

# Reusing Storm-Water

In Makkah Green areas

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## About Prof. HASSAN

PHD in Hydraulic Structure, MBA in E-company OPM3, PMP, PMI-RMP, and CMC. 25 years of experience in Engineering and Construction fields and more than 10 years in OPM and Development services.

PMO Leader HMM Projects

\$ 3 Billion

General Manager MOI Projects

\$1 Billion

OPM Consultant Family Co.

\$ 5 Billion

# What is the Storm Water?



**Threat!**

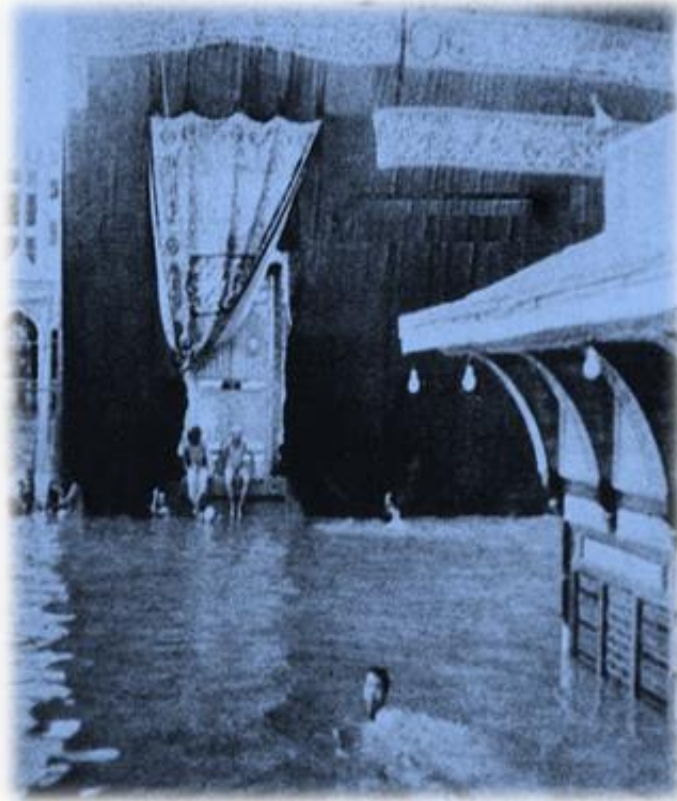
*& think*



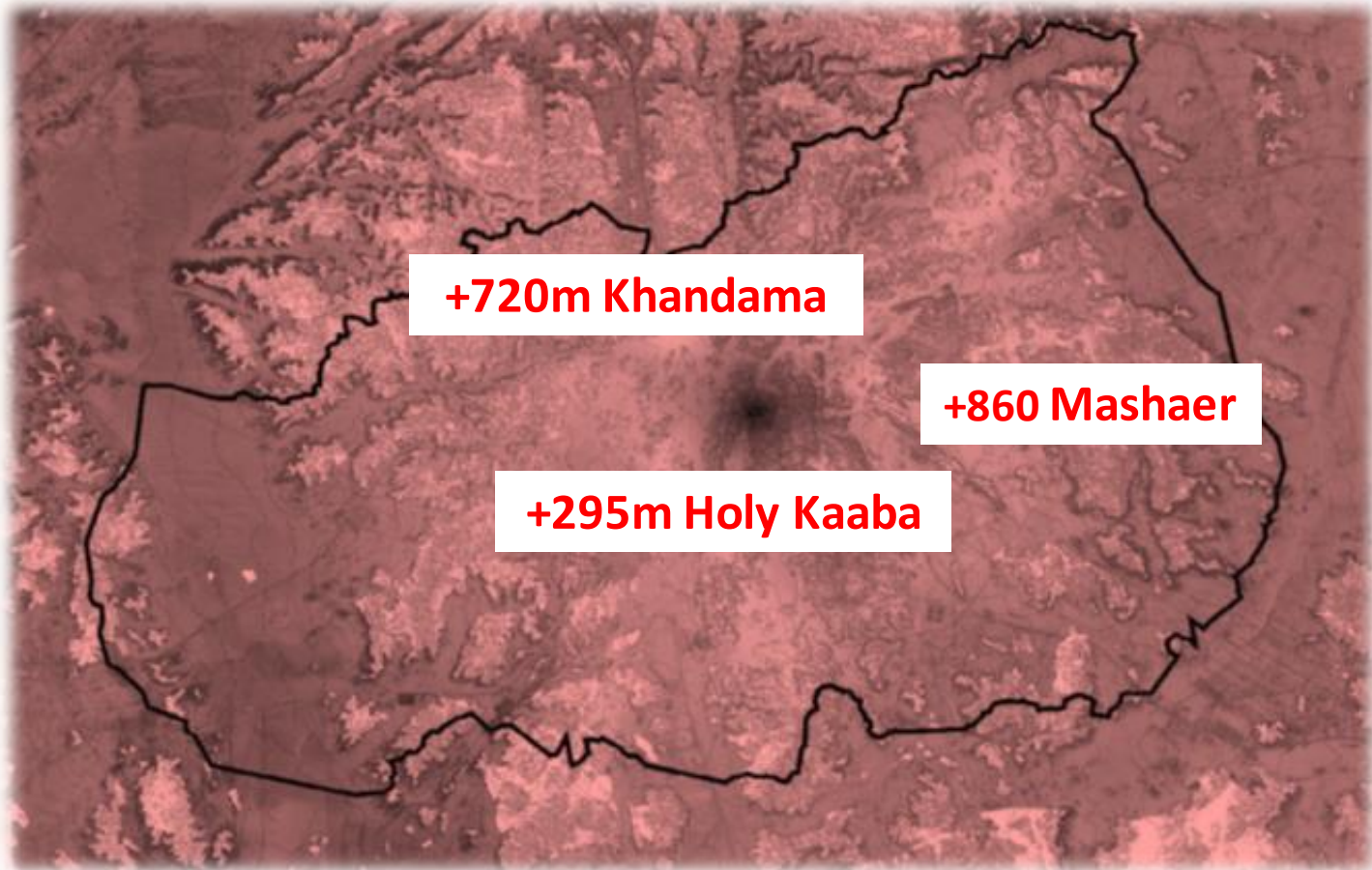
**Opportunity!**

*& think*

# Holy Makkah Storm Water

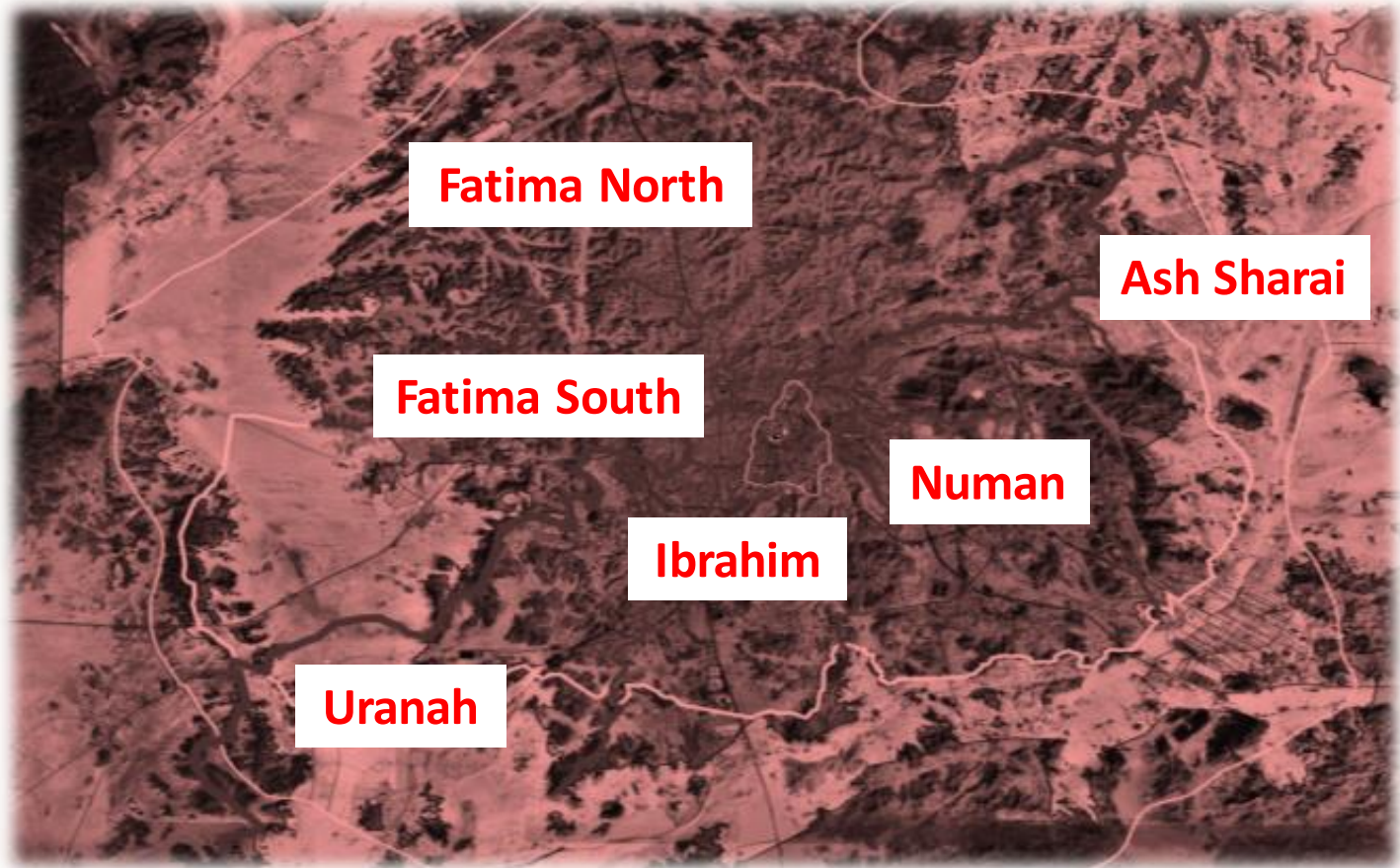


# Rough Topography



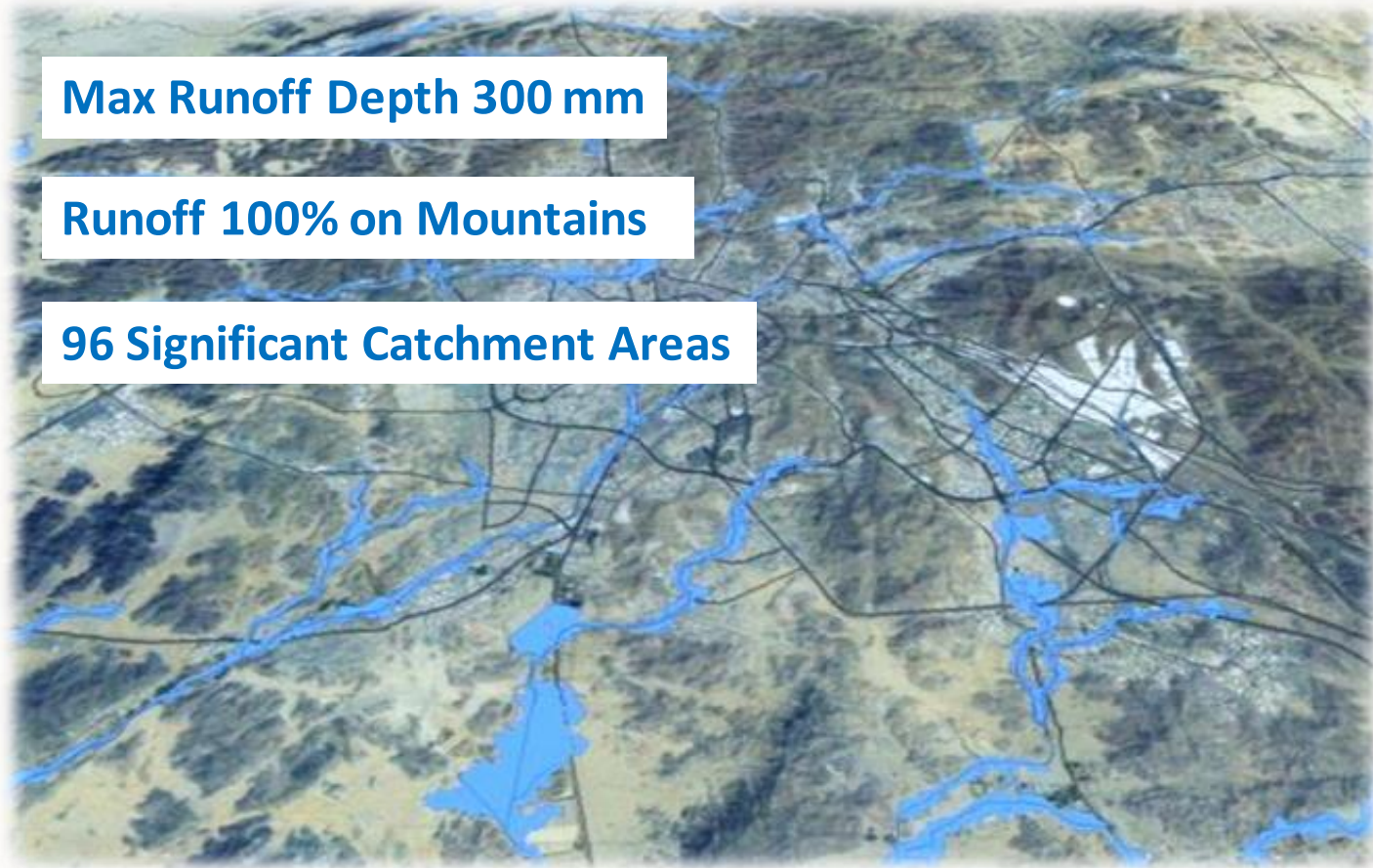
**Hijaz Mountains** 80 Km from Red Sea coast

# Natural Framework



**Six Urban Watersheds (Wadis of Makkah)**

# Makkah Storm Water



Max Runoff Depth 300 mm

Runoff 100% on Mountains

96 Significant Catchment Areas

**94% of Makkah** are urban or mountainous

# Storm Water Negative Impact



**Flood height 2m = Threats + Damages**

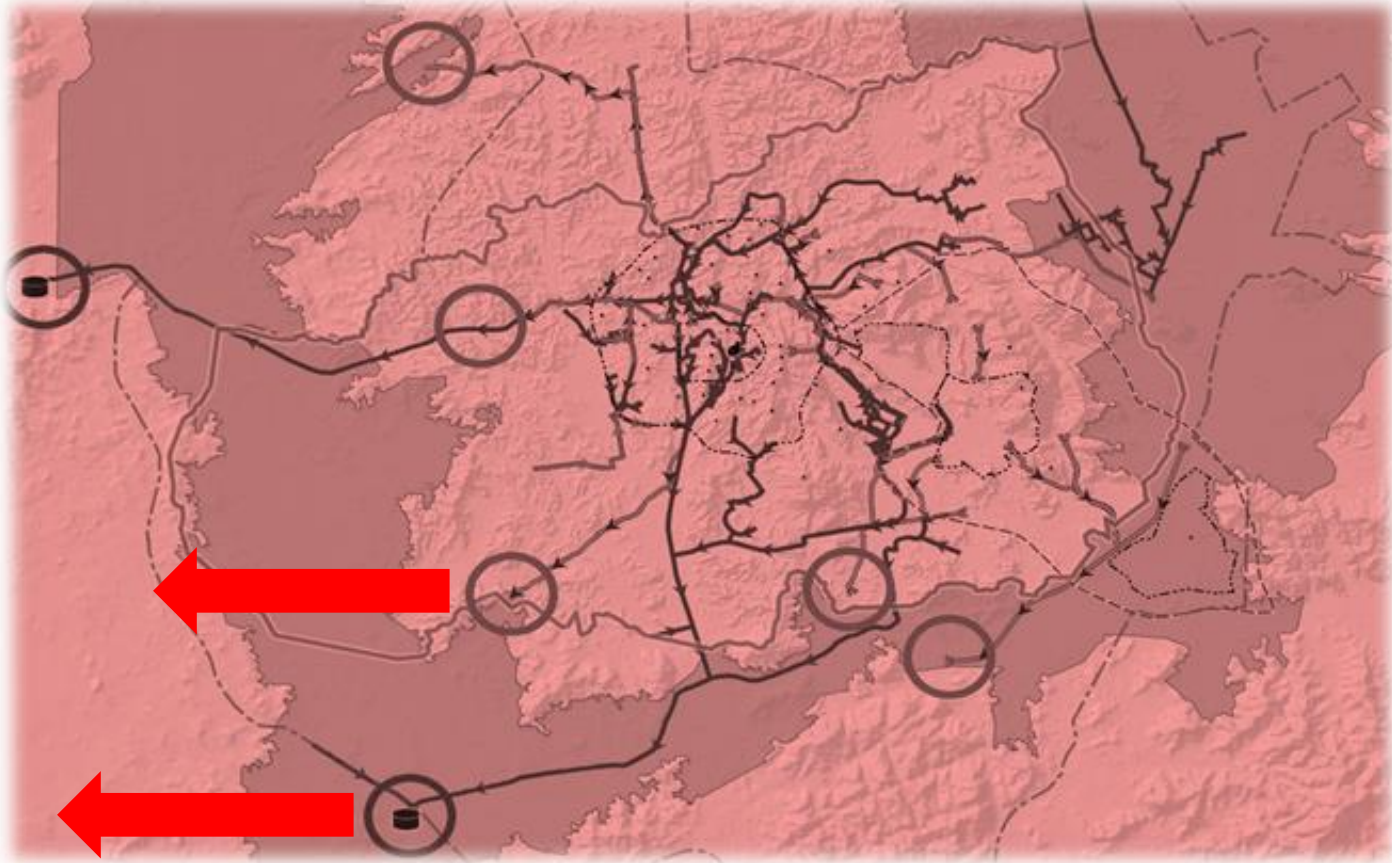


# 42 HMM Storm Water Projects



**436M SR to avoid the Negative Impact**

# Storm Water $\neq$ Waste Water



**No Reuse** The Storm water goes to the Sea

# What is the Storm Water?



**Sure, It is Threat!**

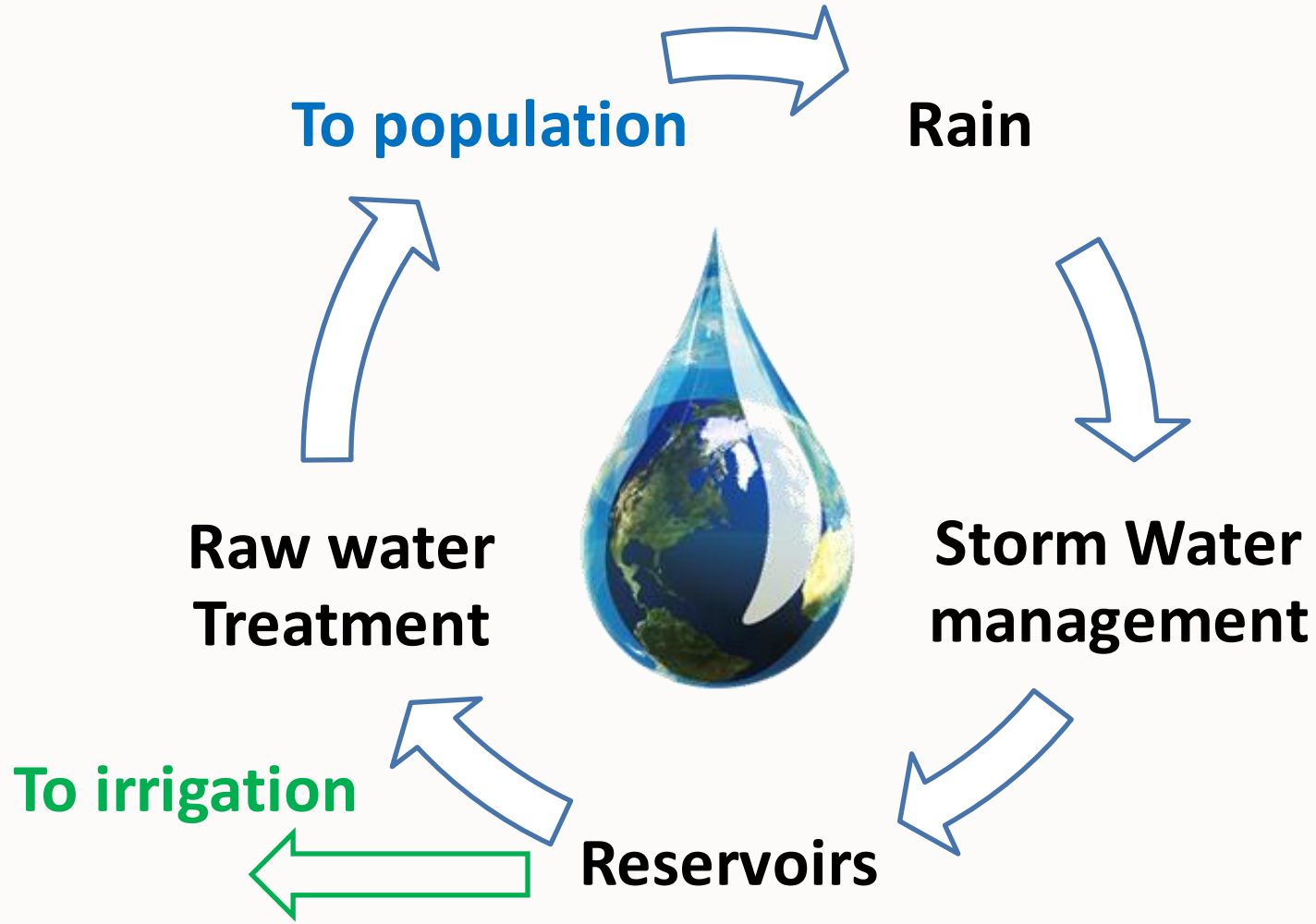
*& think*



**Not exactly**

*& think*

# Storm Water Reuse (SWR)



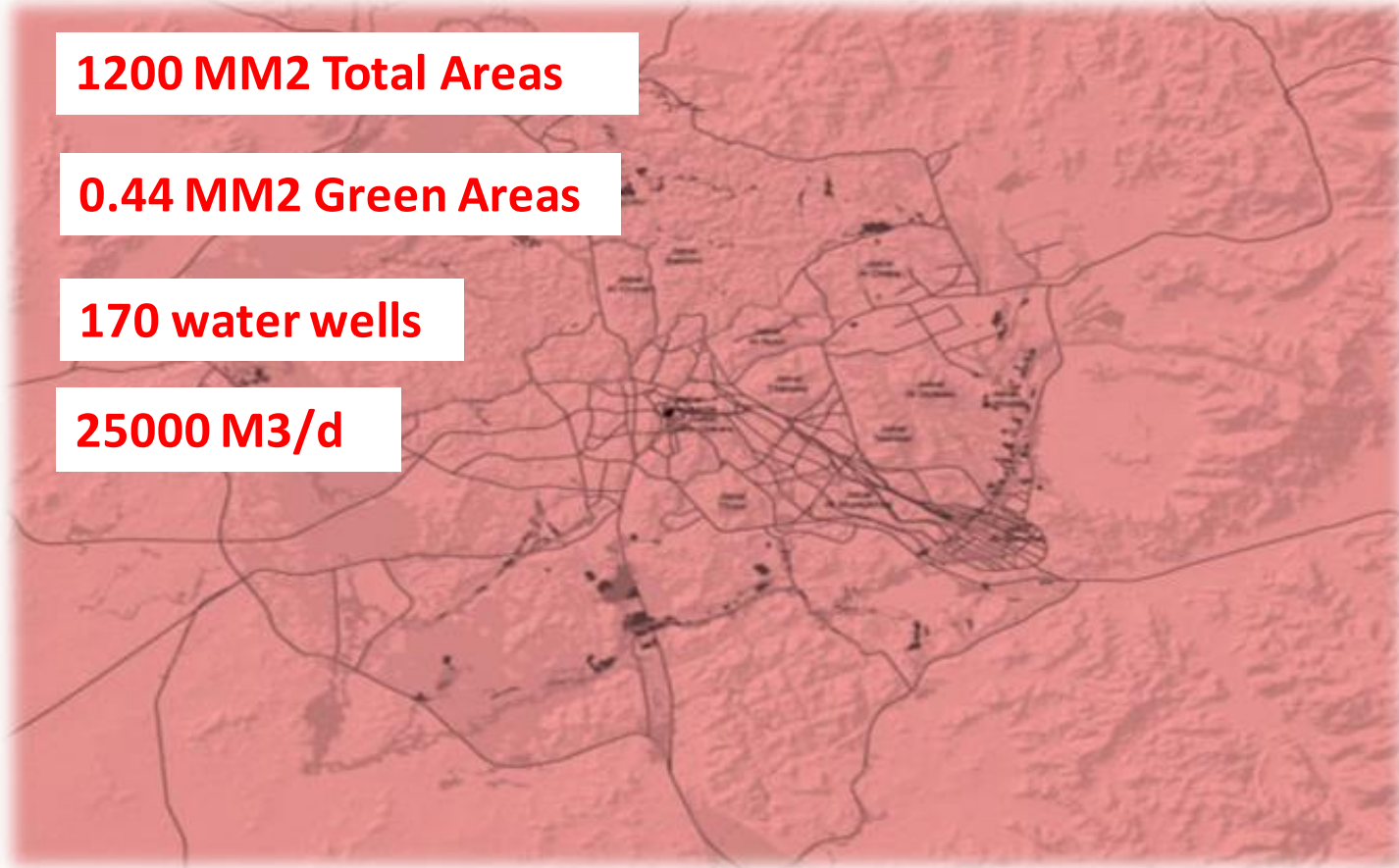
# Green Areas Water Demand

1200 MM2 Total Areas

0.44 MM2 Green Areas

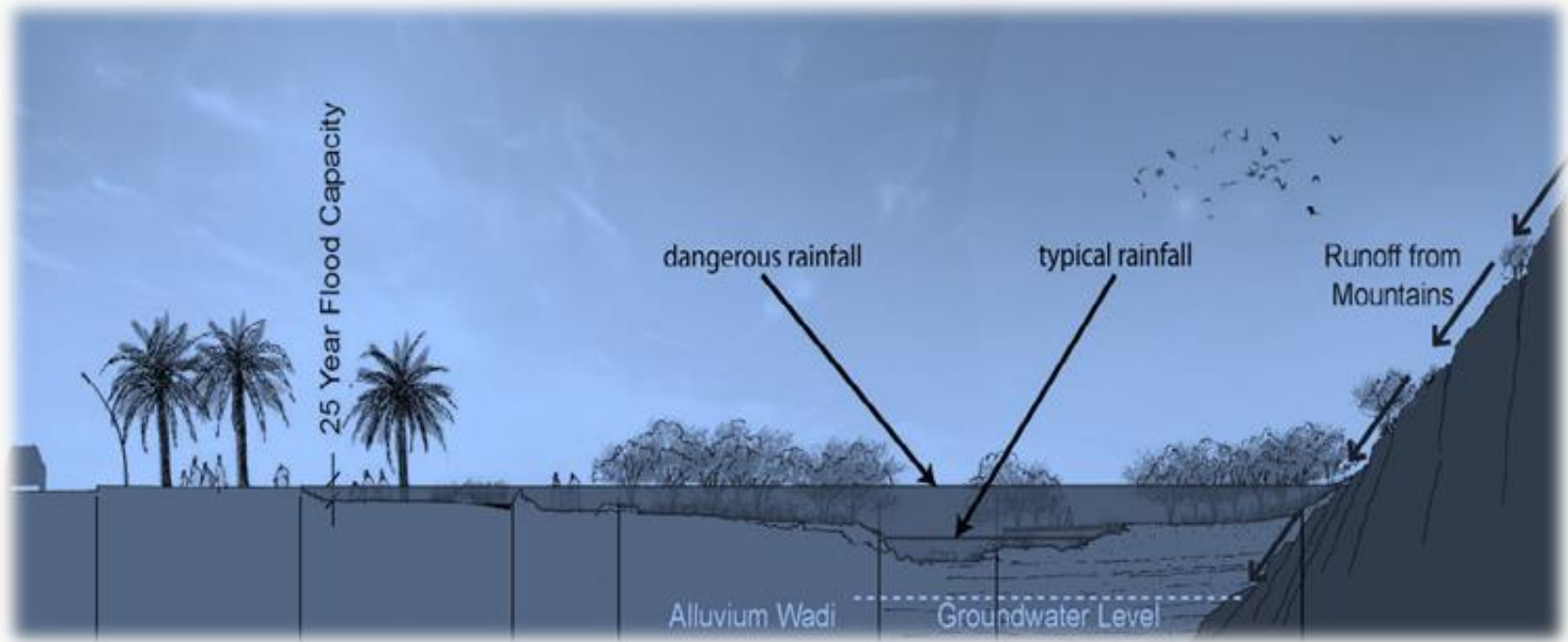
170 water wells

25000 M3/d



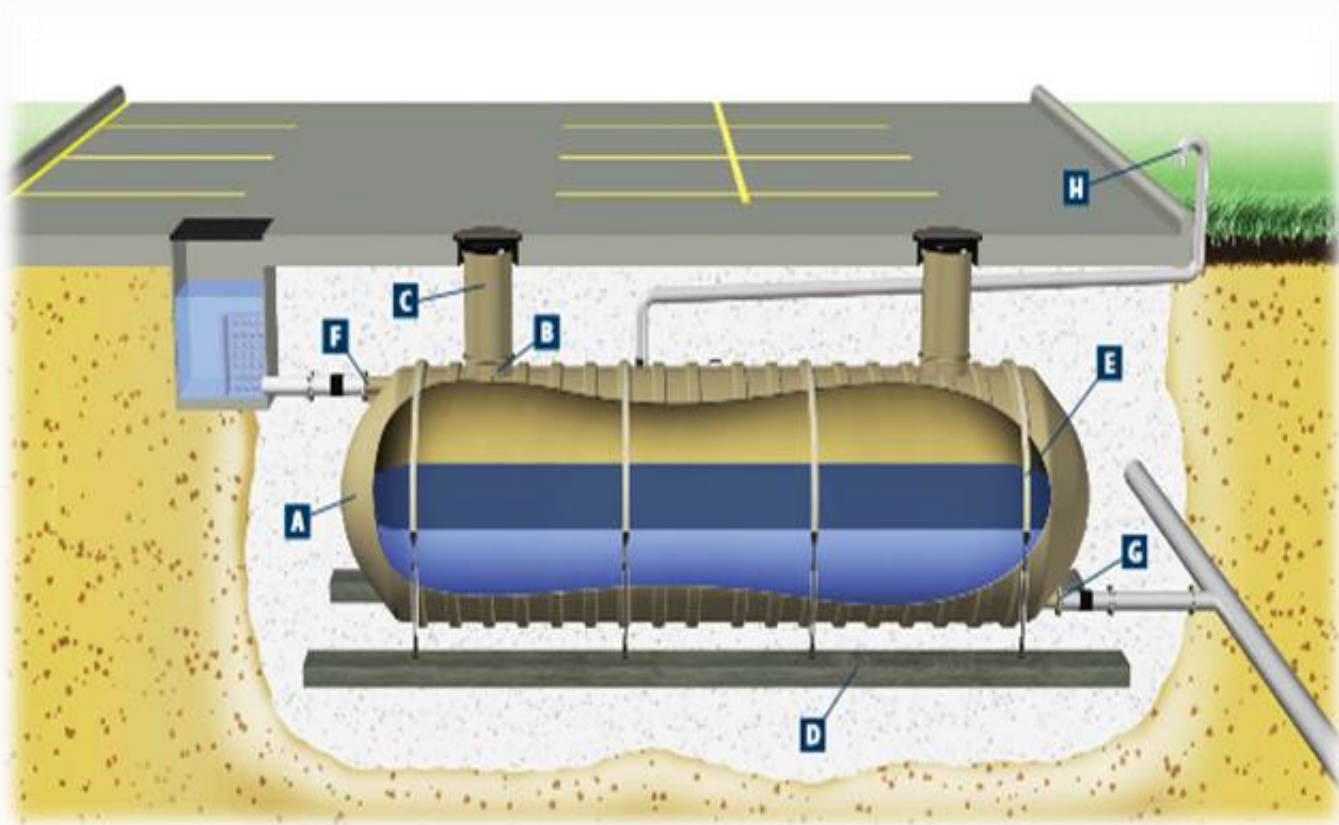
**Groundwater** recharge for sustainability

# Makkah SWR System



- **Storage of urban runoff (Tanks)**
- **Storm water Treatment (Plants)**
- **Groundwater recharge in alluvium areas (Dams)**

# SWR System Components



**Storm water Tanks** for Urban Green Areas

# SWR System Components



**Storm water Treatment Plants**



# SWR System Components



**Dams** for Open Green Areas (Hima)

# SWR System Components



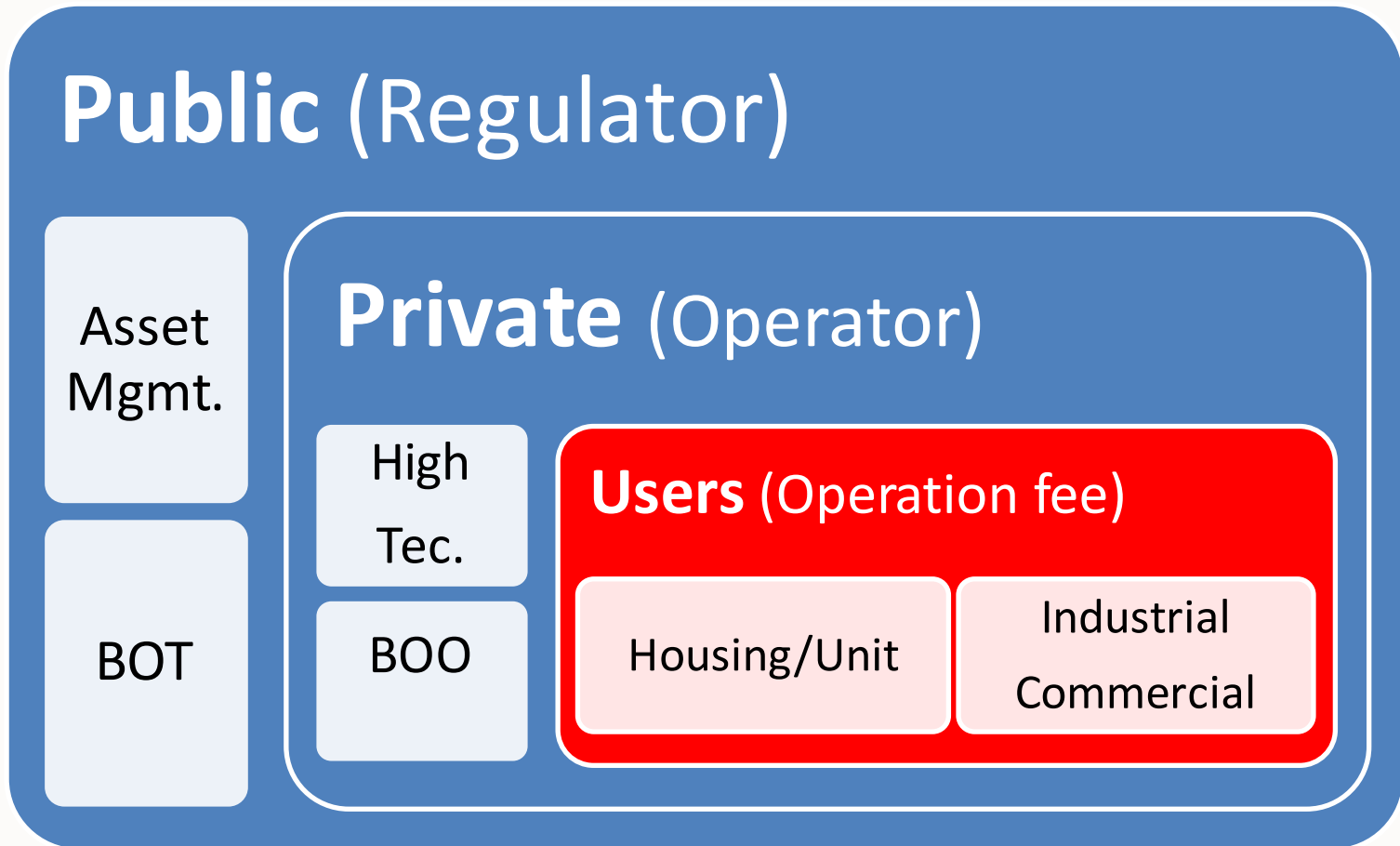
**Dams** for Open Green Areas (Hima)

# SWR System Cost



**2.7B over 30Y** to construct the SWR System

# PPP SWR Projects Fund



**Operation cost = 2% of Implementation**

# Wadi Fatima SWR Project

Total Area 4,529 Mm<sup>2</sup>

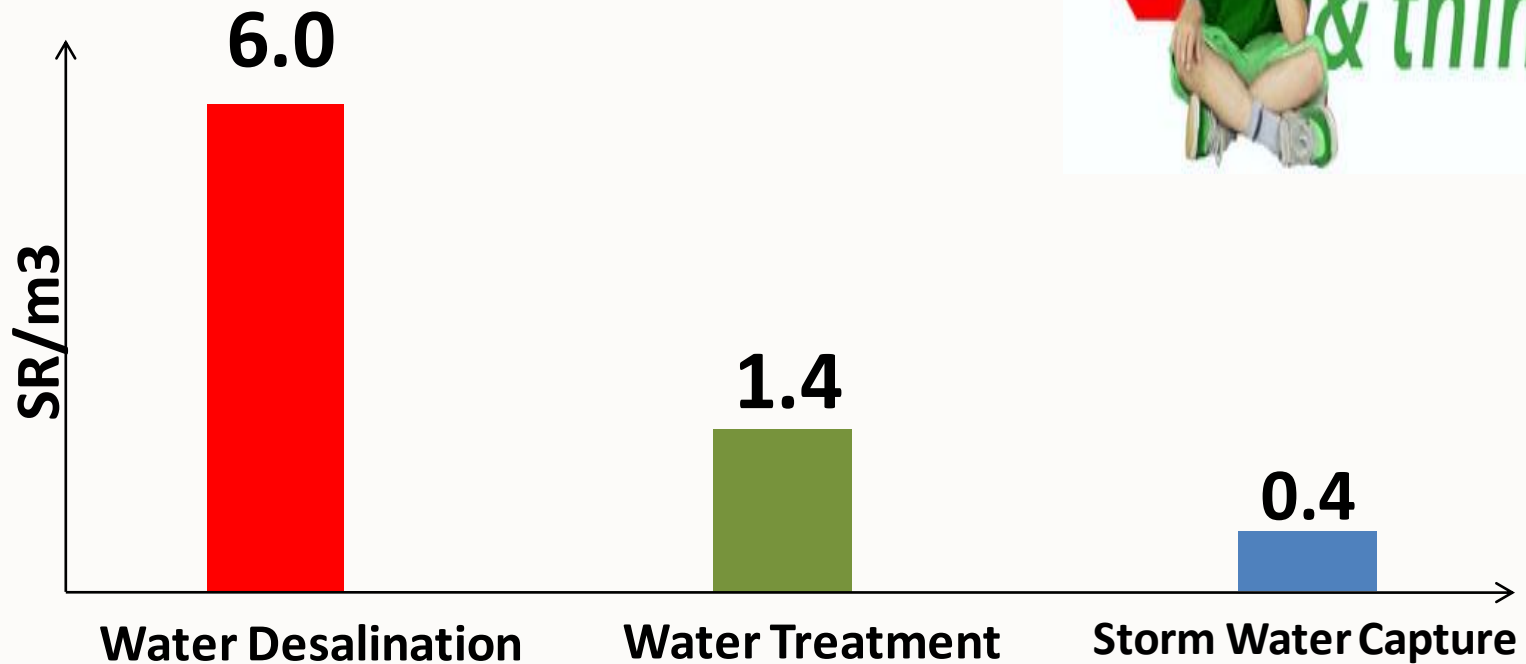
Runoff Depth = 100mm, C=0.4

Potential SWR 181,160 Mm<sup>3</sup>/Y

4M Haji Demand = 2.7% Wadi Fatima SWR

Wadi Fatima SWR will save to **1.09B SR/Y**

# Sure, SWR is Opportunity!





# Be Green

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