

## **PERFORMANCE AUDIT ON THE MANAGEMENT OF WATER RESOURCES IN CYPRUS.**

Despite the development of numerous water projects by the Republic over the years, aiming to ensure sufficient quantities of water, water scarcity remains a key feature of Cyprus, with negative effects on economic growth, the environment and agriculture, while the situation has deteriorated in recent decades as a result of climate change. Realizing the importance of proper management of the country's water resources, our Office decided to include the subject in its priorities and, despite its limited human resources, conduct a thorough performance audit examining the main issues relating to this scarce resource.

The main objective of the audit was to evaluate the national strategy and policies in the water sector, considering the economy, efficiency and effectiveness of the operations of the government entities and statutory bodies involved in water management. The aim was to examine both the quantitative and qualitative management aspects, as well as costing and valuation procedures relevant to water resources.

Recognizing that it would be practically impossible for an audit to cover all aspects of such a complex issue, we focused on the areas we judged our work would add the most value. This was done following a SWOT analysis in the field of water resources. The issues on which we focused our audit relate to the management, by competent bodies, of governmental dams, desalination plants and groundwater bodies, with emphasis on the measures taken to safeguard public health, quantitative sufficiency and water quality for all water uses and for the recovery of water service costs. We also looked into general management issues, such as flood risk management and the use of alternative water sources, such as tertiary treated wastewater and rainwater.

The methodology used included interviews with responsible officers of the bodies involved, meetings with NGOs, document review, data collection from water supply Authorities via an especially designed questionnaire and site visits to two water treatment plants, a water dam and a desalination plant.

The main audit findings are summarized below:

***Institutional framework and competent bodies.*** An overlap of responsibilities between the Water Development Department (WDD) and the Geological Survey Department appears to exist, in the area of monitoring groundwater resources, which may cause unnecessary administrative costs or complications in the proper qualitative monitoring of groundwater bodies.

***Water Management Advisory Committee.*** The Committee displays significantly limited operation, in relation to its statutory responsibilities.

***Water balance.*** The water balance in Cyprus presents frequent and sharp fluctuations since, due to the prevailing climatic conditions, the available quantities of water from natural sources depend solely on rainfall. Moreover, exploitable quantities of water in underground aquifers cannot be accurately estimated.

**Strategic planning and policies.** A delay was noted in relation to the preparation of the River Basin Management Plan for the period 2016-2021, which, in accordance with the provisions of the European Water Framework Directive (Directive 2000/60/EC), should have been reviewed by 31.12.2015 at the latest. The preparation of the Plan is an ex-ante conditionality for the country to obtain funding of water and sanitation projects by the European Union. The Director of the Department informed us that, on 10.7.2016, the Council of Ministers approved the River Basin Management Plan and the Programme of Measures for the period 2016-2021 and it is expected that the required information will be submitted to the European Commission in December 2016.

**Government dams.** There are 107 dams in Cyprus, of a total capacity of 332 million m<sup>3</sup> of water, with the total average quantity of stored water on October 1<sup>st</sup>, for the years 1988-2014, amounting to 100.4 million m<sup>3</sup>. The quantities of water evaporated from all 19 dams for which data are available, in 2014, amounted to 9.6 million m<sup>3</sup>, while the overall rate of evaporation from the dams of the Southern Conveyor Project is estimated at 8%. The issue of water evaporation from dams has repeatedly concerned the WDD, but a reliable and economically feasible solution has not been identified.

**Dam safety.**

- No integrated system is being applied to ensure dam safety, despite the enactment of the relevant legislation in 2010. The civil engineers of the WDD are not sufficiently qualified for the supervision of dams and annual reports on the safety of all large raised reservoirs are not prepared, contrary to legal requirements. During the audit, important information such as geotechnical investigation reports, operation and maintenance manuals and regular preventive maintenance documentation, were not submitted.
- The WDD does not plan to prepare a flood map for the Kouris dam, despite the fact that towns and villages and the Limassol-Paphos motorway are situated downstream of the dam and the Episkopi desalination plant lies at the river mouth.
- No operation and maintenance manuals exist for all dams and there is no evidence that all dams are systematically preserved by the WDD District Offices.
- Due to the delay in the adoption of the Integrated Water Management (Safety of Large Elevated Reservoirs) Regulations of 2015 by the House of Representatives and the compilation of the list of qualified civil engineers by the Minister of Agriculture, Rural Development and Environment, which is still pending, the relevant provisions of the Integrated Water Management Law have not yet been implemented.

The Director of the WDD informed us that, on 3.08.2016, the Minister of Agriculture, Rural Development and Environment approved the first list of qualified civil engineers. The WDD will immediately assign specific duties to the supervising engineers, so as allow full alignment with the provisions of the Law. The first reports of the supervising engineers are expected to be completed by October 2017 and the relevant report will then be sent to the Minister, in accordance with the legislative provisions.

### ***Desalination plants.***

- The WDD signed an agreement for the purchase of water from the desalination plant at Vassiliko, based on which the amount of water produced is predetermined and cannot be reduced. Due to the fact that the necessary network for the transfer of potable water was not constructed on time, most of the desalinated water produced is led to the Southern Conveyor Project and is either transferred to the Tersefanou water treatment plant for reprocessing, supplied for irrigation or stored in dams.
- The Drought Management Plan is not taken into account when determining the annual policy for the allocation of available water resources. As a result, the annual extraction from dams in drought periods greatly exceeds the specified quantities according to the Plan. Consequently, drinking water needs are covered to a greater extent by the operation of desalination plants, with a significantly higher cost.
- The Drought Management Plan determines the amount of water that can be annually extracted from dams and, in effect, the period of operation and the quantities of water to be produced from desalination plants. However, the particular plants which are to operate and those which should remain in standby mode are not specified, while the cost of producing desalinated water varies between the desalination plants.

### ***Groundwater bodies.***

- According to the Report on the review, revision and reclassification of groundwater systems prepared by the WDD in 2014, 16 of the 21 groundwater bodies of Cyprus, or 76%, are of poor quantitative status. Furthermore, nine bodies are under nitrates pollution while the sea front has penetrated 11 bodies, leading to their salinization.
- Weaknesses were identified in the coordination of the WDD and the Geological Survey Department, as regards sample collection and analysis for the purposes of monitoring groundwater aquifers, particularly with regard to analysing samples for all required parameters, and the mechanism of informing the WDD in cases where results exceed parameter ceilings.
- The rate of monitoring nitrate vulnerable zones is particularly low. It was found that no control mechanism is in place by the Department of Agriculture, which is the authority responsible for the implementation of the Action Plan for reducing nitrates pollution, since on-the-spot checks are limited to the sample selected by the Cyprus Agricultural Payments Organisation (CAPO) for the purposes of monitoring cross-compliance in granting agricultural aids.
- There are currently no sanctions imposed for non-compliance with the Action Plan for reducing nitrates pollution, apart from reductions imposed by CAPO in aid payments as part of the cross-compliance implementation system.

### ***Drilling and use of boreholes.***

- A centralized register of all licensed boreholes and the quantities extracted from these is not kept, so it is unknown which/how many boreholes are in use today. The information input in the database maintained by the WDD is incomplete. Applications for the ex-post issue of licences relating to existing unlicensed boreholes were accepted after the expiry of the four-year extension given by law.
- Weaknesses were identified in the applications handling procedures for water works licences and differences in the handling of cases between Districts.
- Application fees for the issue of ex-post licences were modified, resulting in the inequitable treatment of applicants that had submitted an application before and after the modification.
- Local Authorities supply citizens with drinking water from boreholes, even when there are available water quantities in the dams, for cost saving purposes, with a potential impact on the environment and public health.
- Almost non-existent control of compliance with the maximum permitted quantity of water to be extracted from licensed boreholes, while for a large number of older boreholes, a ceiling has not been specified.
- The water extracted from boreholes belonging to local Authorities and private individuals is not invoiced by the WDD, and the environmental charge has not been determined, despite the fact that the relevant Regulations were enacted over two years ago.

The Director of the WDD informed us that, by the end of 2016, the Council of Ministers is expected to issue the Water Fees Regulations, laying down new water prices, which will include environmental and resource charges. He noted that the new prices have already been discussed in the Advisory Committee and approved by the Technical Committee for Determining and Reviewing Fees and Charges, while the views of the Law Office of the Republic are still pending.

### ***Drinking water quality.***

- Apart from the urban Water Boards and some large local Authorities, most local water supply authorities are not in a position to document the implementation of compliance procedures to ensure water quality, beyond sample analyses conducted by the relevant Department of the Ministry of Health.
- The Law on the Quality of Water of Human Consumption (Monitoring and Control) does not provide for fees for water sample analysis, nor the imposition of administrative fines in the event of parameters exceeding indicative ceilings and the consequent need for repetitive sampling to verify the restoration of water quality following the appropriate corrective measures.

### ***Boreholes used for drinking water supply.***

- The process of defining protection zones for boreholes used for drinking water supply under the Control of Water Pollution (Groundwater Protection Measures) Decree (no. 45/96) has been suspended since 2010, due to the need to amend the legislation so as to allow the Minister of Agriculture, Rural Development and the Environment to define prohibitions and mandatory measures within the zones. To this day, 208 Decrees have been issued, out of the approximately 480 boreholes currently in use.
- In the Paphos District, very few water samples are collected and examined by the WDD from boreholes used for drinking water supply.
- There is no monitoring mechanism to ensure that the provisions of the legislation are adhered to by the local water supply authorities. As a result, local Authorities have been observed to connect boreholes that have not been tested by the WDD to the local water supply network, with negative consequences on the levels of quality parameters.
- In many towns and villages, particularly in the Nicosia District, springs and boreholes used for drinking water supply are degrading over time.
- Despite the decision, in 2014, for the Public Health Services to prepare a law proposal for the establishment of a Water Security Council, the matter is still pending since no decision has been reached by the Ministry of Health.

### ***Tertiary wastewater treatment.***

- Despite the fact that the transition period for compliance with Directive 91/271/EEC as regards the installation of central sewage networks and wastewater treatment plants in towns and villages with a population exceeding 2,000 ended on 31.12.2012, until May 2016 the compliance rate was around 76%.
- There is very low utilization rate of recycled water produced by the tertiary treatment plants of Urban Sewerage Boards (59% in 2014), due to the lack of the necessary storage, transfer and distribution network.
- In 2015 it was discovered that the water produced by the Larnaca sewage treatment plant contains almost twice the allowable amount of salts, a fact attributed to seawater intrusion into the Larnaca aquifer, where the wastewater transfer network to the station has been constructed.

The Director of the WDD informed us that, because of the quality of treated water produced by the Larnaca sewage treatment plant, a reduction of 20% was applied on the invoices paid by the WDD to the Sewerage Board in 2015.

### ***Water supply for irrigation.***

- The Decision of the Council of Ministers approving the water allocation policy for 2014 was made extremely overdue, on 23.12.2014, that is at the end of the year concerned and after the available water quantities had already been distributed by the WDD to

farmers. The long delay appears to have been due to the delayed submission of the proposal to the Council of Ministers by the Ministry of Agriculture, Rural Development and the Environment.

- Results of a study conducted by the relevant departments of the Ministry of Agriculture, Rural Development and the Environment, indicate the need of establishing a strategy for water supply for irrigation and encouraging farmers to produce products aimed at optimal water resource management.
- A number of weaknesses were identified in the procedures implemented for the receipt and approval of applications for the supply of irrigation water, including deficiencies in the information available in the relevant database of the WDD and weaknesses in the control mechanism to ensure adherence to the quantity ceiling set for each farmer.
- The supervision exercised by the District Administrations over the operation of Irrigation Associations is limited to a financial audit in accordance with the legislation, and the participation of a representative of the respective District Administration in committee meetings where deemed necessary.
- The WDD does not keep records on all water rights in force and exercised by individuals and/or groups by extracting or diverting water from rivers or lakes, a fact which weakens the control exercised over water resources that, by Law, belong to the Republic.
- The construction of the Solea dam was completed in 2014, however, due to restricted funds, until this day the construction of the irrigation network in the region has not been possible. As a result, the water stored in the dam is not used by the farmers in the area. Our Office maintains its reservations concerning the environmental impact on the underground aquifer of the area downstream of the dam, which is deprived of valuable enrichment with no substantial benefit for farmers.

The Director of the WDD informed us that the Department has provided the local villages with rubber pipes, which have been installed on the ground surface temporarily, until the completion of the permanent network construction. The work was completed and water was supplied to the villages in July 2016, covering the irrigation needs of the region.

***Pricing of water services.***

- The current pricing policy does not contribute to the cost recovery of water services, resulting in non-compliance of the Republic with the provisions of Directive 2000/60/EC. Furthermore, water charges are not uniformly applied by the WDD among districts. The revision of water service charges is pending since a draft legislation has not yet been submitted to the Council of Ministers for a political decision to be made.
- Dissimilarities are noted in the water prices imposed by the local water supply Authorities, as well as the frequency of water invoicing among areas.

- In order to determine the environmental cost of water supply services, the WDD did not take into account updated data concerning the quality status of underground aquifers. The calculation of the environmental cost carried out in 2015 was based on data that were available in 2009.

As mentioned above, the Director of the WDD informed us that, by the end of 2016, the Council of Ministers is expected to issue the Water Fees Regulations.

***Losses from water networks.***

- The percentage of non-invoiced water for the Southern Conveyor system is estimated by the WDD at 15% of the total water quantity supplied for irrigation purposes.
- The mean percentage of non-invoiced water for 2014 amounted to 25% of the total amount of water channelled into water networks.

***Water supply to golf courses.***

- Prior to the submission of the Proposal for the setup of a golf courses policy to the Council of Ministers in 2005, the adequacy of available water resources for the irrigation of the golf courses planned, had not been examined. As a result, the announced policy was continually modified with respect to the provisions for water supply to the courses, due to issues arising in the course of its implementation.
- The WDD currently provides irrigation water to three golf developments in the Pafos District, which operated prior to the original decision of the Council of Ministers on 16.2.2005. This water is invoiced according to the provisions of the Decision of the Council of Ministers dated 17.12.2003, regarding the revision of water charges.

***Drinking water supply by the WDD to individual consumers.*** Cases were identified where the WDD approved the supply of drinking water to individual consumers, without proper documentation of the approval and despite the WDD's concerns about the adequacy of the local network.

***Storage tanks of local water supply Authorities.***

- The WDD does not keep updated information on the number and capacity of water storage tanks kept by local water supply Authorities nationwide.
- It was noted that several local Authorities are unable to deal with possible interruption of the water supply by the WDD, for a minimum of 24 hours.

***Flood risk management and utilisation of rainwater.***

- The preparation of the Flood Risk Management Plan for Cyprus (2016-2021) is still in progress, despite the fact that, under Directive 2007/60/EC, the Plan should have been prepared by 22.12.2015.

- Despite the fact that a study on the utilisation of rainwater was completed five years ago, no action has been taken to implement the suggestions arising from the study. Relevant measures have been included in the Draft Flood Risk Management Plan 2016-2021.

The Director of the WDD informed us that the Flood Risk Management Plan 2016-2021 is expected to be finalised by 20.11.2016, based on the Opinion on the Strategic Environmental Assessment, which was issued on 1.11.2016 by the Environmental Authority. He also informed us that it is estimated that the required information will be submitted to the European Commission in December 2016.