

Regional Conference

10–11 May 2018, Malta

ADVANCING NON-CONVENTIONAL WATER RESOURCES MANAGEMENT IN MEDITERRANEAN ISLANDS AND COASTAL AREAS:

Local solutions
Employment opportunities
People engagement





Session 1. Non Conventional Water Resources: the need, the potential and a global water showcase

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Theme Leader NCWR, Urban Water Management,
Water-Employment-Migration,
GWP-Med*

The Mediterranean and its Water



- Among the most arid regions in the world.
- Hosts more than 50 percent of the world's 'water poor' population, or around 180 million of the region's 460 million Inhabitants.
- Holds only 3 percent of the world's freshwater resources

Source: *Water Scarcity, Security and Democracy: A Mediterranean mosaic*

Water Resources in the Mediterranean

Water stress in the Mediterranean basin

Water Exploitation index¹ Percentage, 2000-2010

- Less than 20
- 20 to 40
- 40 to 60
- 60 to 80
- more than 80

Existing and planned desalination plants

Capacity, thousand cubic metres

- More than 50
- 50 or less

Desertification

Severe desertification area

¹. Ratio of annual volume extracted from natural resources/annual average volume of renewable natural sources

Sources: Blue Plan, Informations based on national sources; Water, energy, desalination & climate change in the Mediterranean, 2008; IDA Worldwide Desalting Plants Inventory; Bellstein, M., Bournay, E., Environment and Security in the Mediterranean: Desertification, ENVSEC, 2009.



Water Challenges in the Mediterranean (Islands)



- **Malta & Cyprus** are the **water poorest countries in Europe** (European Commission First Interim Report on Water Scarcity and Drought, November 2006)
- **Seasonality and high peaks** of water demand in (extended) summer months to be addressed
- **Water quality depletion** due to saltwater intrusion into coastal freshwater aquifers, loss of wetlands, and temperature increase with impacts on surface water
- **Climate change impacts:** increase of droughts & flash-floods
- **Increase in population and Migration flows** put extra pressure
- **Energy cost** for water production/supply

Addressing Water Scarcity in the Mediterranean

- ✓ Improving Water Governance and Management
- ✓ Applying Water Demand Strategy: water efficiency and water saving
- ✓ Non Conventional Water Resources:
 - Rainwater harvesting,
 - Greywater reuse
 - Treated waste water reuse
 - Aquifer recharge
 - Desalination
- ❑ Unsustainable practices: water transfers to the islands by tankers (e.g. water transfer to the Dodecanese islands, Greece: 8-12€/m³)

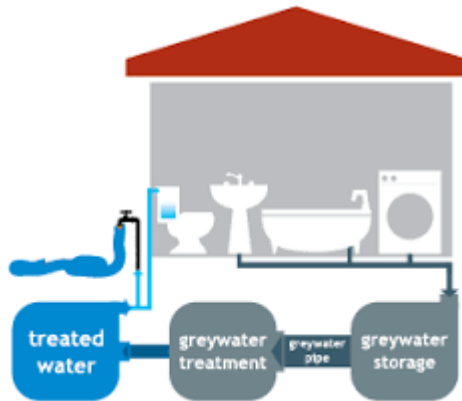


Why Rainwater Harvesting?



- Cost effective method with staggering results
- Augments water availability
- Reduces demand for water sources for secondary uses
- Prevents flooding
- Provides water mainly for secondary uses, at home and neighbourhood level
- Nature based solutions can improve urban water management and increase urban green

Why greywater recycling?



- Reduces wastewater load
- Produces water fit-for-purpose, for secondary uses: toilet flushing, landscaping, industrial uses.
- Decreases freshwater demand for secondary uses



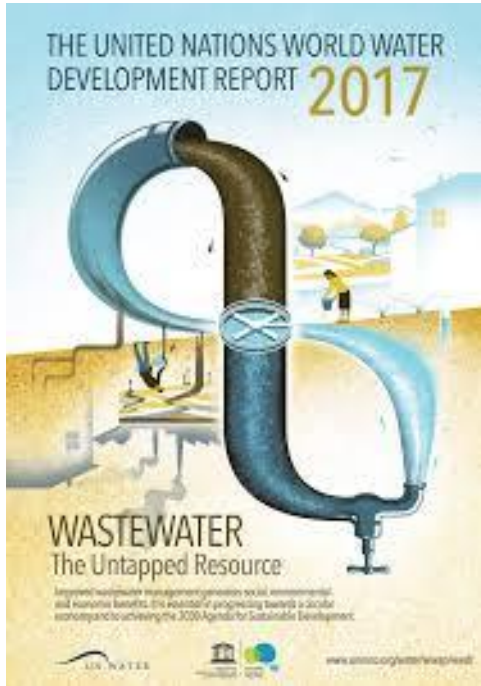
CASE: The Maltese Islands

Malta Business Bureau's EU LIFE+ *Investing in Water* Project conducted a thorough survey in hotels and businesses in Malta, proving a water saving potential of 500,000m³ per annum only through greywater recycling for secondary uses.

Lessons:

- A number of hotels have on-site waste water treatment facilities using water for landscaping and toilet flushing
- Policy recommendations

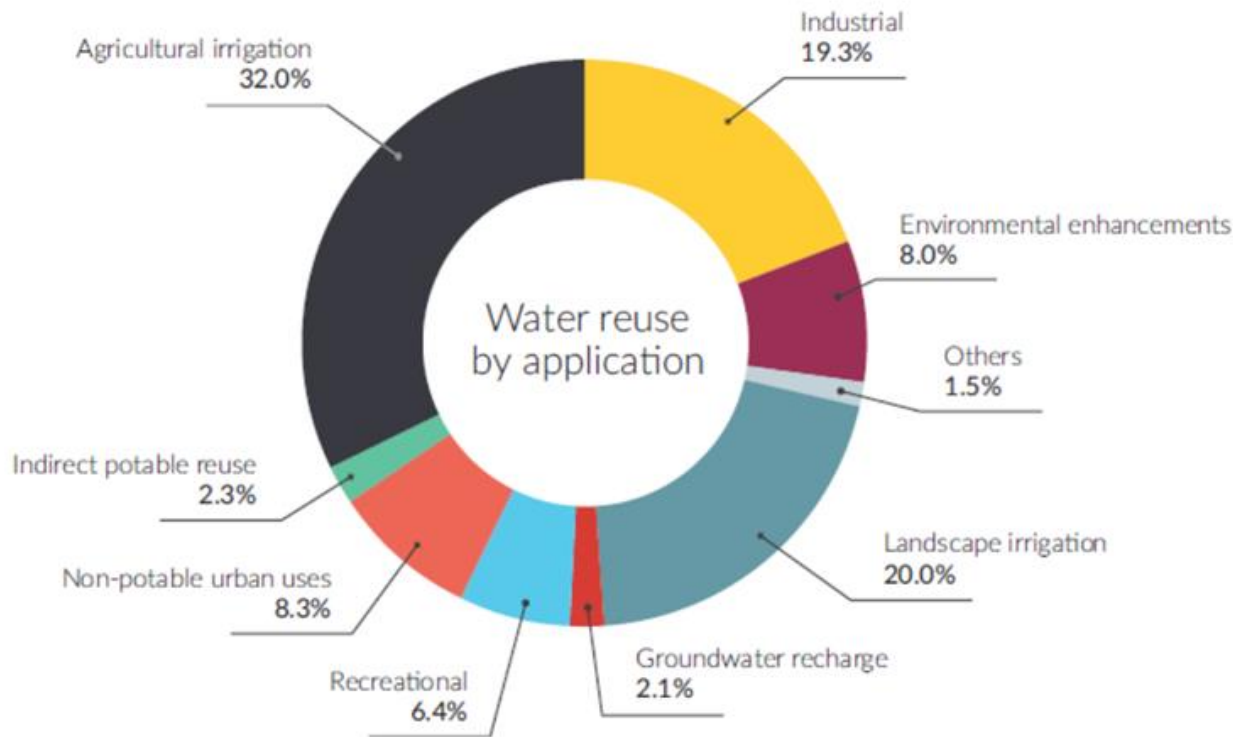
Why treated wastewater reuse?



- Water fit-for-purpose: irrigation, industrial and secondary uses, etc.
- Water for ecosystems
- Water for aquifer recharge
- Nutrient and energy recovery

Wastewater Reuse potential

Figure 16.1 Global water reuse after advanced (tertiary) treatment: Market share by application



Source: Lautze et al. (2014, Figure 2, p. 5, based on Global Water Intelligence data).



CASE: Cyprus

Cyprus has been a pioneer in reuse of waste water, mainly for irrigation.

- In 2012, 9% of irrigation needs were covered by treated wastewater – aim is to achieve 40% coverage

Lessons:

It minimizes these risks through:

- Strict Regulation
- Advanced Treatment
- Mandatory Code of Practice
- Quality Control
- Research

Why desalination?



- Water supply to bridge the water budget deficit

Desalination in the Mediterranean



- By 2030 the Mediterranean Region is projected to multiply its desalination capacity by threefold or fourfold, thus reaching 30-40 million m³/day (Plan Bleu, 2010), compared to current installed capacity 12 million m³/day.
- RO has become the technology of choice due to its low energy requirements and relatively low environmental impact.
- RE is still an expensive option in desalination but future improvements in technology are expected to lower the cost. This will reduce the its environmental impact caused by GHG emissions.

Sustainable desalination in the Islands



Pantelleria Island, IT: Hybrid desalination

Milos Island, GR: capacity 3,360m³/d, powered by RE unit (WT)



Irakleia Island, GR: patented floating desalination unit with WT

Policy Considerations in Mediterranean (Islands)



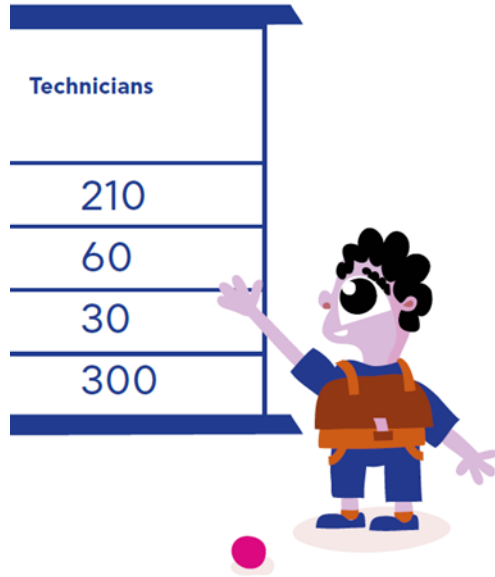
- ❑ **Integrated water resource planning and efficient management** need to precede any decision to invest in desalination
- ❑ **Environmental impact of brine and discharge** into fragile coastal environment: high salt content of brine, residual chlorine, trace metals
- ❑ **Cumulative environmental impacts** of current desalination plants around the Mediterranean never assessed.
- ❑ **Energy Impact:** energy intensive production of water-appropriate RES (WT and/or PV) to be considered, especially for islands, as related to their cost of investment
- ❑ Minimisation of **non-revenue water**, leakages and wastage

[Source: SWIM-SM Policy Brief, Mitigating the Environmental Impacts of Desalination in the Mediterranean Region, 2014]

Bottlenecks in advancing NCWR

- Reuse is still facing many technical, economical, environmental and social constraints which are still seeking sustainable solutions.
- Poor water governance
- Lack of national policies and strategies related to waste water management in general and waste water for agriculture in particular in many Mediterranean countries; Lack of regulatory framework for the use of NCWR
- Access to financing: financing tools, credit worthiness, etc.
- Health fears and hazard due to mistrust in wastewater quality; Misconceptions and religious constraints, especially for reuse.
- Some NCWR technologies at domestic or community level can be costly, especially compared to the cost of freshwater supply

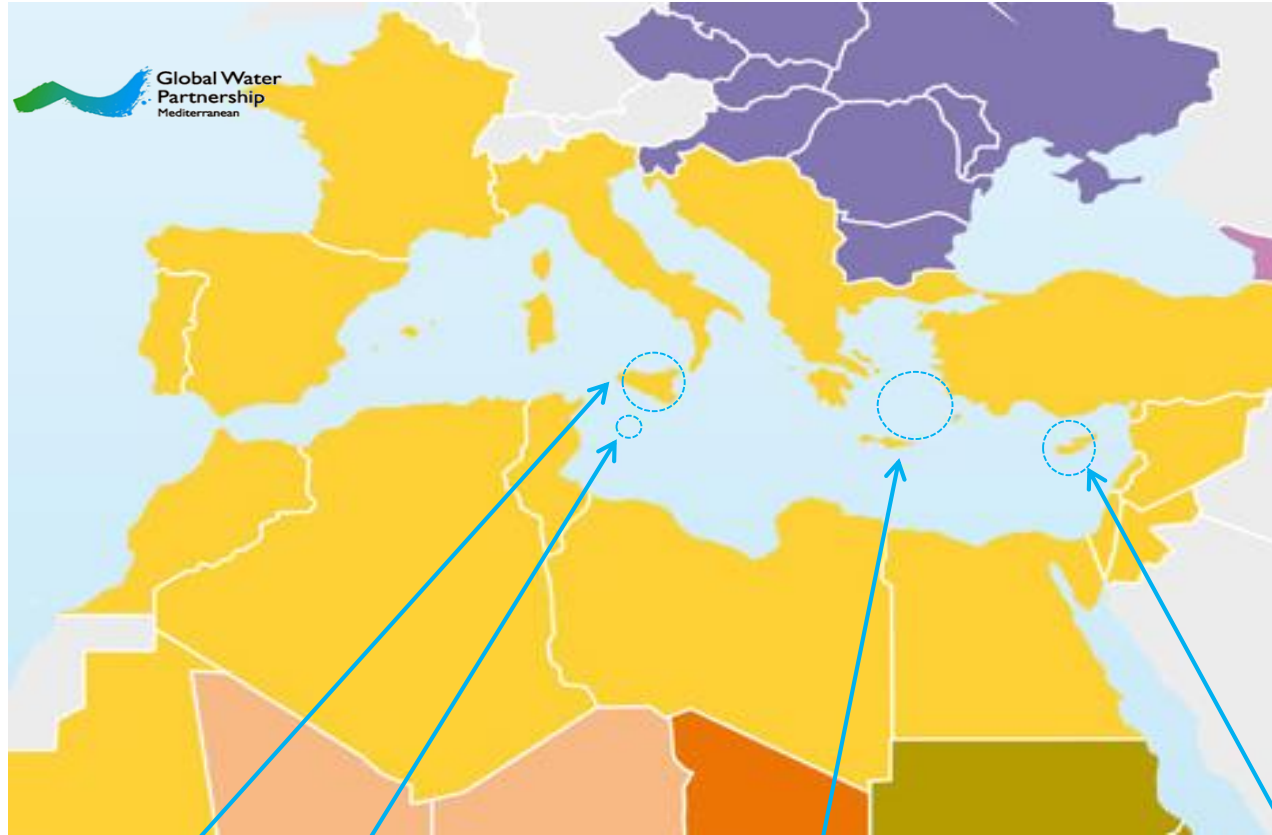
How to advance NCWRM



- Integrate NCWR in the water management plans
- Improve water governance and management
- Establish an appropriate legal and regulatory framework for the use of NCWR
- Enable access to financing
- Showcase the multiple benefits (economic, environmental, social) of the use of NCWR, through demonstration projects, with tangible results, replicability and scalability potential



<https://www.youtube.com/watch?v=hxyVDFWaXY&t>

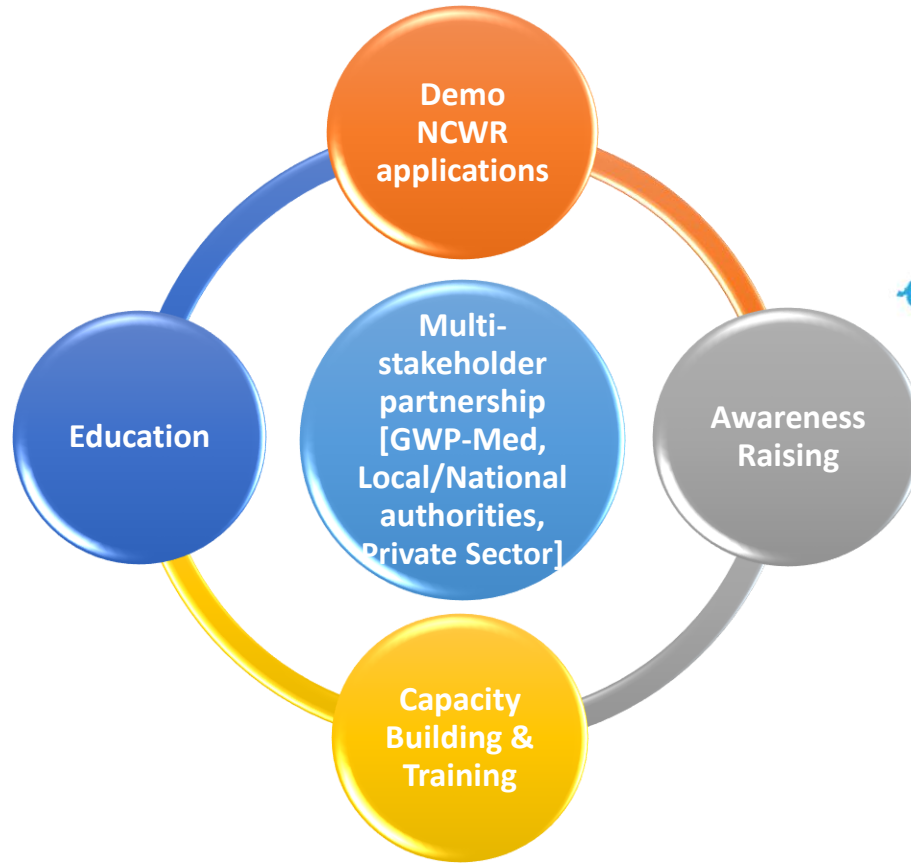


**Italy, Sicily
(2017-2018)**

**Malta
(2011-2017)**

**Greece, Cyclades & Dodecanese
Islands (2008-2018)**

**Cyprus
(2013-2018)**



Countries: Greece, Cyprus, Malta, Italy
Duration: 2008-2018
Total Budget > 5.255 million USD
Coca-Cola Foundation Grant



AIM



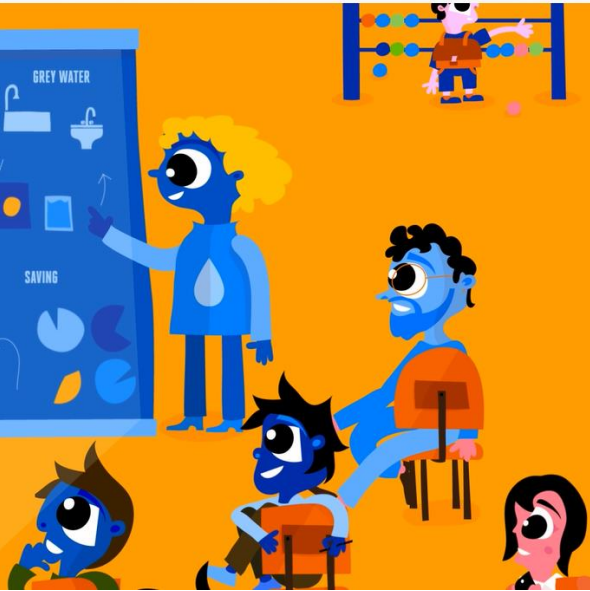
- ✓ Advance the used of Non Conventional Water Resources
- ✓ Demonstrate appropriate NCWR applications for local water security and climate change adaptation
- ✓ Promote water saving practices
- ✓ Promote multi-stakeholder partnerships, including with the private sector
- ✓ Share knowledge & experience
- ✓ Become a paradigm for replication

1. WORKS



- ✓ Non Conventional Water Resources Applications:
 - Rainwater Harvesting
 - Greywater Recycling
 - Small desalination units
- ✓ Green/blue infrastructure & nature based solutions
- ✓ Water Efficiency measures, including optimization of existing infrastructure
- ✓ Information and Communication Technology (ICT) for sustainable irrigation

2. EDUCATION



- ✓ Country-specific educational material
- ✓ Hands-on activities for students
- ✓ Special sessions for students with special needs
- ✓ Teacher training
- ✓ Digital tools (video games, etc.).

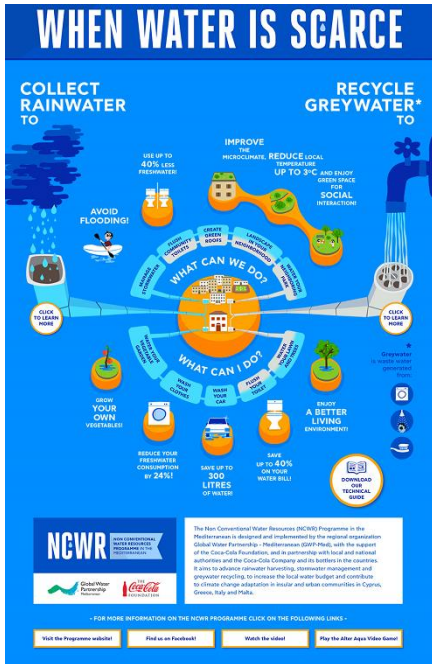
3. CAPACITY BUILDING & KNOWLEDGE EXCHANGE



- ✓ Capacity building workshops for institutional and other stakeholders on NCWRM
- ✓ Technical trainings for technicians, engineers and professionals in the construction industry on NCWR technology and nature based solutions design and application
- ✓ Capacity building for farmers on sustainable water use in agriculture
- ✓ Technical guide on Non-Conventional Water Resources Technologies
- ✓ National and Regional workshops and conferences on NCWRM

4. AWARENESS RAISING

- ✓ Awareness raising for targeted and wider audiences on the use of NCWR and water efficiency options at domestic and community level
- ✓ Awareness raising for sustainable irrigation for farmers
- ✓ Water saving campaigns
- ✓ NCWR campaigns
- ✓ Campaigns for tourists





TECHNICAL APPLICATIONS

Mariela Antonakopoulou & Nassia Kassela
Programme Officers, GWP-Med



Rainwater Harvesting & Stormwater Collection

- ✓ Increase local water availability
- ✓ Water suitable for various non-potable uses
- ✓ Traditional method for islands in the Mediterranean

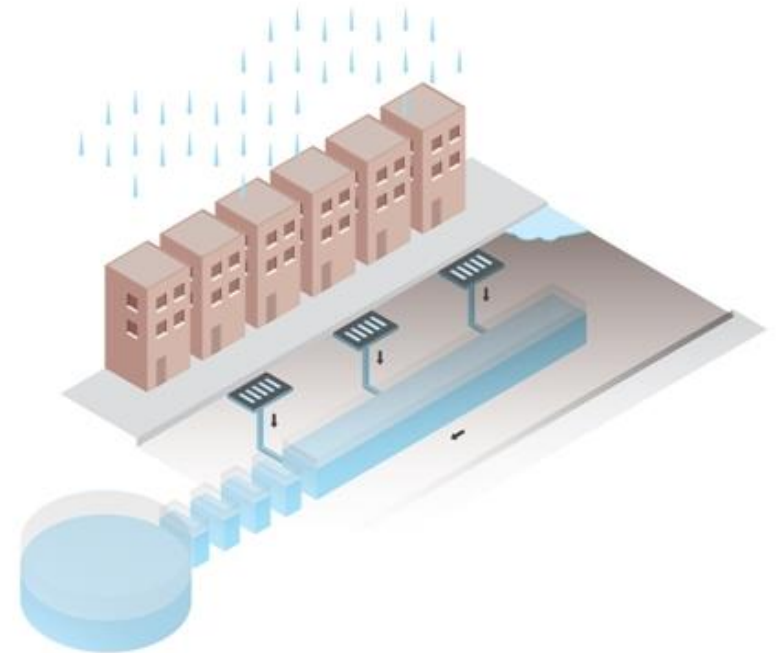
Rainwater Harvesting & Stormwater Collection

- **Collection & use** of water for secondary uses
- **Traditional & replicable solutions**
- Use of **innovative technologies**



Rainwater Harvesting & Stormwater Collection

- **Collection & use** of water for secondary uses
- **Traditional & replicable solutions**
- **Use of innovative technologies**



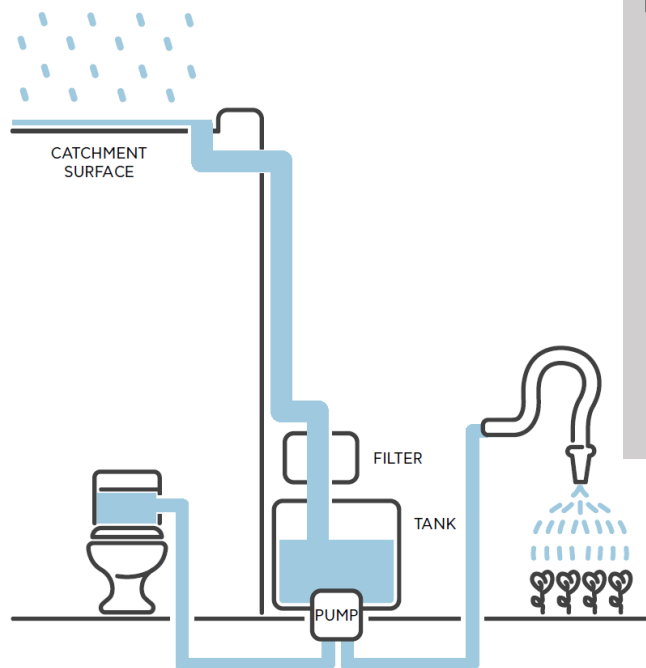
Rainwater Harvesting & Stormwater Collection

Operating components

- Catchment surface
- Conveyance system
- Storage facility
- Delivery system

Rainwater Harvesting reservoirs

- Concrete tanks
- Plastic tanks
- Metal tanks
- Rain barrels
- Modular underground tanks
- Open water reservoirs
- Traditional cisterns (stone-built, cave reservoirs, ...)



Design Criteria

- *Size & available space (under- or overground)*
- *Accessibility*
- *Budget*
- *Time-constraints*

Rainwater Harvesting & Stormwater Collection



Plastic tanks
(from 2 to 10 m³)



Metal tanks
(from 5m³ to 300 m³)



- Rain barrels
- ✓ *Additional water source*
 - ✓ *Low Impact installation, respectful of the traditional landscape*



Rainwater Harvesting & Stormwater Collection



Open water reservoirs

- ✓ *Flood protection*
- ✓ *Additional water source*

Modular underground tanks

- ✓ *Recycled & recyclable*
- ✓ *Variability of shape & size*



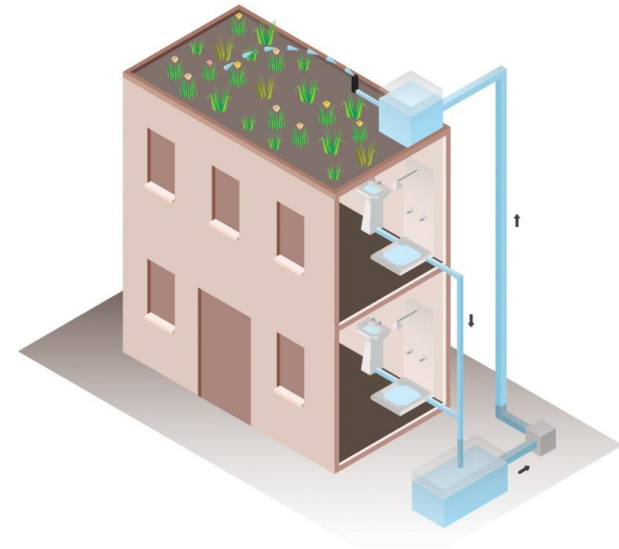
Greywater Recycling

- ✓ Increases water availability
- ✓ Reduces water demand from municipal water supply
- ✓ Decreases wastewater load of sewerage systems
- ✓ Can be used for various purposes: landscaping, toilet flushing, irrigation, car washing, etc.



Greywater Recycling

- **Collection, treatment & re-use** of water for secondary uses
- **Additional water sources** with the use of innovative technologies
- **Replicable** solutions



Greywater Recycling

Operating principles & components

- Collection tank of greywater
- Treatment technologies
- Storage facilities
- End uses

Treatment Technologies

- Physical treatment
- Chemical treatment
- Membrane Bioreactors (MBRs)

Design Criteria

- ✓ *Quality and quantity of the greywater to be treated*
- ✓ *End use of the treated greywater*

TSS	< 10	mg/l
Turbidity	< 2	NTU
BOD	< 10	mg/l
Ecoli	< 10	CFU/100ml
Residual Chlorine	< 1	mg/l

Recommended standards for greywater reuse such as toilet, flushing, landscape irrigation and constructed wetlands

Greywater Recycling system

Chemical Treatment at Makario Football Centre in Nicosia, Cyprus

- ✓ Treat 15m³ / day
- ✓ Clean water is used for field irrigation
- ✓ More than 5,000 athletes / year



Greywater Recycling system

Greywater treated with MBRs at the KMS National Swimming pool in Malta

- ✓ Treat 2 m³ / day
- ✓ Clean water is used for toilet flushing
- ✓ More than 6,000 athletes / year use the facilities





Other applications

- ✓ Water security
- ✓ Water supply system reliability
- ✓ Water resources of sufficient quality & quantity
- ✓ Innovative applications of multiple benefits

Water quality improvement

- Water Kiosks

Security of Water supply

- Water efficient equipment
- Additional desalination units
- Replacement of pumping systems

Water regulation improvement & cultural value of water infrastructure

- Reinstatement of historic reservoirs
- Installation of tanks to increase storage capacity



Maintenance & improvement works

- Leakage control
- Suitability for drinking water



Urban green-blue infrastructure

- RWH applications coupled with increase of green areas
- GWR applications coupled with increase of green areas
- Green roofs
- Green walls





PEOPLE ENGAGEMENT

Panagiota Kaltsa
Communication Officer, GWP-Med

Education



Educational Program in partnership with MIO-ECSDE & NTM (in Malta):

- Educational material for students, specially produced for Malta, in Maltese & English
- Educational Programme for Students. Hands-on activities implemented by NTM in kindergartens, primary schools and the
- Teacher training workshops
- Educational Water Videogame

NCWR Awareness Raising & Communication



Communication Strategy Pillars



Inform



Engage



Empower

Employability

Training can create the opportunities for water jobs and entrepreneurship.



- Water Supply and Sanitation
 - Water supply networks
 - Wastewater treatment
 - Desalination
 - Operation & Maintenance
- Urban Water Management
 - Rain- storm-water management
 - Green/blue infrastructure
 - Water Efficiency
- Rural
 - Sustainable irrigation and farming

Outcomes



Contribute to local water security

- Address water scarcity with the supply of over 630,000 m³ of water annually
- Benefit over 280,000 citizens in 32 islands and coastal areas in 4 countries
- Contribute to flood prevention through stormwater management applications



Showcase smart NCWR solutions, also in urban context

- Green/blue infrastructure, green walls, green roofs
- Innovative RWH & stormwater management applications
- Greywater recycling & reuse



Foster regional & national dialogue on NCWRM

- National Water Management Plan for the Maltese Islands
- Regional Dialogue on NCWRM in the Mediterranean
- Global meetings & fora, particularly on insular & urban issues



Enhance Education, Raise Awareness, Share Knowledge

- A new water culture for over 35,000 students, 5,200 teachers & the public
- Green jobs potential; vocational training of 320 local technicians & 20 farmers
- Knowledge & experience sharing within & beyond our region



A global showcase

- ✓ Second Global Award as a Water Showcase with replication potential in the Mediterranean and beyond (7th World Water Forum, South Korea, 2015)
- ✓ Replication opportunities currently explored in Lebanon, the Caribbean Islands, Central and Latin America

LOCAL SOLUTIONS