जल सूक्त

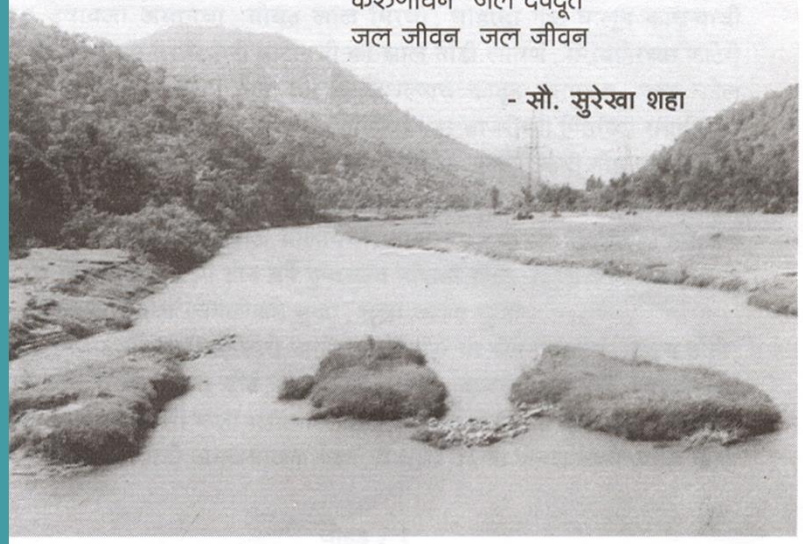
जल जिवित जल पूजित
जल संचित जल सुकृत
जल संगीत संजीवक
जल विद्युत जल मौलिक

जल दैवत विश्वात्मक
जल तृप्ति आत्यंतिक
जल वांछित जल इच्छित
जल इप्सित जल रक्षित

वरुणसुत इंद्रहस्त
जल वर्षित मन हर्षित
जल यात्रा अति पुनित
जगताचा जल उत्सव

जल गाते मल्हार सूक्त
जलविन मृतसा भूमिपुत्र
करुणाघन जल देवदूत
जल जीवन जल जीवन

- सौ. सुरेखा शहा




WELCOME
RAINWATER HARVESTING
FOR
MUMBAI & THANE
(MMR REGION – PART-I)
PART II & PART III to be
announced soon.

WHY RWH is required for MUMBAI & THANE??

मुंबई | शनिवार, १५ मार्च २०२५ । पाने १४ + मुंबई टा

क्यात

भागात
ा ओघ
विभागात ८ हजार
ुंतवणूक होणार
ल्ह्यांतील ३३१
सरकारसोबत
केले आहेत. या
हजार रोजगार
ेत.
➤वृत्त... १४

शिक्षकांना
र
च्या वेतन
करण्यासाठी
शिक्षण
लयाकडून
र्यालयाकडे
. त्यामुळे
साडेसहा
थकबाकी
ी रक्कम
आहे.
त... १४

रतातून
णाऱ्या
रिका
आहे.
रांना
वाही
दिली
स्त्र

पाणीसाठा खालावला

मुंबईसाठीच्या सात धरणांत ४२ टक्के पा

म. टा. खास प्रतिनिधी, मुंबई

चार धरणांत निम्म्याहून कमी

मोडक सागरमध्ये २२ टक्केच

कपाती निर्ण

फेब्रुवारीच्या अखेरीस सुरू झालेल्या उन्हाच्या कडाक्याने पाण्याची मागणी वाढली असून धरणांतील पाण्याचे मोठ्या प्रमाणात बाष्पीभवनही होत आहे. परिणामी मुंबईला पाणीपुरवठा करणाऱ्या सातही धरणांतील पाण्याची पातळी झपाट्याने खालावत आहे. सध्या या धरणांतील एकूण पाणीसाठा ४२ टक्के असून मोडक सागर, तानसा, मध्य वैतरणा आणि भातसा या धरणांतील पाणीसाठा ५० टक्क्यांपेक्षाही खाली गेला आहे.

पावसाळ्यास अद्याप तीन महिने बाकी आहेत. त्यामुळे उपलब्ध पाणीसाठ्यावर मुंबईकरांना अवलंबून राहावे लागणार आहे. मोडक सागर, तानसा, मध्य वैतरणा, विहार, तुळशी आणि राज्य सरकारच्या अप्पर वैतरणा, भातसा या सात धरणांतून मुंबईला पाणीपुरवठा होतो. त्यांची पाणीसाठवण क्षमता १४ लाख ४७

पाणी जपून वापरा

उन्हाचा ताप हळूहळू वाढू लागला आहे. मार्चनंतर पाण्याच वाढते. गेल्या वर्षी याच तारखेला ३८ टक्के पाणीसाठा शिल सन २०२३मध्ये ४३ टक्के साठा होता. त्यामुळे झपाट्याने क पाहता मुंबईकरांना पाणी जपून वापरण्याची गरज आहे. याच २०२३च्या तुलनेत २०२४मध्ये पाणीसाठा कमी झाल्याने ५ १० टक्के पाणीकपात करण्यात आली होती. त्या आधी ३० पाच टक्के पाणीकपात लागू होती.

वीजमागणीचा उच्चांक

Rainwater Harvesting

- Technical Requirements

&

- Social Responsibility

Mumbai Corporation of Greater Mumbai announced in **200** modification in D.C. Rule - It is compulsory to implement RWH Scheme for all the projects having area more than **1000 sqm.**

Further as on **2020** modified D.C. rule was published **DCPR 2034** RWH arrangement shall be provided for al development and redevelopment of plots having area of **500 sqm** and more.

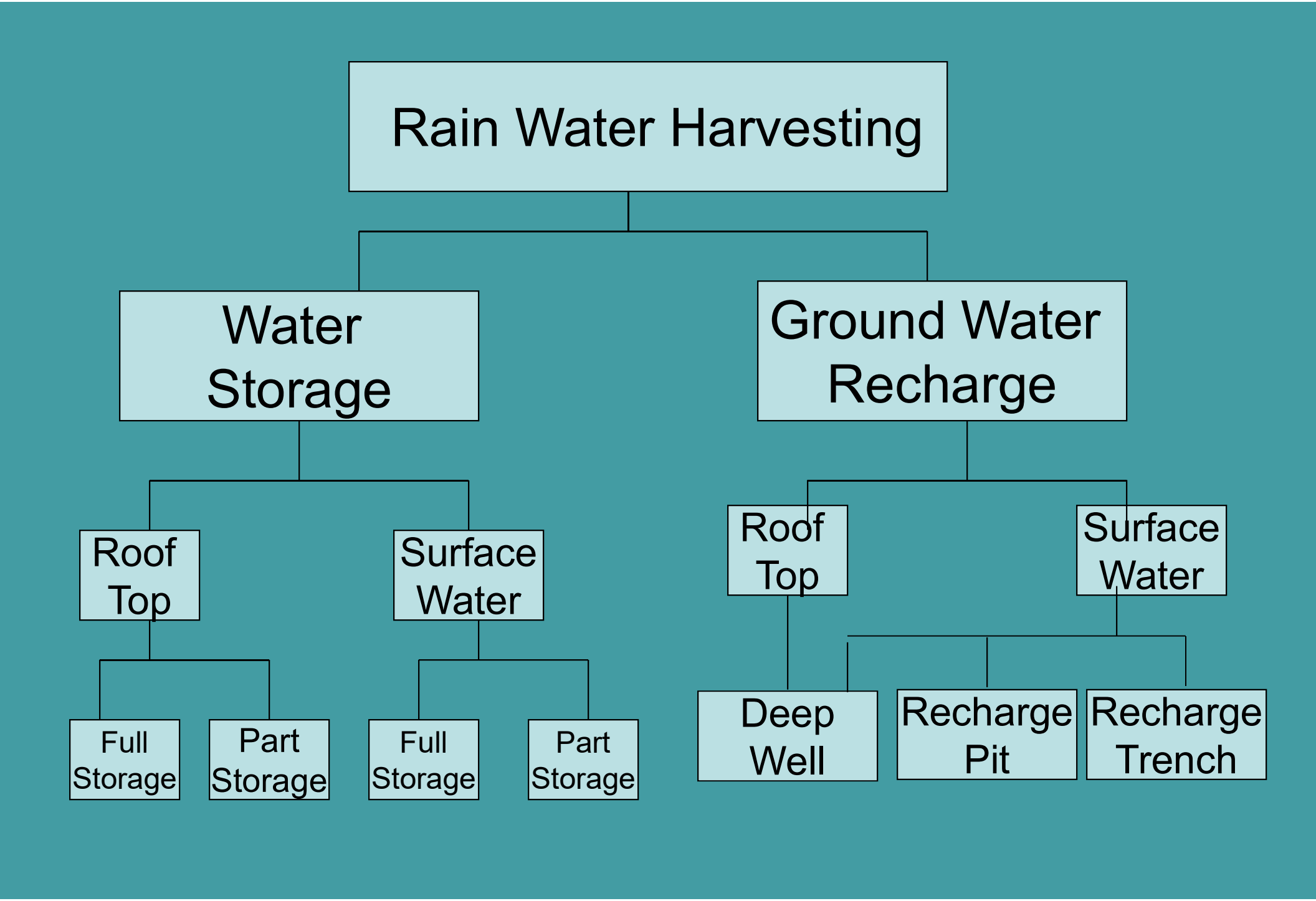
Thane Municipal Corporation – October 2002

WHAT IS RAIN WATER HARVESTING ?

Harvesting is collecting when plenty

Storing in safe way

Utilizing in scarcity


Rain Water Harvesting
Water Storage
Ground Water Recharge
Roof Top
Surface Water
Roof Top
Surface Water
Full Storage
Part Storage
Full Storage
Part Storage
Deep Well
Recharge Pit
Recharge Trench

RAINWATER HARVESTING
FOR
Mumbai & Thane.

HOW THIS RWH IS DIFFERENT
THEN RWH FOR OTHER AREAS

WHETHER WORK DONE (working models) AT VARIOUS STATES AND LOCAL LEVEL IN RURAL AREAS OF MAHARASHTRA IS USEFUL ?

NO

WHY ?

Mumbai , Delhi, Kolkata all the Mega cities are blessed as the capital cities and enjoy a BENEFIT because of Vision of Britishers.

In Fact

One of The Best Kind of Rainwater Harvesting System Exists for Mumbai, Thane Water Supply.

HOWEVER

This RWH implementation is different than normally thought of RWH.

i.e. Rainwater from distant localities is collected and used

instead of using

Rainwater from roof and immediate surroundings.

WHAT IS THIS SYSTEM ?

Identification of Appropriate Locations Having

(a) Proper slopes,
(b) Large catchment area
(c) Potential for constructing a dam

(d) Possibility of connecting the same by large dia. pipe line to Mumbai – Thane.

DETAILS OF EXISTING WATER DEMAND given in next slides

.	Source	Year of Construction	Yield in MLD	Yield in MLD Cumulative	Distance f City in KM
	Vihar Lake	1860	90	90	Within
	Tulsi Lake	1872	18	108	Within
	Tansa Dam	1892 1948	500	608	106
	Vaitarna Dam	1954	455	1,063	119
	Upper Vaitarna Dam	1972	635	1,698	163
	Bhasta Dam	1980-2007	2,030	3,718	102
	Middle Vaitarna Dam	2014	455	4,173	150
	Powai Lake	1891	20	4193	
	Modak Sagar Lake	1956	455	**4648**	

Mumbai's Water Supply System – Future Sources

Sr. No	Source	Yield in MLD	Cumulative	Distance from C in KMs
	Present Sources Total		**4648**	
1	Gargai Dam	440	4,613	180
2	Pinjal Dam	865	5,478	195
3	Damanganga Dam	1,586	7,064	237
4	Desalination Plant	200+200	7,264 + 200	Within City

WATER SUPPLY
Future Sources & Locations
Chitale Committee Report

Recently Taken Up	Capacity (MLD)
Gargai	455
Pinjal	865
Kalu	590
Shai	1067
TOTAL	**3800 MLD**

Water Demand Vs. Population

Projection – Past , Present , Future

Year	Populations in Lacs	Water Demand (MLD)
1971	51	670 (1340)
1981	82	1110 (2220)
1991	99	1340 (2680)
2001	120	1620 (3240)
2011	135	1820 (3640)
2021	160	2160 (4320)
2031	340	3520 (7040)

This Does not include commercial , Industrial, Railways, BEST etc. (say 20%)

Characteristics of MUMBAI & THANE

Densely Populated (varied population)

Industrialized

Surrounded by sea

Average Rainfall – 2000 mm. To 25000 mm

Natural lakes – ? ? ?

Bore Wells – ? ? ?

Dug Wells - ? ? ?

Typical Geological Characteristics of Mumbai

- Principally consist of 7 islands having 1 to 3 m. earth crust (soil) followed by hard rock.
- Area surrounding islands sometimes shows existence of sand and sand stones to the depth of more than 10 m.
- Kharlands and Marine Clay area.
- Area reclaimed by good soil like Nariman Point
- Area reclaimed by Garbage – Dumping Grounds

- **Geological characteristic of Thane are similar.**

Land Use Map of Mumbai

Significant Population Density Variation

ry High Density	-	South Mumbai	-FSI more than 3
gh Density	-	Rehab. Schemes	-FSI 2.5-3.19
edium Density	-	All suburbs	-FSI 1
w Density	-	**Open grounds, roads, public utility areas.**	
?? Zopadpatti	-	100% Ground coverage - Poor condition of sewage and waste disposal	
?? Industry	-	Effluent Generating Areas	

pulation Density decides roof area available per person.

Data for Mumbai

• Area of City & Suburbs	• 437 sq.km.
• Residential are of Mumbai	• 175 sq.km.
• Commercial Area	• 15 sq.km.
• Industrial Area	• 50 sq.km
• Recreation,Playground etc.	• 25 sq.km
• Amenities, Market etc.	• 15 sq.km
• Roads	• 60 sq.km
• Remaining like BARC, RailwaysWater courses etc.	• 100 sq.km.

Data for Mumbai

- Area Suburbs & Extended suburbs - 367 sq.km
- Suburbs Population Density - 20,000persons/sq.km
- Area for City - 70 sq.km
- City Population Density - 50,000persons/sq.km
- Typical Metro Population Density - 12,500-17,500 pers/sq.km
- 1991- population – City/Western Suburbs/Eastern Suburbs - 30L+39L+28L=97L
- 2005- population - City/Western Suburbs/ Eastern Suburbs - 30L+50L+40L=120L

Problems of Roof Water Stored on Ground

- Large space for storage tank
- Storage size – cost constraints
- Prevention from contamination
- Continuous monitoring for quality

Problems of Ground Recharging

- Varying Geology – Scattered Information
- Contamination of water because of surface pollutants and garbage
- Potential danger in dumping ground areas
- Inadequate information - Underground Aquifers
- Low success rate

Second Line of Defense

ocial Outbreak in neighboring districts

Var – Bombarding	– May destroy water supply systen
iots & Terrorism	– Possibility of Attacking water sup system
arthquake, Flood , yclone	– May eradicate water supply syst

In view of serious need of Second Line of Defense
We need to create a bank of experts from various fields

WHY
RAIN WATER HARVESTING IS NOT POPULARLY IMPLEMENTED ?

I GET WATER FOR BRUSHING,

I GET WATER FOR FLUSHING,

I GET WATER FOR SHOWER,

I GET WATER FOR WASHING CAR,

I GET WATER FOR GARDENING

I THROW THE STALE WATER

I do not face any problem in getting Water like my fellow Citizens

PLEASE UNDERSTAND
RAINWATER HARVESTING
IS NOT ONLY A
TECHNOLOGY
BUT ALSO

OUR SOCIAL RESPONSIBILITY

How to Implement RWH in Mumbai/Thane?

It shall be implemented by partnership of

- Residential Society as a unit
- NGOs for promoting concept and generating awareness
- Builders / Promoters of new complexes
- BMC & TMC
- Technocrats to develop appropriate methods with the help of Architectural & Engineering colleges

Role of Society as a Unit

- Implementation of RWH Scheme (bearing the cost).
- Judicious consumption of water
- Use rainwater for flushing, car washing, gardening.
- Recycling of water

Role of Builders/Developers/Societies

Develop proper schemes of RWH/Recycling for ne projects.

Generating facility of maintenance and monitoring

Establishing RWH schemes as prominent features of ne complexes through propagating the same as 'Uniqu Selling Point'

Role of NGOs

- Generating awareness for value of water.
- Creating initiative for water literacy
- Facilitating for community projects
- Funding Institutes and Technocrats
- Take up Data Analysis & Research Projects with the help of BMC/TMC

Role of Technocrats
Engineers & Architects

- To develop the concept and detailing
- To develop Zone Map.
- To develop suitable and simple models for easy implementation
- To make Professional Services available to the builders/ developers and housing societies at reasonable cost.

Summery

RWH for Mumbai, Thane is a complex subject having many technical & social dimensions.

Typical solutions given by many books and institutes are not directly applicable to Mumbai, Thane.

Mumbai, Thane has varying geological characteristics , which makes it further difficult. It is essential to have proper expertise in Geology and Hydrogeology to tackle this problem of RWH for Mumbai, Thane.

As a first step Form a small study group of professionals (committee?) having expertise in Civil Engineering , Architecture, Sanitation Plumbing, Geology, Hydrogeology and Social Sciences

Committee needs to review the various schemes adopted over last five years and assess success rate of the same in Mumbai, Thane.

The committee to document experience and expression of the persons for monitoring the schemes.

After detailed study of such schemes, Zero down on 5 or 6 sample schemes.

- To form a centralized Committee, which can give guide lines to adopt different schemes with or without modification based on zoning.

- **Objective** of committee should be to create a MICRO ZONE MAP based on geological substrata , and assign an appropriate scheme/ schemes of RWH for the respective zones

- I request Mr. Hemant Vadalkar President ISSE to take up this task as ISSE endeavor and form a Committee (study group) who can work further on this issue.

Let us have a look at the sample slide of

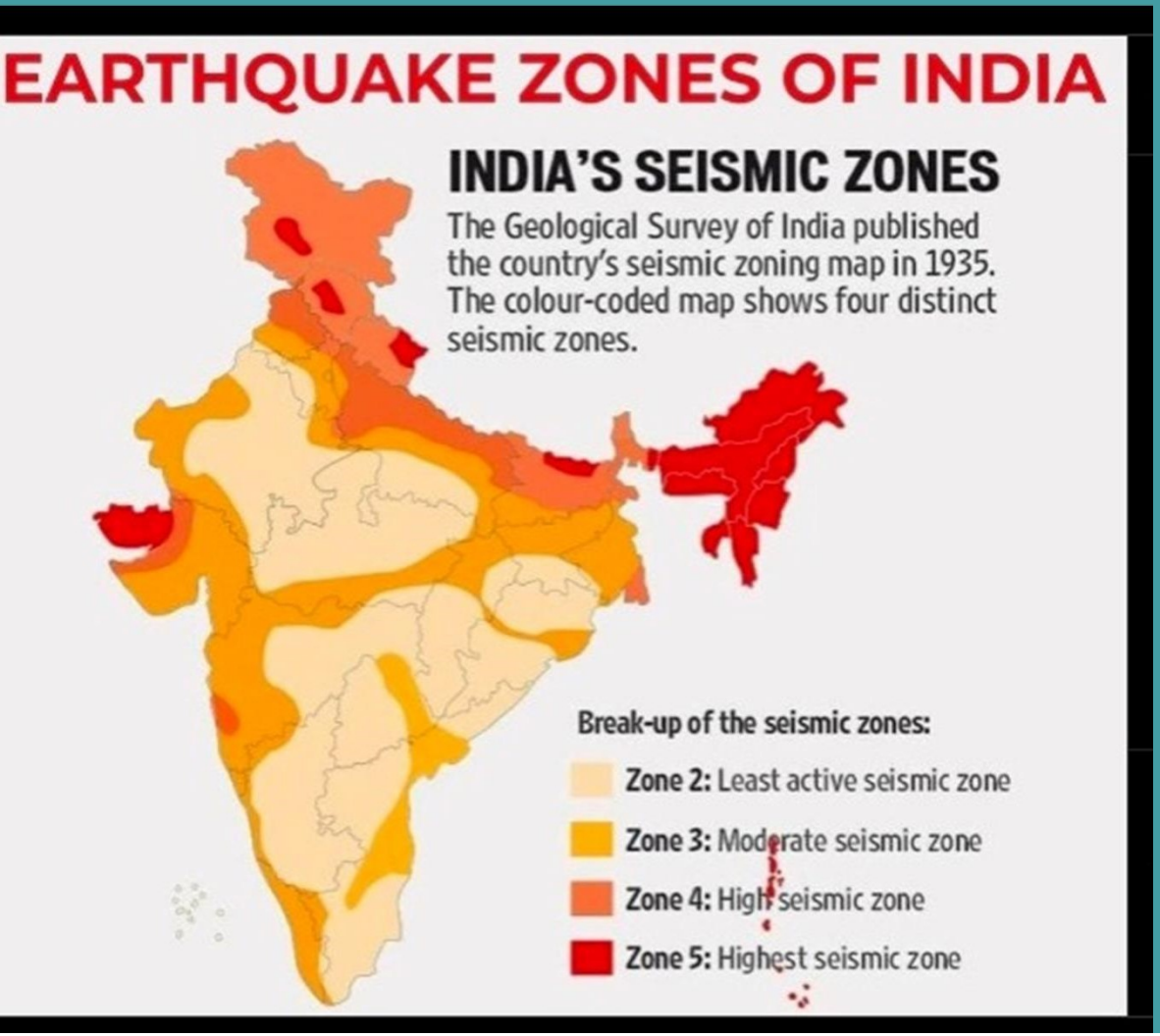
‘EARTHQUAKE ZONE MAP’ from ‘ IS-2002’

Can we generate similar ‘Micro Zoning Maps’ for

Mumbai, Thane giving details of :

1. WATER TABLE
2. GEOLOGICAL STRATA
3. RWH MODEL RECOMMENDED

TO GENERATE RWH ZONING MAP FOR MUMBAI, THANE LIKE EARTHQUAKE ZONE MAP



ZONE -3

This zone is classified as `he IS code assigns a zone factor of 0.16 for Zone 3. Several megacities like Chennai, Mumbai, Pune, Kolkata, Bhubaneswar, Jamshedpur, Ahmedabad, Surat, Lucknow, Vadodara, Mangalore, Vijayawada, Coimbatore and the entire state of Kerala lie in this zone.

Water Future for Mumbai

By

MR. JAYANT KULKARNI (M.D.)

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