oil and grease and bacteria & Nitrates from bird and animal droppings, Humic acid from decaying leaves, etc. hence with proper filtration both surface and rooftop water can be Harvested and used to recharge the Groundwater system.

#### 12.RAINWATER HARVESTED FROM ROOF TOP IS CLEAN AND CAN BE DIRECTLY USED FOR DOMESTIC CONSUMPTION

Truth is that rooftop water too has contaminants, moreover Rainwater actually has zero Hardness in its purest form, and it tends to absorb the minerals from the surface it comes in contact with , and when collected in a tank it has a very low TDS (Total Dissolved Solids), and hence it is not advisable to use the roof top harvested water for domestic purpose without proper treatment. Ideally it should be used only for washing , cleaning, gardening, and flushing purpose.

#### FOR MORE INFORMATION REGARDING RAINWATER HARVESTING IN HARD ROCK TERRAIN YOU CAN REFFER TO

Anil Lalwani

## Rainwater Harvesting

In Urban Centers within the Hard Rock Terrain of the Deccan Basalts of India

🖄 Springer

Available on Amazon .in

