

# Local Water Harvesting – The Malta Experience

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Natural Water Retention Measures

# How NRW can save money!

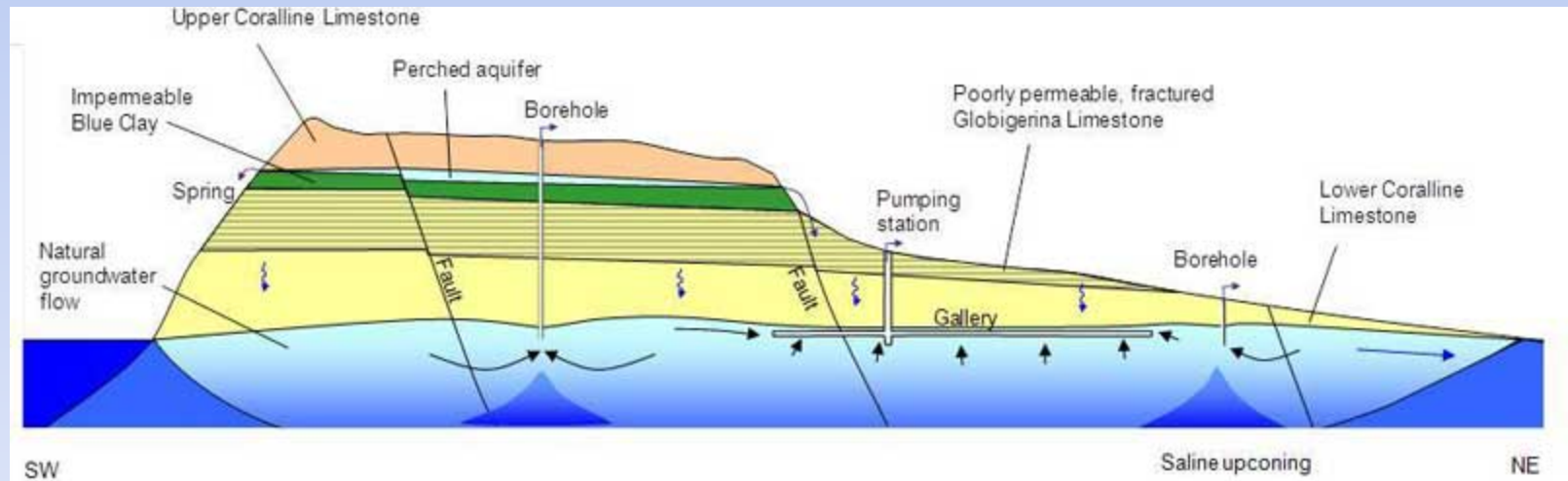
- Context
- History of water conservation
- Flooding induced by urbanisation
- EU-financed project on flood relief €52 million
- How to make the project **much** better...
- Lessons to be learnt

# The Maltese Islands



# Context

- Mediterranean climate; Limestone geology
- Poor natural fresh water resources: – brackish groundwater;
- 65% potable water from reverse osmosis desalination

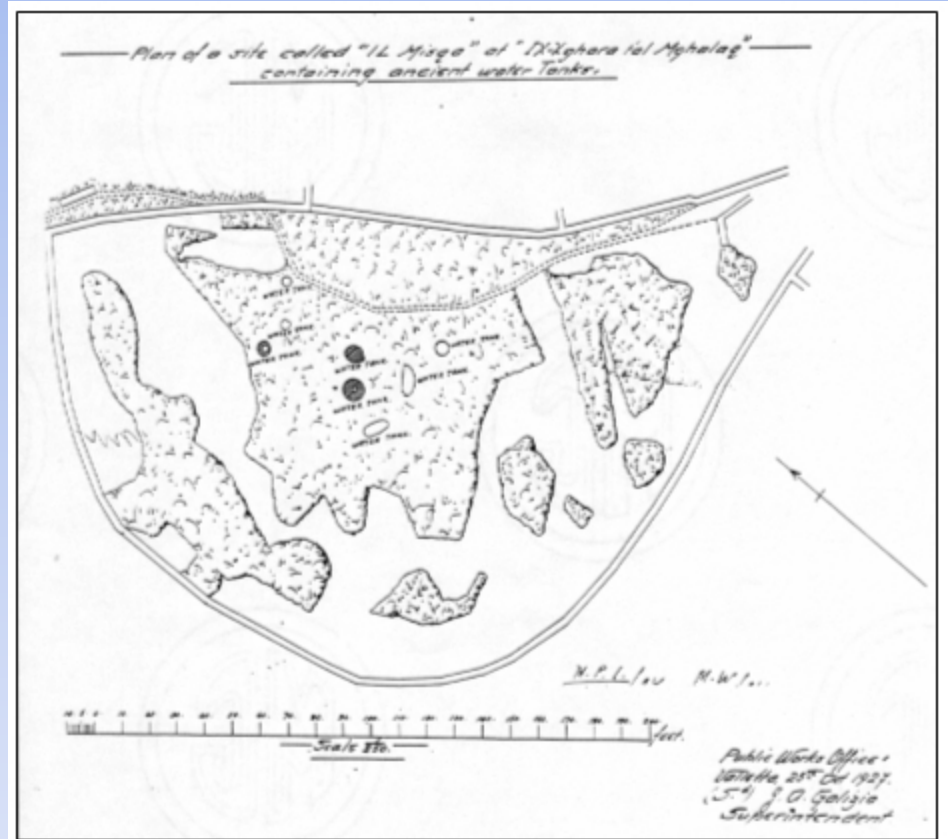




# History of water conservation

- Oldest free standing buildings



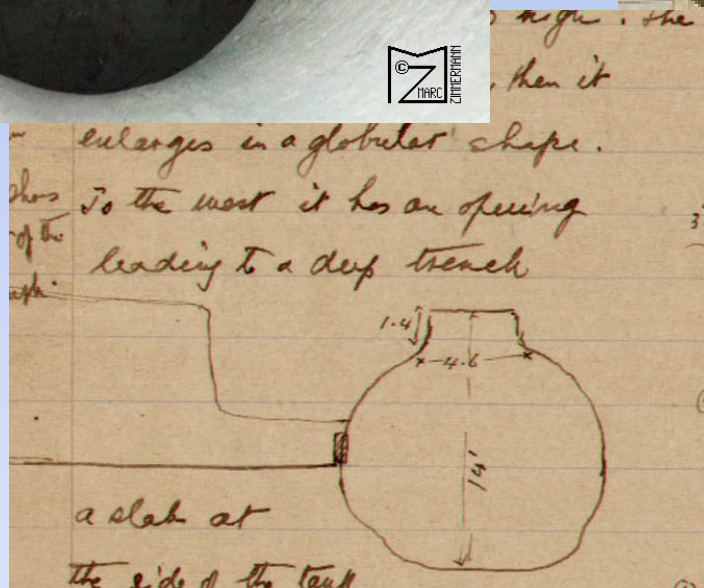




# Domestic water harvesting



Plan



Section

Archaeological sketch section

# Municipal water harvesting



Excavated and vaulted tanks  
in towns

Bormla - Santa Tereza

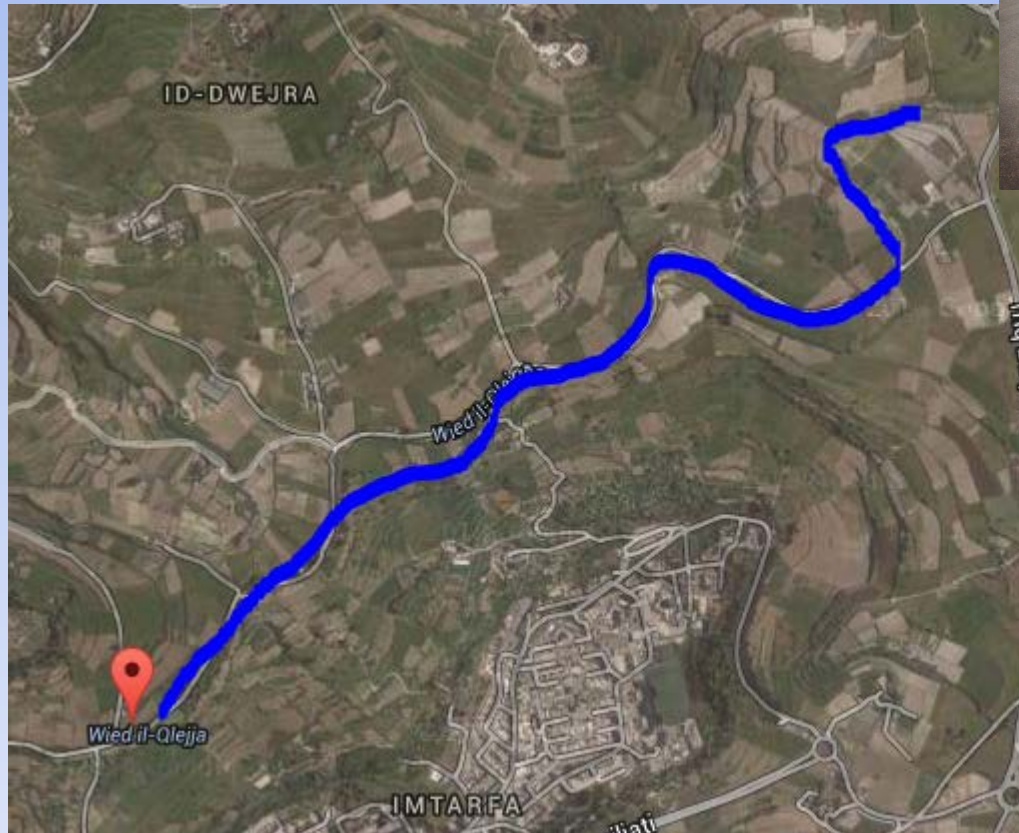
Valletta – Opera House





# Infiltration 'lakes'

- Osbert Chadwick 1890



# Flooding induced by unmanaged urbanisation

- Semi-annual events:  
intensity: c. 40-90mm/hr





# Flooding induced by unmanaged urbanisation



- €10 million claims due to floods in September 2003 event alone.



# Roof – sewer connections

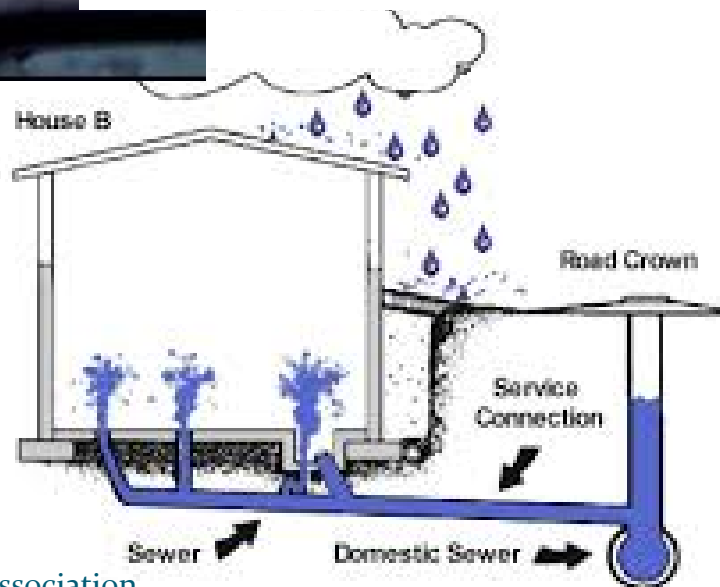


Document F – Conservation of Fuel, Energy and Natural Resources  
(Minimum requirements on the Energy Performance of Buildings Regulations, 2006)

Size of well or cistern Table F.10

Building Type	Size of cistern (m <sup>3</sup> )
1. Domestic dwellings (inc. Apartment blocks)	Total roof area (m <sup>2</sup> ) x 0.6m
2. Hotels, Schools, Offices, Factories, Industrial buildings and Hospitals	Total roof area (m <sup>2</sup> ) x 0.6m
3. Shops and showrooms, and places of public gathering and entertainment not integrated in 2 above	Total roof area (m <sup>2</sup> ) x 0.45m
4. External paved areas (inc. open terraces and balconies) *	Total paved area (m <sup>2</sup> ) x 0.6m
<p><b>*Note:</b> This requirement applies only if the total open paved area is greater than 300sq.m</p>	

- Sewage overflows to streets
- Wells not used



# National Flood Relief Project

- 16.6km tunnels
- 3m -7m  $\phi$
- €52 million
- EU funding 85%





# National Flood Relief Project

- No upstream treatment of catchments
- 1 in 5 year storm design event
- 300,000 m<sup>3</sup> /a infiltration at Gzira

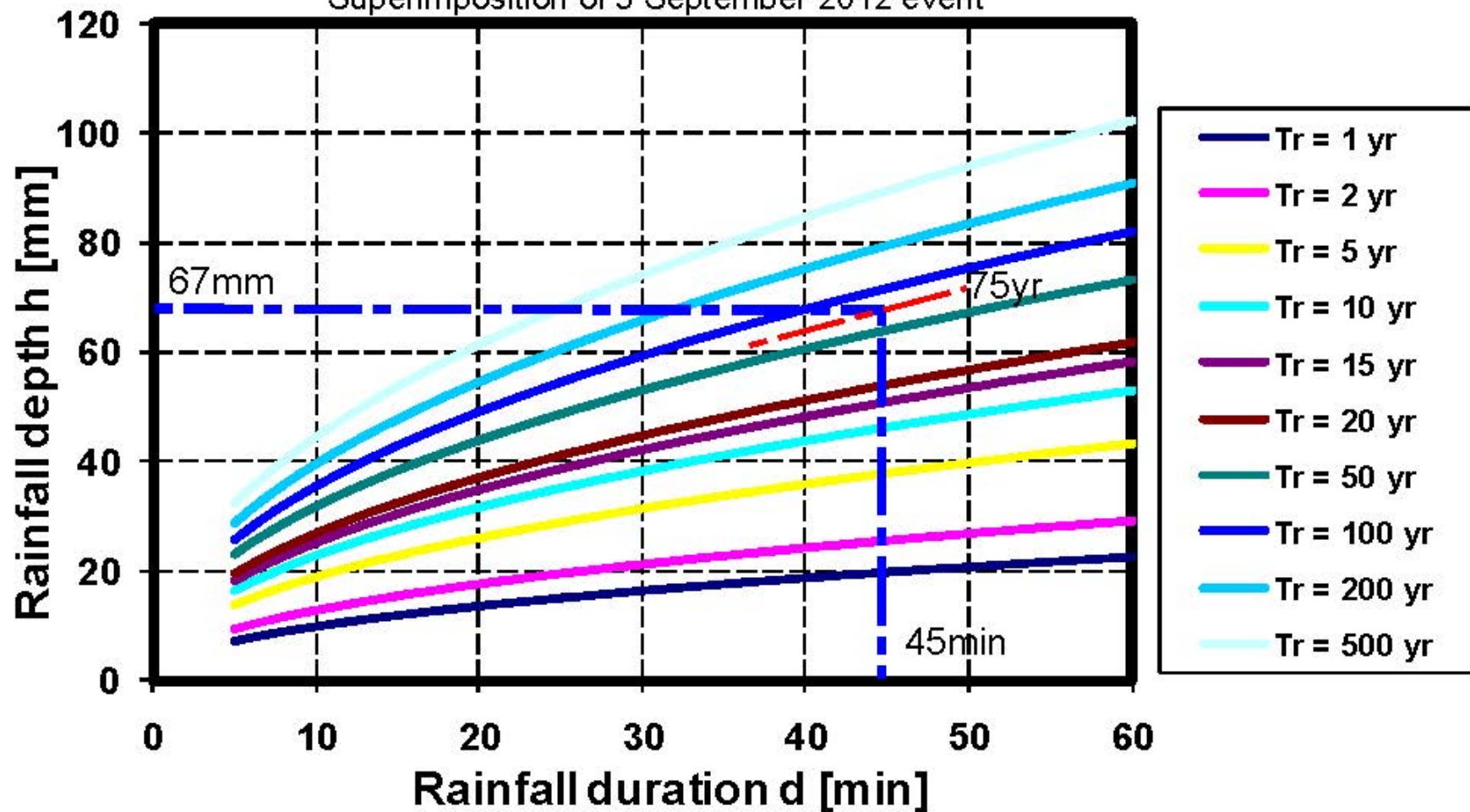




# Depth-Duration curves

## Depth-duration DD curve for $h \leq 1$ hr: $h = ad^n$

Superimposition of 3 September 2012 event



# Measures to improve capacity

- Incentivize use of harvested run-off
- Encourage infiltration of roof water
- Disconnect roofs from sewers
- Green roofs and landscape areas to increase absorption

# Lesson to be learnt

- ***“Prepare for the unknown by studying how others in the past have coped with the unforeseeable and the unpredictable.”***  
— **George S. Patton**