# Energy Efficiency in Water and Wastewater Facilities
# Case Study: Malta

## 10th Energy Efficiency Forum
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# Introduction

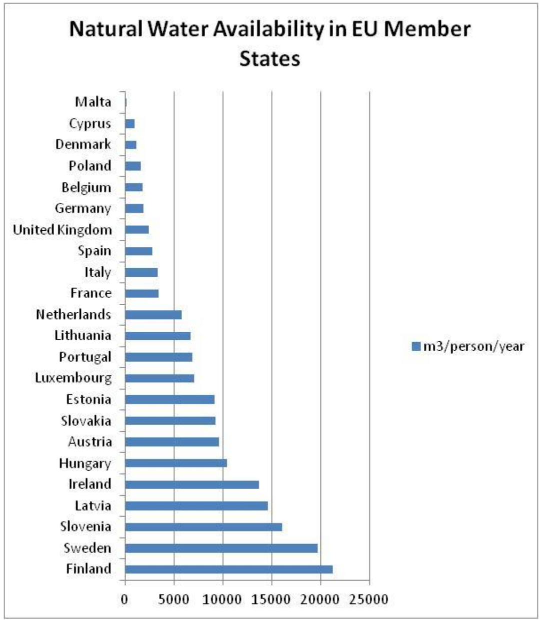
**National Policy Framework**

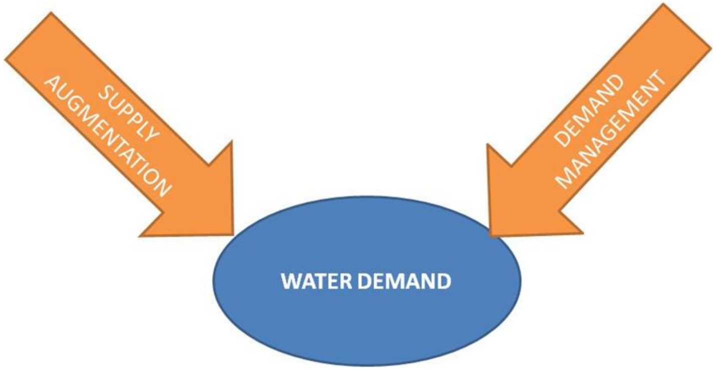
Malta is the Member State in the European Union with the least availability of natural water resources.

Freshwater availability is well below the 500m$^3$/year which the UN defines as the limit of absolute water scarcity.

Malta has therefore developed a water management framework based on the conjunctive use of water demand management and water supply augmentation measures.

Hence Malta recognizes the fact that its natural water resources (if used sustainably) are not sufficient to meet national demand, and hence the production of alternative (non conventional) water resources is a necessity.



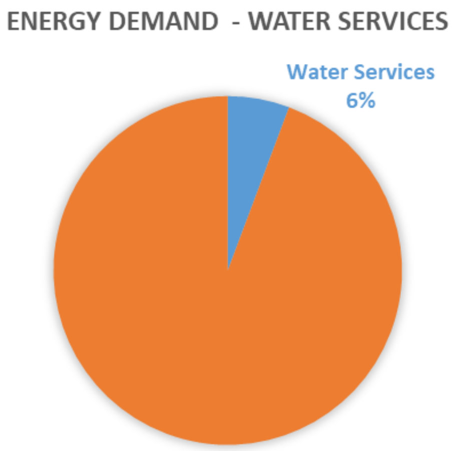



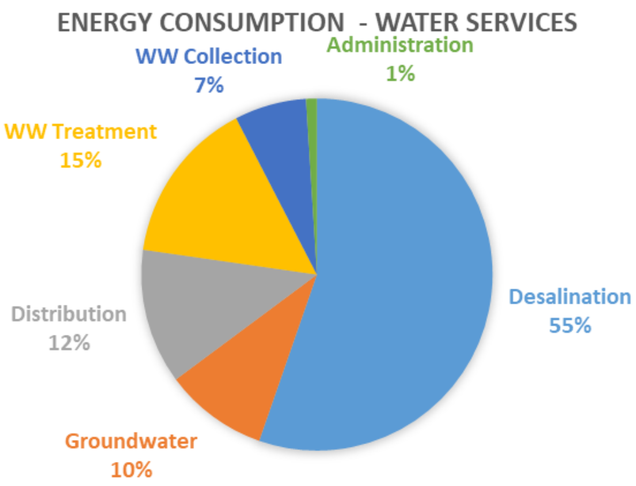
# Linking Energy and Water

Within a context of water production and distribution and wastewater collection and treatment, the energy requirements for the delivery of water services is an important factor for the national energy demand.

The provision of water services today accounts for 6% of the total national electricity demand.

Production of water is by far the main user of energy, in particular due to the use of sea-water desalination plants which account for around 60% of the total production of potable water.

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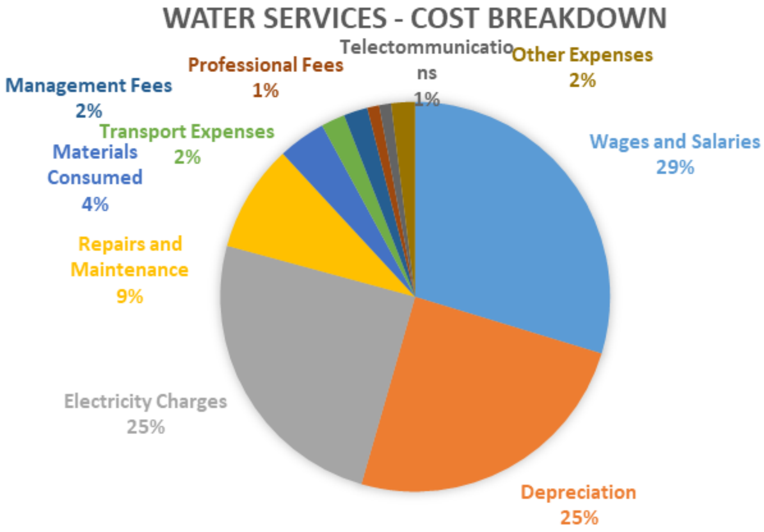
# Linking Energy and Water

Energy costs are therefore one of the important cost items in the accounts of the water services provider.

Energy charges account for around 25% of the total costs of the water utility.

Invariably, energy efficiency becomes an important consideration in all aspects of water services provision; in particular when one looks at the financial sustainability of water utilities.



# Desalination

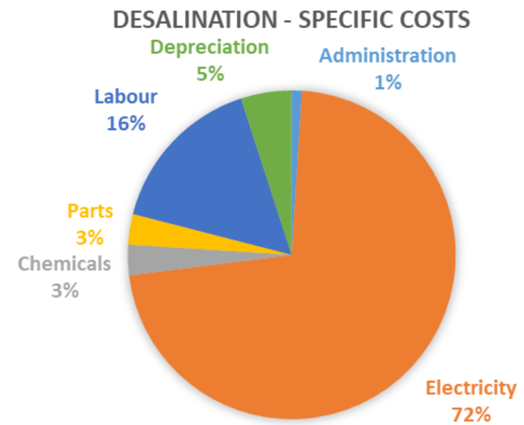
The biggest challenge in operating desalination plants is to control the energy used in converting seawater into potable water.

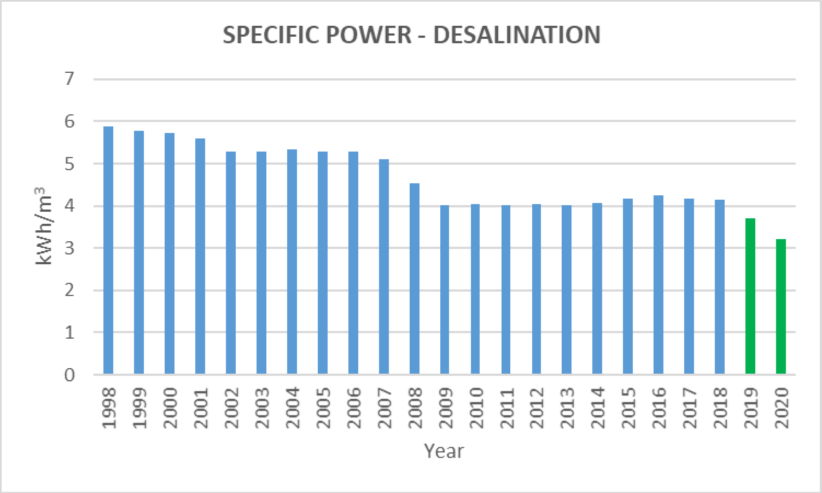
**Energy Recovery:**

RO takes place in the membranes at a recovery rate of 40-45%. The reject amounting to 55-60% is fed back to the system to recover mechanical energy. Energy recovered can be up to 35-40% with old technology and 50-55% with latest technology.

**Management System:**

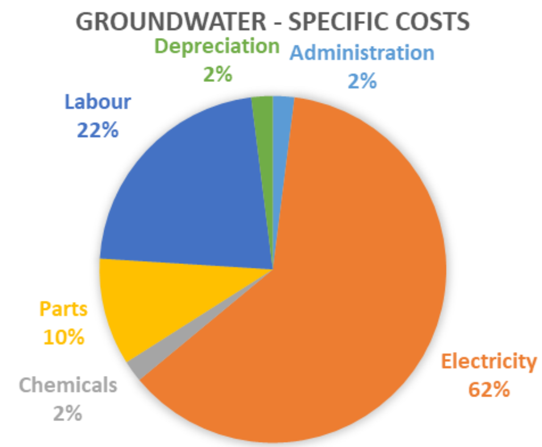
In-house real time decision making system for the production of potable water at the highest levels of efficiency, thus guaranteeing production of potable water at minimum resource cost.



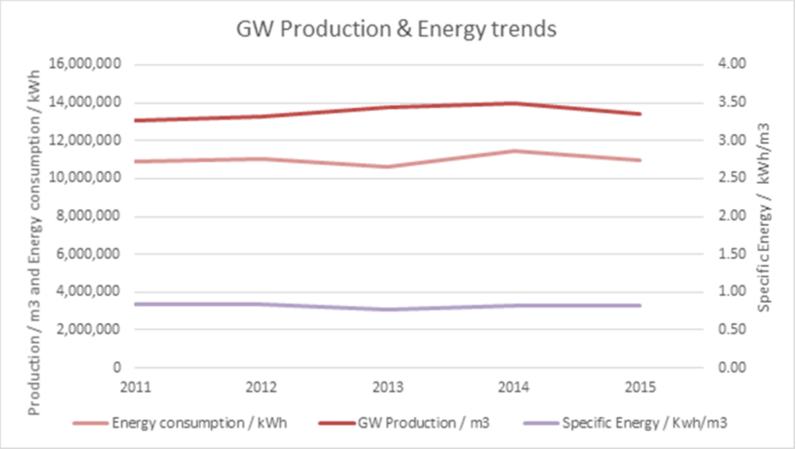



# Groundwater

The specific energy required to produce $1m^3$ of water from groundwater sources has remained relatively stable over the years at a level of around $0.8kWh/m^3$.




Limited margins for improvement exist, given that primarily energy use depends on pump-efficiency and groundwater depth.




Distributed abstraction (necessary due to sea-water intrusion) also limits efficiency margins. High yield Pumping Stations exhibit lower specific energy requirements than boreholes.

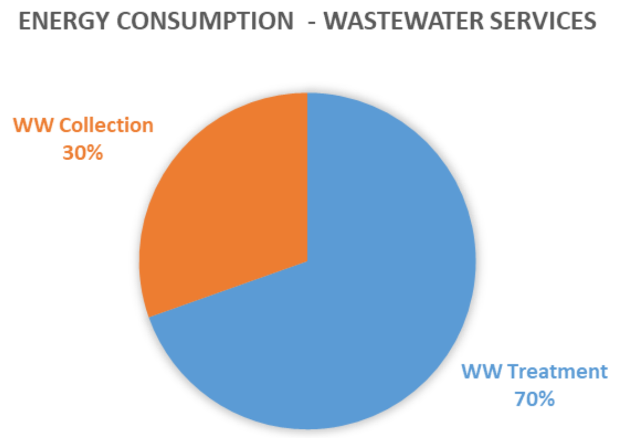
# Wastewater

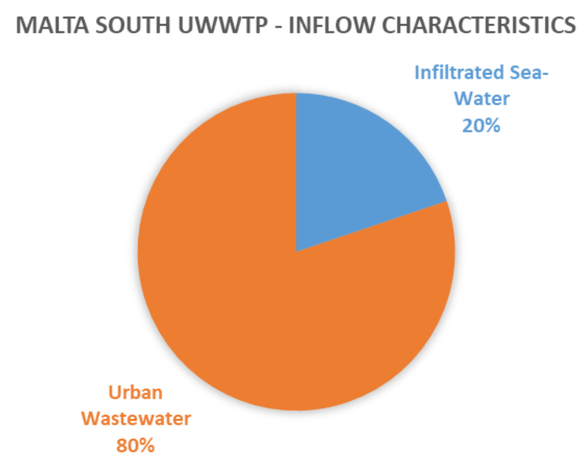
Protection of the quality of urban wastewater is reflected in lower energy requirements at the Urban Wastewater Treatment Plants.

Hence current focus on the upgrading of sewer network to reduce sea-water infiltration which results in additional energy requirements for:

- Pumping of additional volumes of water, and
- Treatment of high salinity sewage prior to discharge to the marine environment

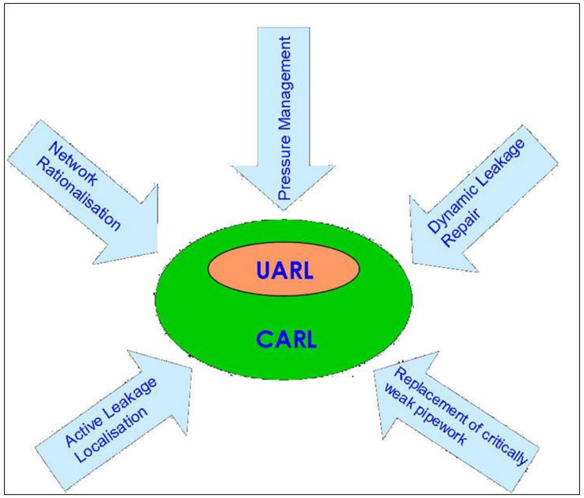
The energy requirements for treating wastewater with a salinity of 12,500µS/cm as compared to a baseline of 5,000µS/cm increase by 75%.



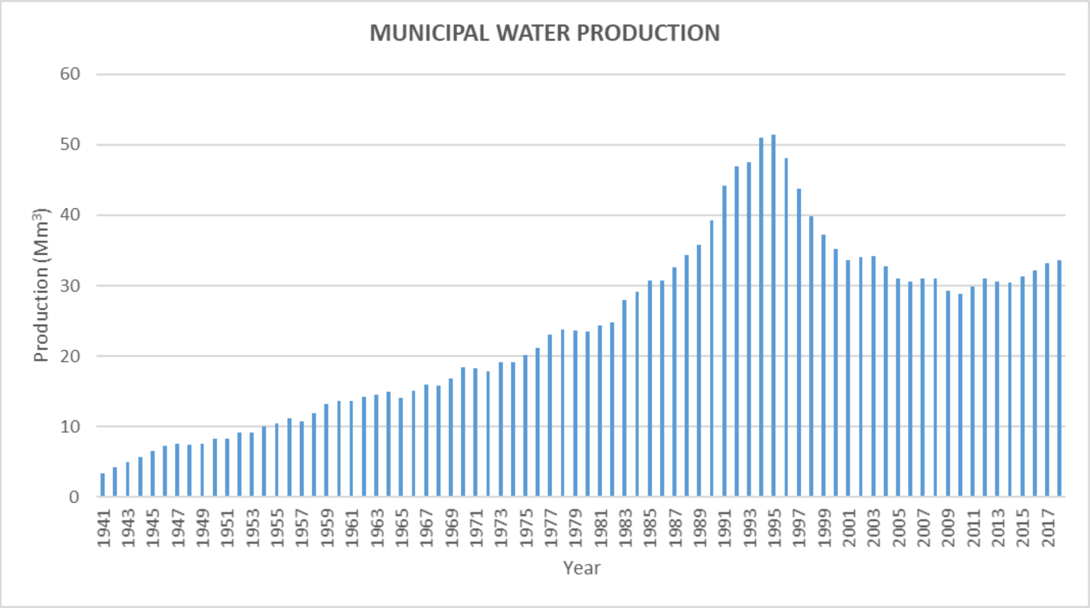
# Demand Management

Water Demand Management (water efficiency) also leads to energy savings (energy efficiency) as it results in lower volumes of water moving in the urban water cycle.




At national/regional level, distribution network leakage identification and control is the most effective measure to optimise the effective use of water.

Leakage management in Malta resulted in a reduction of around 40% of municipal water demand over a 15-year period.



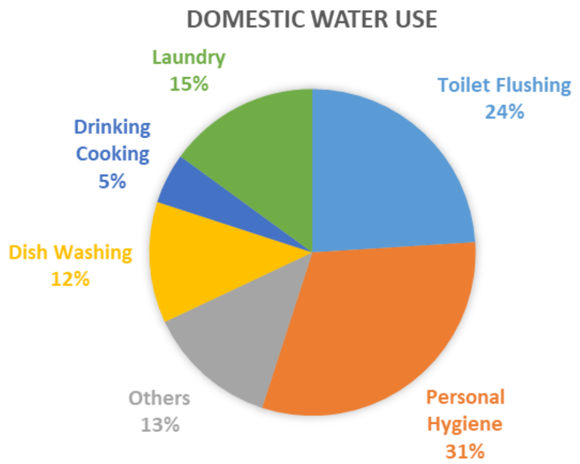
# Demand Management

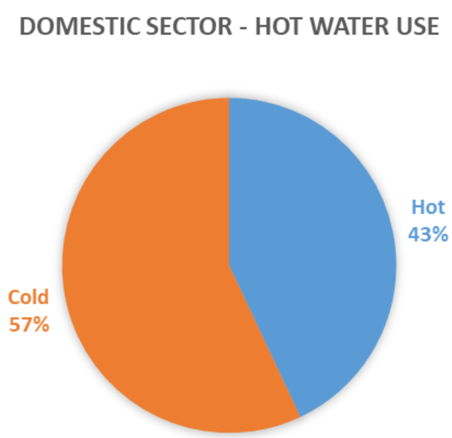
Demand Management Measures are also important at the level of the user.

Domestic water consumption in Malta stands at around 17 million m$^3$ pa. This amounts to an average daily consumption per person of around 115litres.

Grey-water reuse (shower to toilet) schemes have the potential to reduce water use by around 25%.

Efficiency measures addressing water consumption (aerators, water efficient showers and appliances etc) also result in energy efficiency due to a lower use of heated water.

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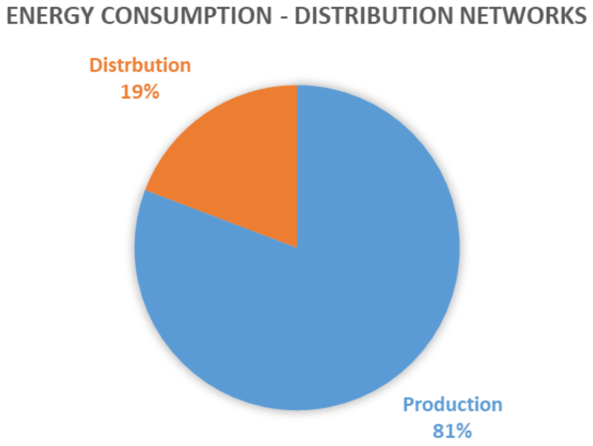
# Distribution

Distribution network management also presents an opportunity for the application of energy efficient measures.

Frictional losses in distribution mains usually result in around 0.5bar (5m) dynamic pressure for a good network and up to 6 bar (60m) for a high friction network.

The energy required to lift 1m$^3$ of water, 1 meter in 1 hour in efficient systems thus amounts to 30Whr. In inefficient systems (high frictional losses in pipes) this could increase up to 360Whr.



# Net Zero Impact

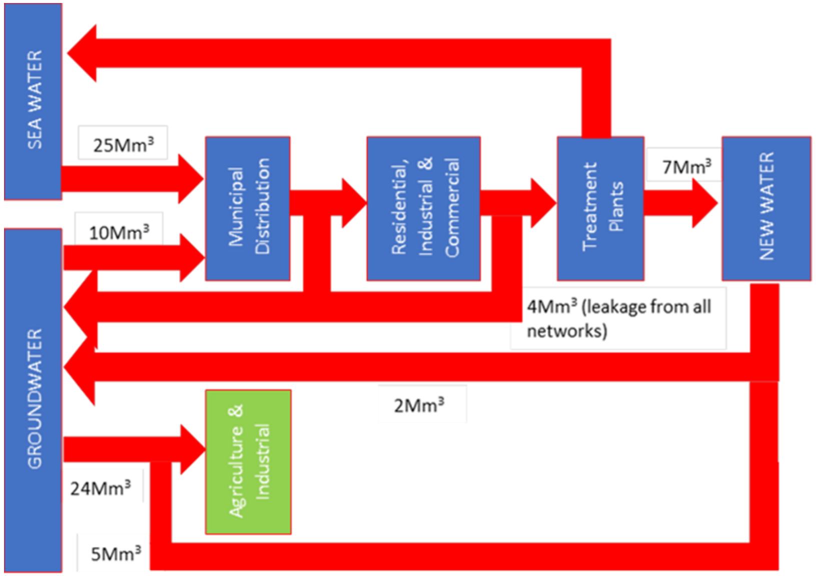
Concept of a **Net Zero Impact Water Utility**

which:

(i) Contributes back to the environment an equal volume of water as that sourced from natural water resources; and

(ii) Sources its additional energy needs from the implementation of energy efficiency measures

Thus significantly reducing the broad environmental impact of water services provision.



# Conclusion

Energy efficiency plays an important role in the future planning of water utilities, in particular to ensure their financial sustainability and lower their environmental impact.

Energy efficiency can be applied at various operational levels:

- Water production
- Water distribution
- Wastewater collection
- Wastewater treatment

Indirect measures (ex. through water demand management) also present important opportunities to optimise energy use in water services provision.

Hence comprehensive management frameworks are required operating within the whole urban water cycle to ensure the effective use of energy in water services provision.

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Thank you for your attention

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