Assessing the Current Quantitative Status of Groundwater

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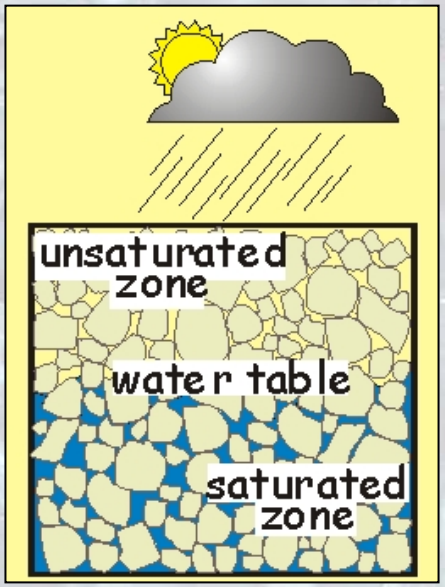
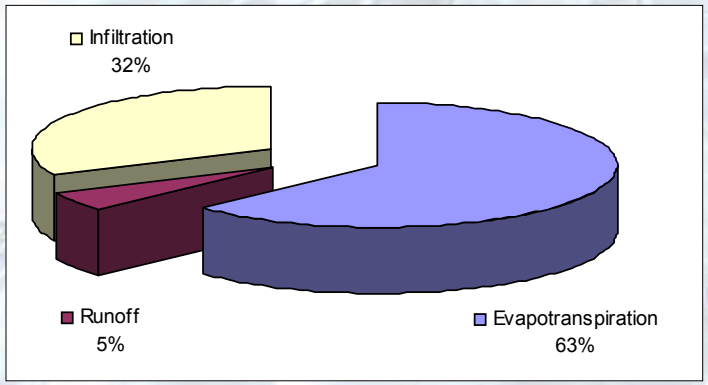
A Water Policy for the Future

What is Groundwater?

Groundwater begins with rain that seeps or infiltrates into the ground and continues to move downward under the force of gravity until it reaches a depth where water fills all of the openings (pores) in the rock. This is called the saturated zone or aquifer.

In the long term the groundwater abstracted from aquifers cannot be larger than the amount recharged through rainfall infiltrated into them.

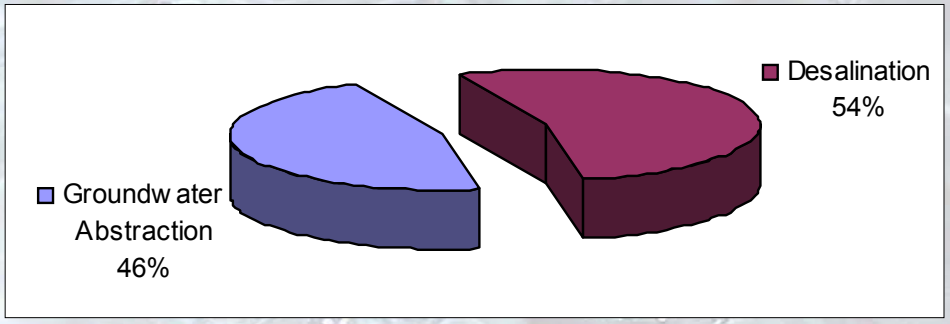


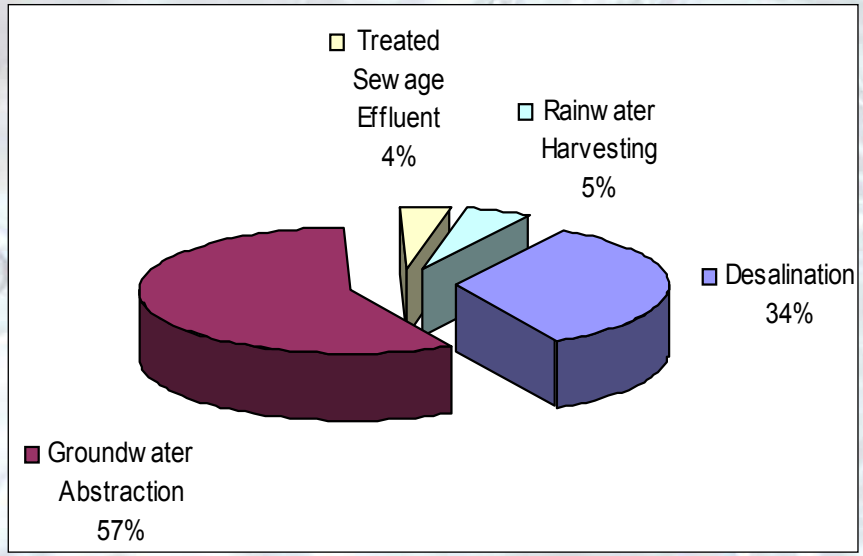


Water Balance estimates show that, in the long term, the part of rainfall that infiltrates into the underground and recharges groundwater is about 32% of the total precipitation, amounting to an annual volume of 45 million m^3.

Significance of Groundwater

During the hydrological year 2002/03, groundwater abstraction by the WSC amounted to 15.76 million m³ or around 46% of the total potable water production.



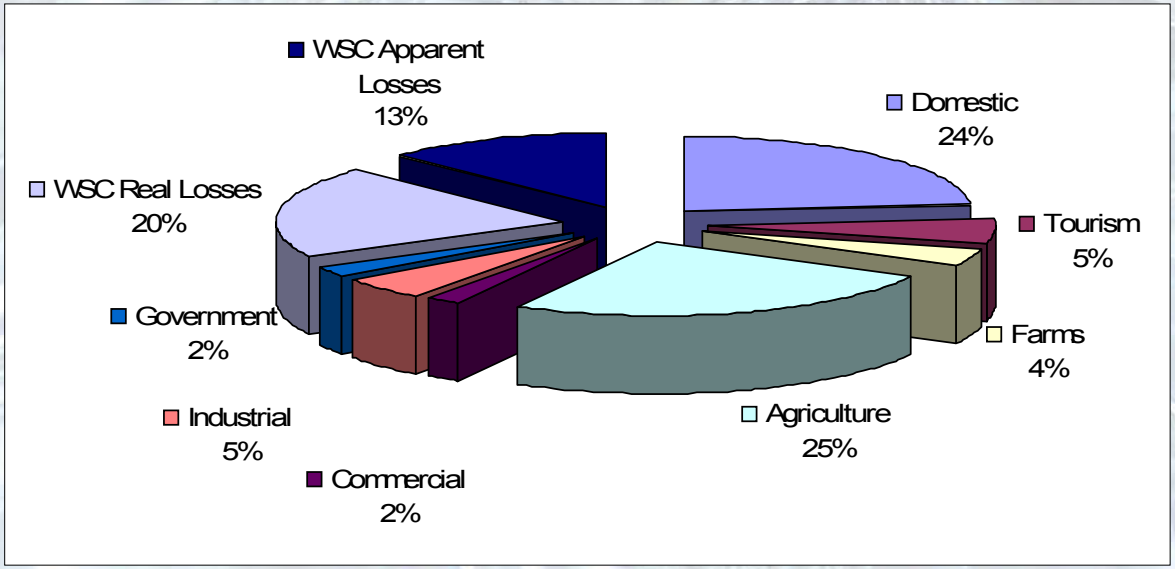


The WSC however is not the sole user of Groundwater in Malta. Groundwater Abstraction by the private sector is estimated to reach an annual volume ranging between 16 and 17 million m³.

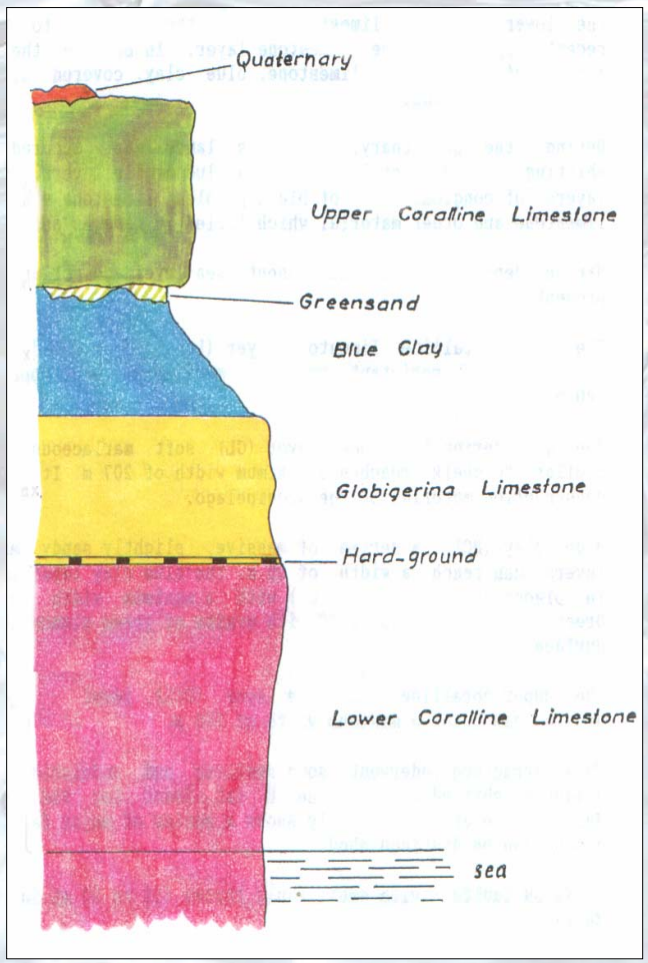
14 million m³ of this groundwater is estimated to be used by the agricultural sector.

Water Demand

Total Water Demand is estimated to reach some 57 million m^3 per year, of which 29% are used by the farming and animal breeding sector and a further 29% for the domestic and tourism sector. Other sectors claim smaller parts.



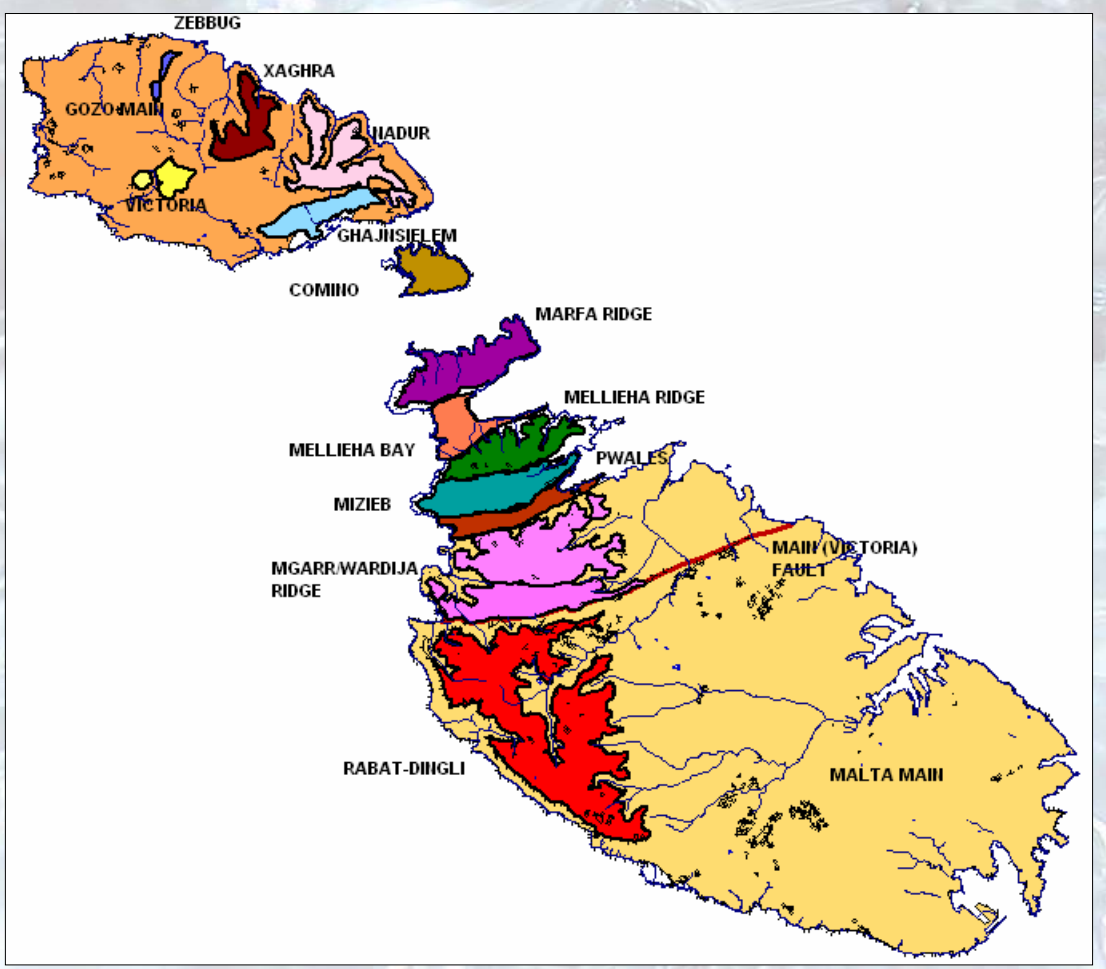
Occurrence of Groundwater



The geological structure of the Maltese islands permits the division of the islands into several distinct aquifer blocks with limited communication of groundwater.

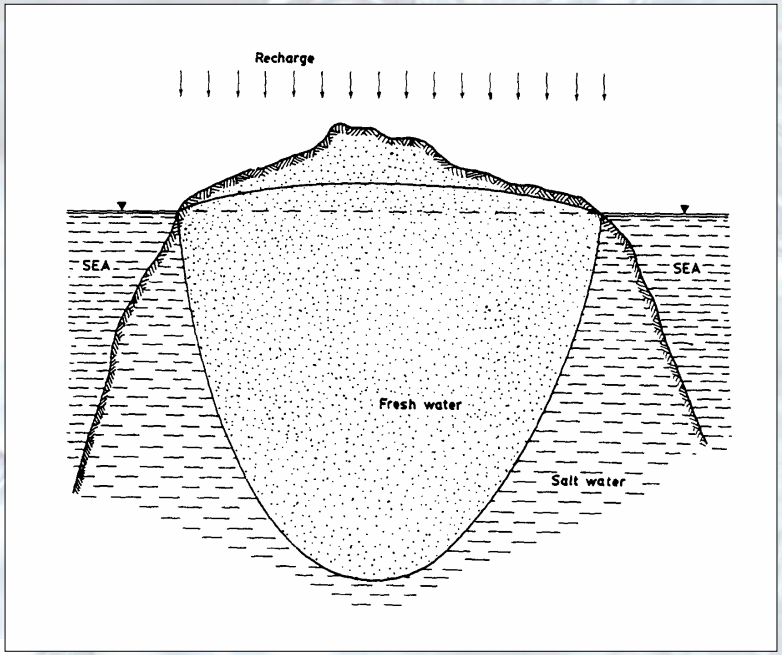
The main aquifer rocks are the Upper and Lower Coralline Limestone, with the Globigerina Limestone functioning only locally as an aquifer.

Main Aquifer Blocks



Sea level Aquifers

Freshwater is lighter than saltwater. Therefore, freshwater "floats" on top of saltwater. The weight of the rainwater that percolates into the ground depresses the saltwater beneath it forming a profile that has the appearance of a lens. This is called the Ghyben-Herzberg lens.



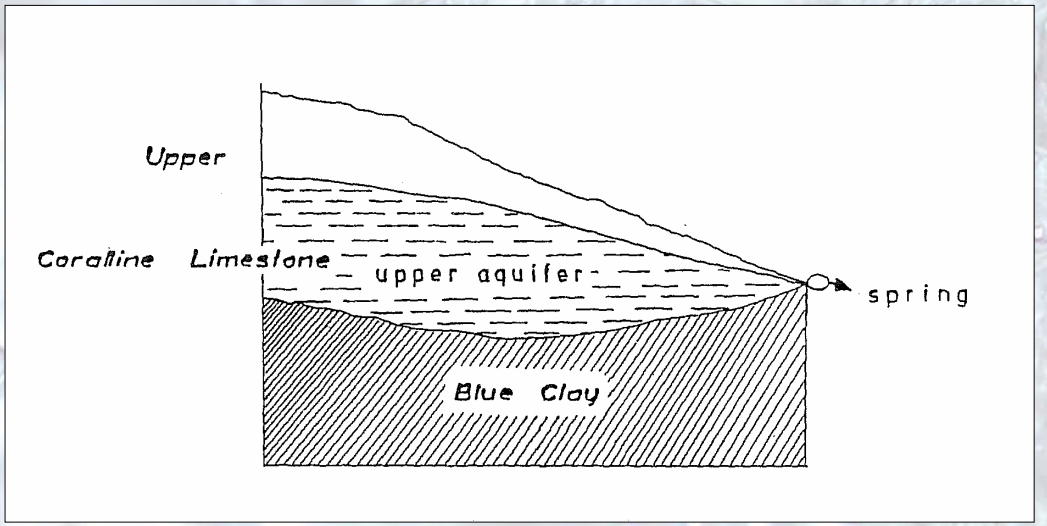
The underground boundary that separates the freshwater from the saltwater is not a sharp boundary line. In reality, this boundary is a transition zone of brackish water (fresh/salt mixture).

These freshwater bodies are fragile structures that require careful management.

Perched Aquifers

The perched aquifers are sustained in the Upper Coralline Limestone by the underlying impervious Blue Clay formation.

Their overall renewable freshwater capacity is estimated at 10 million m^3/annum. The recharge forms a very large percentage of the water in storage.

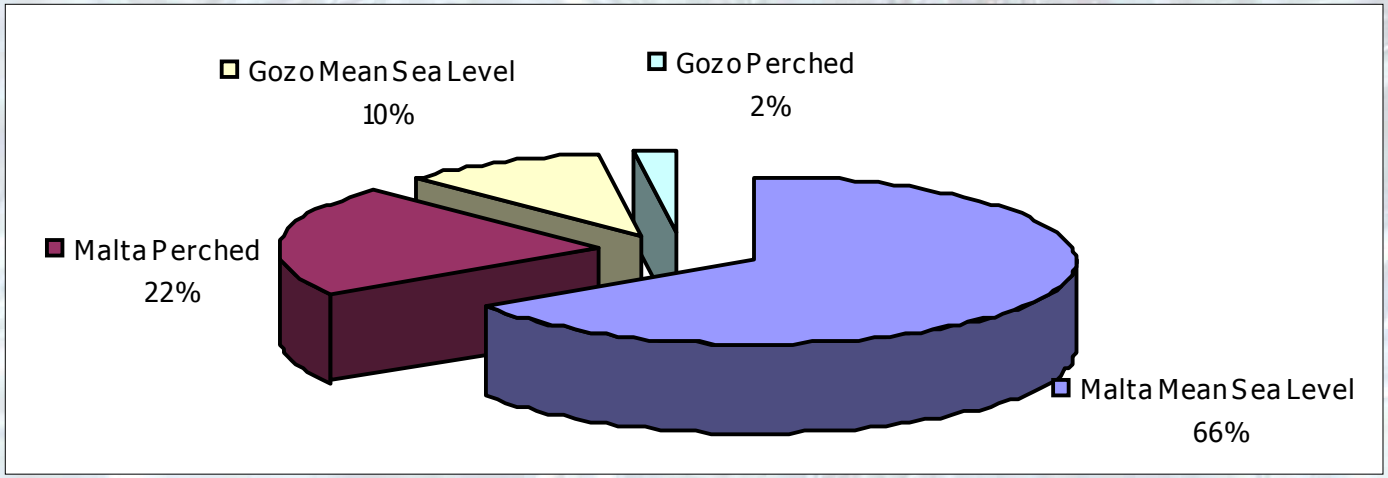


The perched aquifers have only a small potential for water extraction

Relative importance of Aquifers

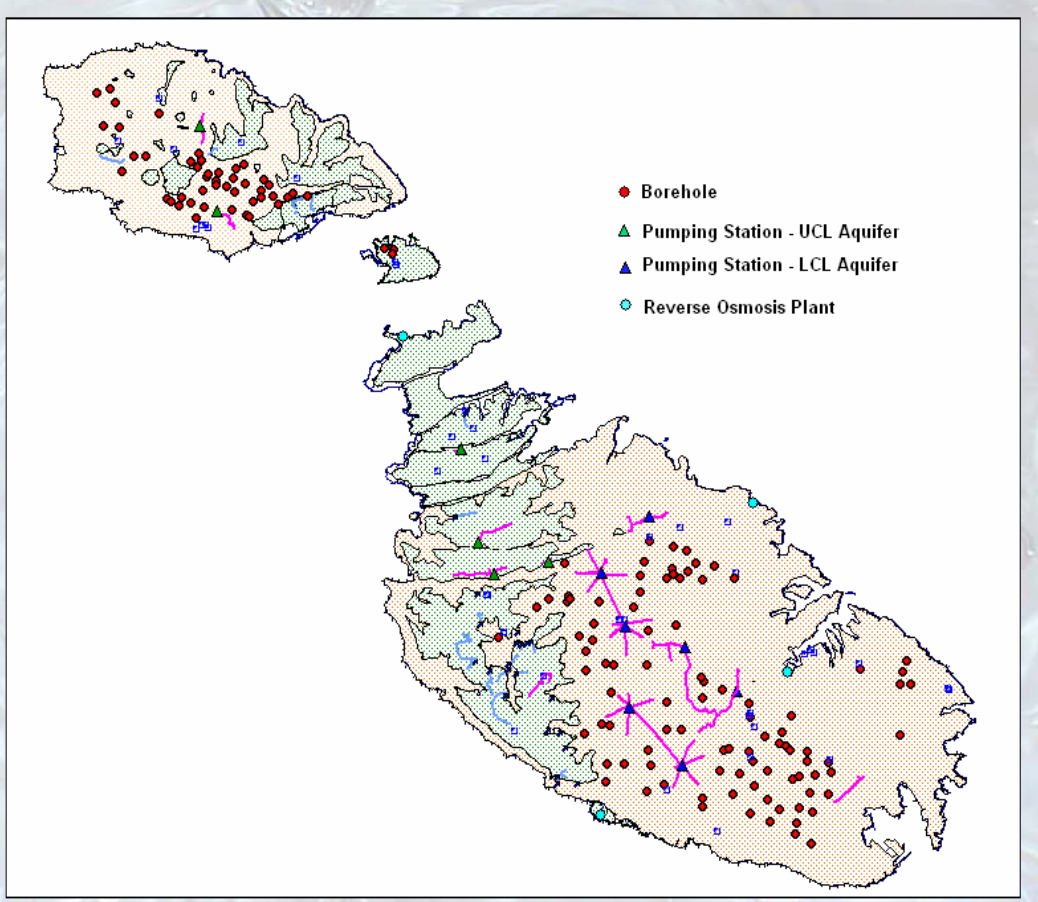
By far the largest underground water storage capacity, yielding about 76% of the groundwater extracted in the country, is provided by the sea-level aquifers.

The perched aquifers have only a significant local importance; and are heavily exploited for agriculture.



Public Groundwater Sources

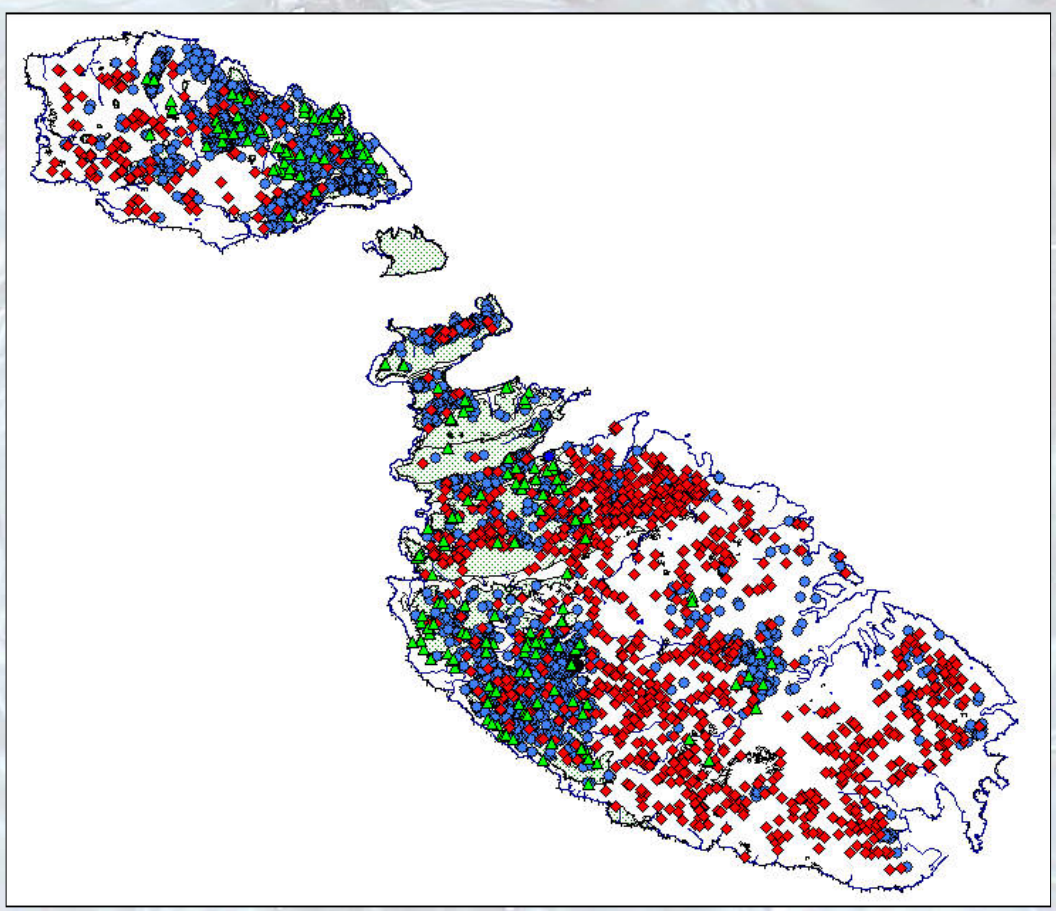
The WSC abstracts groundwater through a network comprising around 100 boreholes and 13 pumping stations.



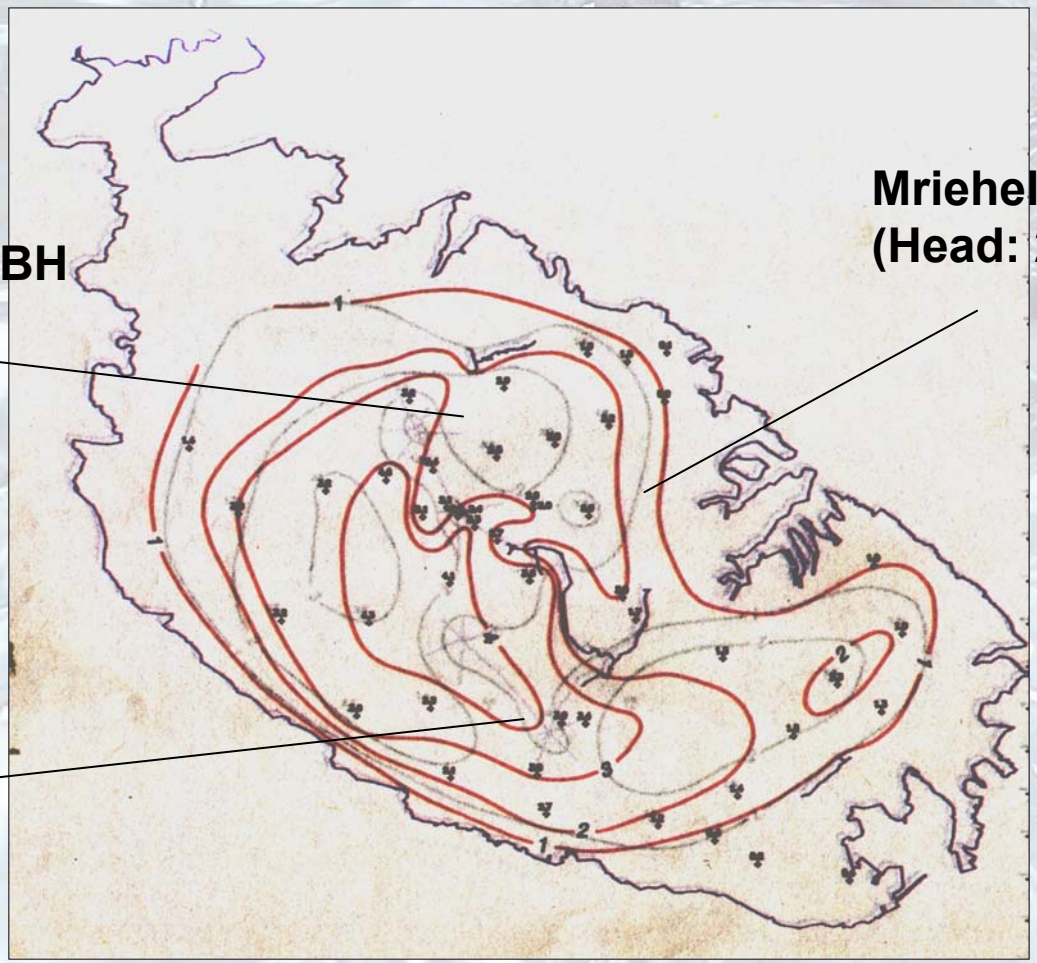
Private Groundwater Sources

The number of registered private groundwater sources reached 5,113 in 2001.

These are supplemented by an unquantified number of unregistered/illegal boreholes.

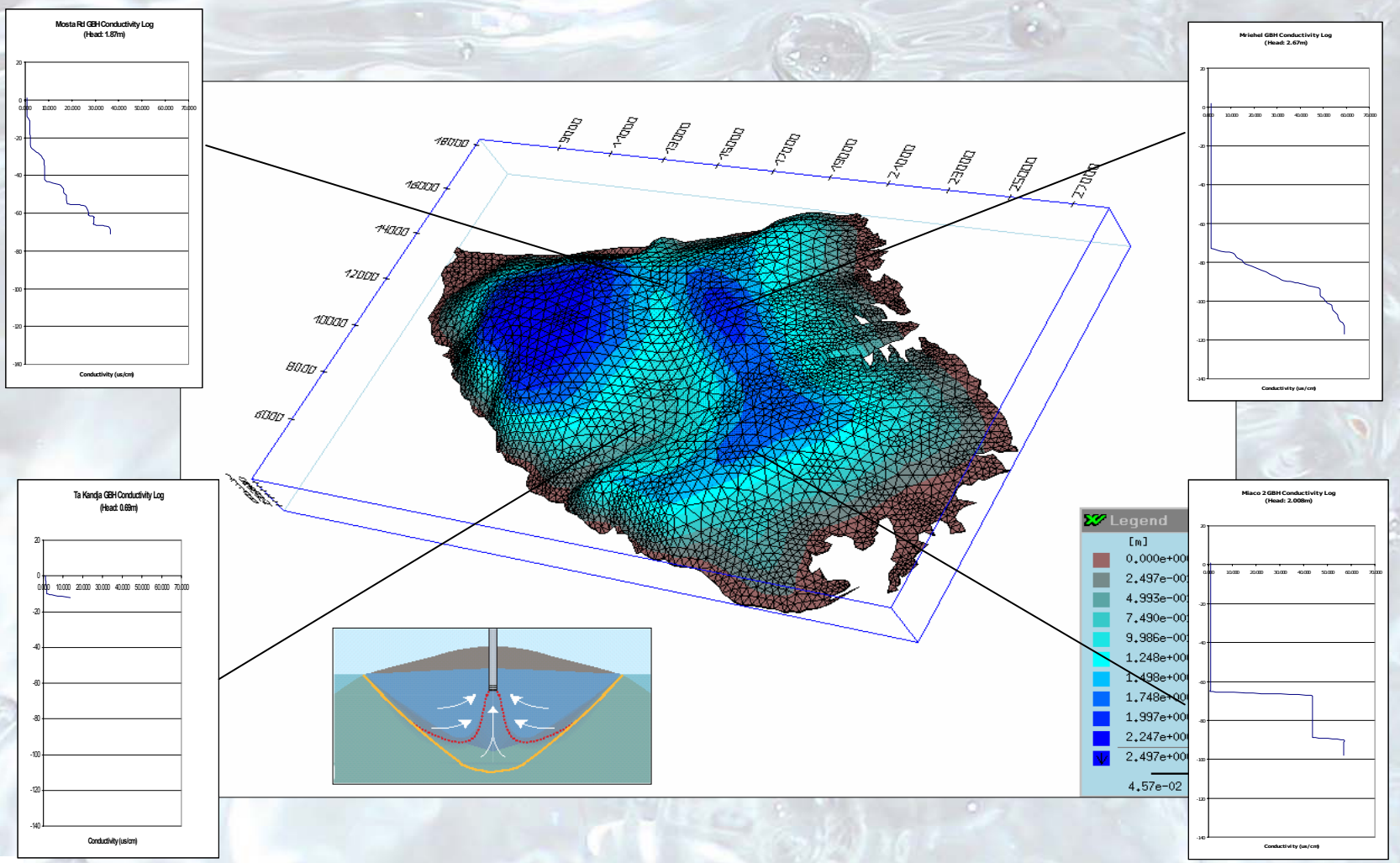


Evaluation of status (Sea Level)



T.O. Morris
The Water Supply
Resources of Malta
1955

Evaluation of Status (Sea Level)



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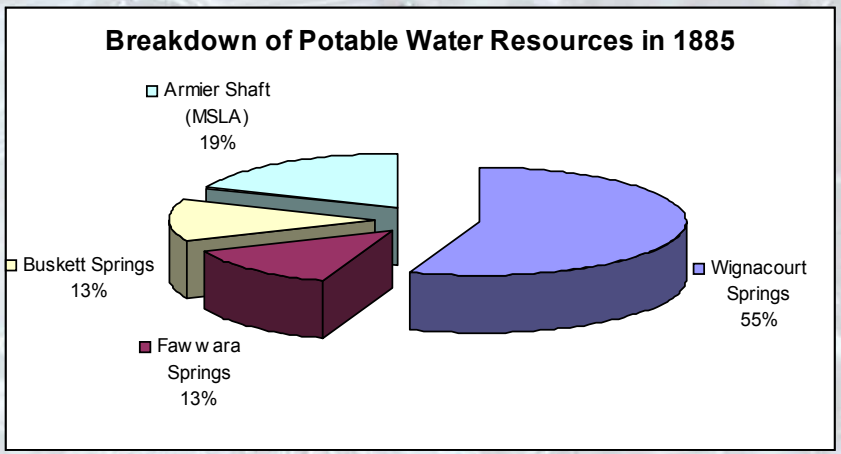
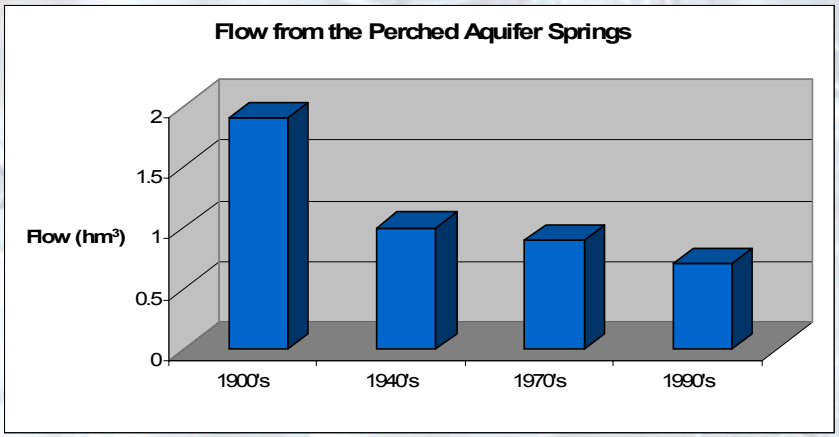
Evaluation of Status (in Perched)

Most of the perched aquifers are over-exploited – they are being driven down to a small stored volume of water.



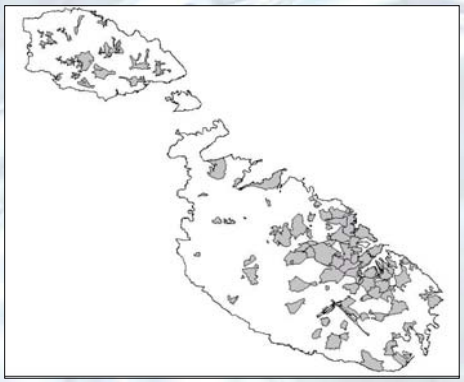


The springs that arise from these aquifers, after their flow has dwindled over the years , have all but been abandoned for the purpose of obtaining drinking water.

Surface Runoff

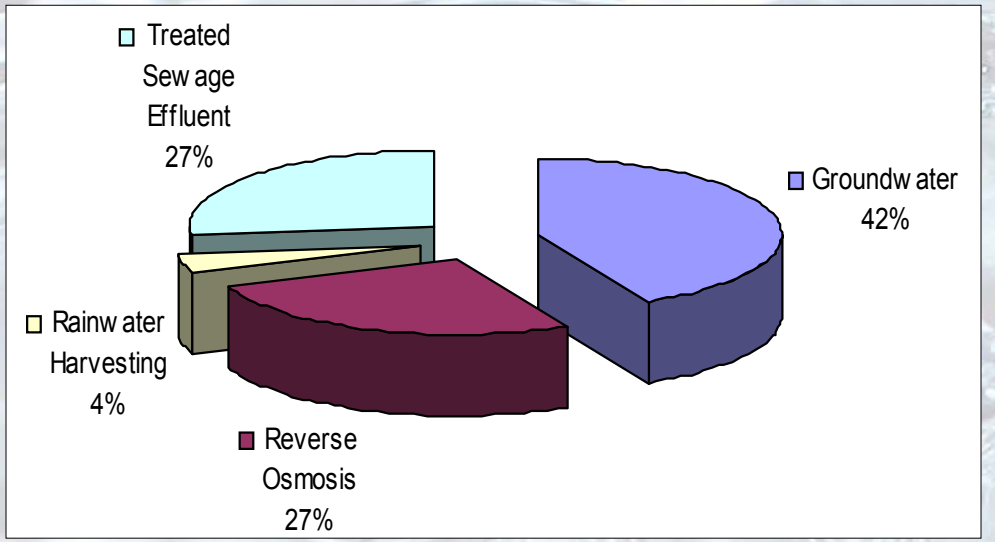
An estimated 25 million m^3 of surface runoff are generated annually in the Maltese Islands.

20% of this volume is estimated to be generated in the upland areas; and can be potentially harnessed for recharging the sea level aquifer or for use in agriculture. A number of dams have been constructed along the main valleys for this purpose. Their total capacity amounts to 154,000m^3.



The remaining 80% are generated in the built-up areas. Between 4 and 5 million m^3 of rainwater could be potentially collected by having a well in each household.

Treated Sewage Effluent



By 2007, it is expected that all domestic and industrial waste water will be treated. This will introduce an estimated 15 to 19 million m^3 of water into the system.

The treated effluent will either discharged to the marine environment or reclaimed and re-used.

The subsequent use of treated effluent however depends on the real and perceived health considerations, the cost of production, storage and distribution and the quality of the water produced.

EU Directives

One of the major aims of the Water Framework Directive is to promote a sustainable water use based on a long-term protection of available water resources.

The Directive thus requires Member States to protect, enhance and restore all bodies of groundwater, ensure a balance between abstraction and recharge of groundwater, with the aim of achieving good groundwater status at the latest 15 years after the date of entry into force of the Directive (that is by 2015).

For good quantitative status, therefore, groundwater must not be abstracted at a rate that exceeds its replenishment.

Conclusions

The widespread exploitation of groundwater has resulted in a drop in reserves with aquifers becoming practically non-existent in certain regions of the islands.

The degradation in Groundwater Quantitative Status can only be reversed if:

- **Groundwater is treated as a limited resource and preferentially allocated to the most beneficial concerns.**
- **Groundwater abstraction is regulated.**
- **The potential of non-conventional sources of water is harnessed in order reduce the dependence on groundwater.**