POLICY PAPER

Towards a more sustainable use of water in the domestic sector

Case Study – Gozo

1. Background

The Ministry for Gozo through its ecoGozo vision[1], is responsible for the implementation of a Local Sustainable Development strategy on the island of Gozo in Malta. In line with this concept, Gozo will strive to reduce its water footprint through a number of actions, among which the cleaning and maintenance of valleys to serve as water harvesting facilities and storage of water in public spaces, and a a strong educational and awareness campaign. The Ministry for Gozo also collaborates with other entitities such as the University of Malta, the Malta College for Arts, Science and Technology (MCAST) and the Global Water Partnership – Mediterranean (GWP-Med), and with corporate business, such as the Coca-Cola Foundation amongst others, to invest in rainwater harvesting initiatives and promote responsible water use in the Maltese Islands.

1.1 Characteristics of the island of Gozo

The island of Gozo with a land-area of 68.67 square kilometers is the second largest island in the Maltese archipelago. The resident population of the island of Gozo in 2014 amounted to 31,458 inhabitants, leading to a population density of 458 inhabitants/square kilometre – a significantly lower figure than that of the main island of Malta, where the population density stands at 1,566 inhabitants/square kilometre. As a consequence, the island of Gozo is less urbanised, and only 22% of the land area is built up. Furthermore, the island lacks significant industrial development, with the industries present being located in a single 'industrial estate' in the central reaches of the island. Yet, this population density is still significantly higher in comparison with the European average, and creates significant pressures on the island's very limited freshwater resources.

[1] For further information on the island of Gozo's ecoGozo project, please visit www.ecogozo.com

Figure 1: **Map of the Maltese Islands**

1.2 Water resources on the island of Gozo

Four typologies of water resources can be identified in the island of Gozo, namely:

- naturally renewable resources
- groundwater and harvestable surface rainwater runoff
- unconventional water resources and
- desalinated sea-water together with treated sewage waters.

The groundwater resources in the island occur as two types of aquifer systems – a sea-level aquifer system sustained in the Lower Coralline Limestone formation which extends underneath the whole island (with the exception of a small area in around the harbour of Mgarr where a marly formation occurs at sea-level) and a number of relatively small high-lying (or perched) aquifer systems sustained in the Upper Coralline Limestone by an underlying layer of marly clay formation.

Groundwater abstraction for municipal purposes is undertaken by the Water Services Corporation, the main utility of the islands, through 44 boreholes and two pumping stations, mainly from the sea-level aquifer system. Due to the salinity of certain abstraction stations, abstracted groundwater is currently polished through a low-pressure membrane system prior to its distribution to consumers, this to ensure that municipal water attains all the parametric quality standards required by the EU's Drinking Water Directive.

Groundwater also sustains the island's important agricultural sector. Groundwater abstraction for agriculture is estimated to exceed abstraction for municipal purposes, making the sector the most dependent on groundwater resources.

The second main source of municpal water is derived from desalinated sea-water produced by a reverse-osmosis membrane process in the Cirkewwa Desalination Plant located on the northermost shores of the island of Malta. Desalinated water is transferred to Gozo through a sub-marine pipeline, with the volume transferred varying according to the monthly water demand of the island. Due to its low salinity, desalinated water is blended with groundwater at the island's main reservoir of Ta' Cenc to further optimise the quality of the water supply distributed to consumers. Transfer of desalinated water reaches mean annual levels of 480,280 cubic meters, generally peaking during the summer months where maximum daily transfer volumes can reach up to 3,150[2] cubic meters.

Harvesting of roof rainwater presents a further potential water source for the urban sector, which can address a variety of second class uses both at the individual and the community level. Rainwater harvesting is mainly undertaken in wells located within private residences or public reservoirs located under main squares or other recreational areas. From a water supply perspective, the main limitations of this resource is the storage space required to ensure a sufficient carry-over capacity throughout the year.

In as much, storage capacity and thus use of harvested rainwater is largely expected to be located in the older village cores where most old houses and constructions have at least one well.

The wastewater generated on the island is currently diverted to a wastewater treatment plant located at Ras il-Hobz which started operating in November 2007, where following conventional treatment the effluent produced is discharged to the sea. The effluent production capacity of this plant amounts to 6,000 cubic metres per day. Polishing facilities are currently being developed at this plant which will enable the production of water of sufficiently high quality to enable its safe use for secondary purposes. The envisaged production capacity of this polishing plant amounts to 4,000 cubic meters per day and the water will be transferred through a pressured pipe-line (most of which already in place) to the urban centre of Victoria. The envisaged uses of this water include urban landscaping, agricultural irrigation and possibly a very small amount by the industrial sector.

1.3 Water demand characteristics

The water demand of the municipal/urban sector in the island is estimated to reach an average level of 2,278,584 cubic meters/year. This is mainly comprised of the total potable water supplied by the Water Services Corporation less leakages[3]. It is noted that with 73% of the island water demand, the urban sector is the main water consumer on the island. The demand of the agricultural, industrial and commercial sector, at 27% is quite marginal.

The per capita water demand (for domestic purposes) in the island stands at 147 litres/person/day; lower than the 119 litres/capita/day estimated for the island of Malta.

2. Water Use in the Urban Sector

Water in the urban sector is primarily used within households, the commercial environment and for urban landscaping purposes. Without doubt, households have by far the most significant water demand.

[2] *This figure was registered on September 13th, 2014 by Water Services Corporation.*
[3] For Gozo, Water Services Corporation has an ILI (Infrastructural Leakage Index) of 1.6.

Water is used in households for a variety of activities, and household water use surveys undertaken as part of the SWMED[4] project provide the classification of household water use as shown in figure 2:

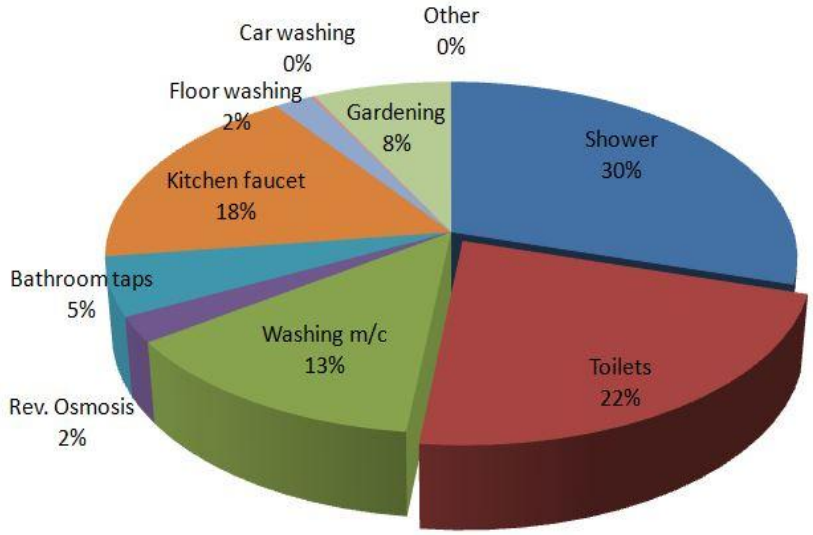

Figure 2: **Breakdown of Household Water Consumption**

Water supply to households is primarily derived from the municipal water distribution network operated by the Water Services Corporation.

The commercial sector's water demand is almost exclusively met through water supplied by the Water Services Corporation. Water use by this sector is primarily for washing purposes where mainly wash hand basins and toilet flushing are the main components of the demand.

Urban landscaping demand is met through harvested rainwater, where communal rainwater harvesting reservoirs are available and from groundwater transported by tankers.

3. High Level Policy Objectives

The high level policy objectives which define the management strategy for achieving the sustainable use of water in the urban sector in the island of Gozo can be outlined as follows:
(i) Attainment of the drinking water quality standards in the urban water supply according to the requirements of the EU's Drinking Water Directive;
(ii) Achieving a high level of efficient use of water by the urban sector, resulting in a lower sectoral water demand thus reducing the quantitative pressures on groundwater resources (and therefore contribute to the achievement of the good status objectives of the Water Framework Directive);
(iii) Supporting the introduction of alternative water resources such as rainwater harvesting, recycled greywater and treated sewage effluent, and support their use in lieu of naturally renewable groundwater resources;
(iv) Ensure the integrated utilisation of available (different) water resources to conjunctively satisfy the demand of the sector; and
(v) Achieving a high level of stakeholder engagement in the development and achievement of the policy objectives.

[4] SWMED – Sustainable Domestic Water use in the Mediterranean Regions.

4. Programme of Measures

The achievement of the high level policy objectives requires the formulation of a suite of water management measures aimed at ensuring the sustainable use of water resources. Following discussions, held at the water tables organised under the frame of the SWMED project and a number of targeted consultation meetings with the main stakeholders, namely the Ministry for Gozo, the Ministry for Energy and Health, Local Councils, NGO's and the Water Services Corporation, the following measures were identified.

4.1 Water Supply Quality

The main aim of these measures is that of optimising the quality of water supplied to consumers by the Water Services Corporation.

Measure 4.1A: Development of a Reverse Osmosis Desalination Plant

The development of a Reverse Osmosis plant in Gozo can eliminate the dependence of the island on the transfer of water through the submarine pipeline from the main island of Malta. This plant would ensure greater flexibility in the management of the municipal water supply, providing greater polishing capacity when (and if) required and also provide the local capacity to match peak demand. Furthermore, the plant will eliminate the significant energy requirements for enabling the water transfer through the submarine pipeline thus reducing the energy footprint of the water production and transfer process.

The envisaged production capacity of this plant amounts to 9,000 cubic meters per day, with a projected specific power of 3.824 kWh/cubic metre[5].

Measure 4.1B: Optimising Groundwater Abstraction

Variable speed pumping technology and online monitoring systems are recommended to be installed in all of the island's public groundwater abstraction stations to enable the modelling of groundwater abstraction aimed at achieving the highest quality blend under the prevailing production requirements.

4.2 Efficient use of water in the municipal sector

The main aim of these measures is that of ensuring that the water demand of the sector achieves the highest efficiency levels possible.

Measure 4.2A: Water Saving Devices

As part of a national scheme, water saving devices such as toilet flushing volume reducers, shower and faucet flow controllers are recommended to be distributed to all households on the island. This scheme also should be supported by a strong public engagement campaign and expert advice on water use in the home is recommended to be provided to all households. This measure has already been successfully implemented in Gozo by the ecoGozo programmme within the Ministry for Gozo, through two pilot projects, one of them being the SWMED project.

[5] *This figure excludes product transfer.*

Measure 4.2B: Water Efficient Appliances

Fiscal incentive schemes are recommended to be developed to support the acquisition of water efficient appliances such as washing machines and dishwashers. These schemes shall aim to achieve a shift in the market towards high water efficient appliances, and therefore ensuring a durable effect to the measure.

Measure 4.2C: Effective management of leakages in the municipal distribution network

It is recommended that the successful leakage management programme currently employed by Water Services Corporation be maintained in order to ensure that leakages in the distribution network are maintained at the technical and economic lowest achievable levels possible and it is suggested that research initiatives on leakage management techniques be considered in order to further optimize the water distribution network infrastructure.

Measure 4.2D: Use of smart meter data to inform consumers on wasteful water use practices

A centralised data management system is being developed by Water Services Corporation to enable the assessment of consumer water consumption patterns. The analysis of this data will permit the identification of anomalous high consumption patterns. In such cases, it is recommended that advice could be provided to consumers to better manage their water consumption or identify in-house leakages contributing to water wastage.

4.3 Unconventional Water Resources

The main aim of these measures is that of supporting the development of alternative water resources to provide the urban sector with alternative water resources and thus reduce the sector's impact on the island's threatened natural water resources.

Measure 4.3A: Rainwater harvesting

The Ministry for Gozo recommends that support schemes for the rehabilitation and use of existing reservoirs and wells within households should be be issued again and new schemes with regards to building of new reservoirs within existing households for rainwater harvesting purposes could also be considered.

The introduction of innovative rainwater management solutions based on Sustainable Urban Drainage Systems could also be assessed. This with the scope of limiting the volume of water which outflows as runoff from the urban environment by creating the conditions for the absorption of this water within the urban framework.

The Ministry for Gozo will support initiatives launched to identify existing public rainwater harvesting infrastructures, assess their structural status and determine the rehabilitation works required to restore these public assets. It is recommended that rehabilitation works should be undertaken where management structures which ensure the effective use of the harvested water can be established.

Following a successful 5-year programme of cleaning of rainwater harvesting facilities, the Ministry for Gozo also recommends the continued cleaning of silt behind dams in valleys in order to increase the rainwater harvesting potential which is mainly used for agricultural purposes. The cleaning of such valleys should be done using the integrated valley management concept.

Measure 4.3B: Greywater Recycling

An assessment of available grey-water recycling technology and its adaptability to the local scenario could also be undertaken. Support schemes to increase the visibility of this technology in the local market may be considered in cooperation with the commercial sector. Furthermore, the feasibility of incentive schemes to support the adoption of grey-water recycling technology in households could be assessed.

Measure 4.3C: Highly Polished Treated Effluent

Following the commissioning of the polishing plant at the Ras il-Hobz wastewater treatment plan, it is recommended that the necessary regulatory provisions be made to ensure the utilisation of the highly polished effluent for urban landscaping purposes. This through the engagement of regional and local authorities.

4.4 Conjunctive use of water resources

The main aim of these measures is that of developing the necessary information base to support the adoption of alternative water resources.

Measure 4.4A: Develop guidelines on the safe use of alternative water resources

Water use guidelines are proposed to be be developed to ensure the safe use of alternative water resources in the urban environment. In particular it is recommended that these guidelines focus on the safe use of harvested rainwater, recycled greywater and highly polished treated effluent.

Furthermore the possibility of providing technical support (such as chemical laboratory analysis) for the qualitative assessment of alternative water resources used in households may be investigated.

Measure 4.4B: Establishing Effective Management Structures

Regulatory provisions are recommended to be enacted to establish the necessary management structures for regulating water use in urban landscaping, in particular requiring water supply operators to shift to alternative water resources, instead of groundwater.

Measure 4.4C: Rehabilitation of historical water features

It is also recommended that the rehabilitation of old water harvesting and channeling systems be evaluated as a means of potentially increasing the utilisation of perched aquifer spring water, from the minor perched aquifer systems. This evaluation would take full consideration of current water use conditions at these aquifer systems in order to ensure that any development does not impinge negatively on existing users.

4.5 Effective Stakeholder Engagement

The main aim of these measures is that of ensuing a high level of stakeholder engagement in the implementation process of the identified water management measures.

Measures 4.5A: High level of coordination with National Water Conservation Campaign

The Ministry for Gozo will support and actively participate in formulation and implementation of the National Water Conservation Campaign being planned by Government. The Ministry will strive to achieve a high level of coordination with Ministry for Energy and Health in the implementation of this campaign in Gozo.

Measure 4.5B: Regional Process

Following the success of water tables organised as part of the implementation of the SWMED project in Gozo, stakeholder consultation meetings will be held from time to time in order to discuss proposals for water management measures on the island.

5. Conclusion

Gozo's geology and geography coupled with its Mediterranean climate provide great challanges in terms of freshwater resources. In general there is recognition of the necessity to improve fresh water resource management through more efficient use and better utilization and also to address sectors to become more sustainable in this field through reduced water abstraction from the island's aquifers. Furthermore any actions in this regard need to be supported by public awareness campaigns and active stakeholder involvement.

This policy paper may serve as a baseline document for future water resource management in Gozo, and may act as a guidline to sustain and maintain this truly precious resource on our island.