A Water Policy for the Future

A Consultation Document

A WATER POLICY FOR THE FUTURE

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Foreword

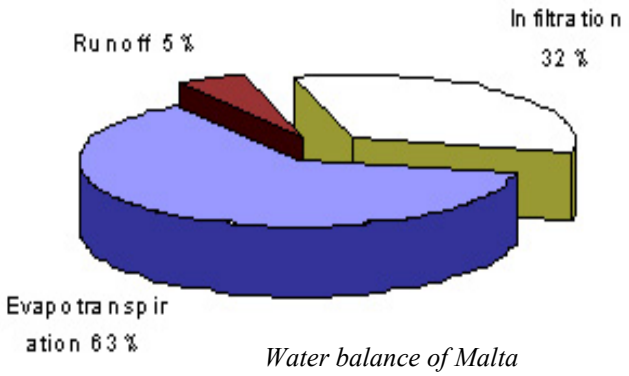
The main purpose of this document is to report on the results of a groundwater resources review commissioned by the Food and Agriculture Organization of the United Nations (FAO) for the Malta Resources Authority (MRA). It draws together the findings and recommendations of a group of independent experts who undertook studies on key sectors and specific themes, related to groundwater management. The document proposes a policy framework intended to provide the basis for the rational management of groundwater within the perspective of sustainable use of water resources in Malta and Gozo.

From the onset of the project it was decided to compile all the information that is useful for the building of new policy as it throws light on the technical, socio-economic and legislative aspects of water resources management. The assessment includes an evaluation of groundwater resources by quantity and quality, an assessment of water demand, an economic study of water resources, a review of the legal and institutional framework, and an assessment on the use of treated sewage effluent. A summary of the findings arising from the respective studies, together with the relative directions for policy adjustment, is given in the following paragraphs.

Part I: Summary of water facts

1.1 Water balance of the Maltese islands

The source of all groundwater in Malta is precipitation on the islands. In the long run, water abstraction from underground aquifers cannot be larger than the amount recharged through rainfall infiltrated into them. Average annual rainfall on the territory is of 550 mm per year, however with inter-annual variations ranging from 200 mm to 1000 mm. It is estimated that, over the long term, the part of rainfall that infiltrates into the underground and recharges groundwater is about 32%, with variations from "wet" to "dry" years. In a wet year, up to 280 mm of rainfall (80 million m^3) may recharge groundwater, while in a dry year the recharge may be as low as 56 mm (16 million m^3). The average amount of renewable groundwater per inhabitant is estimated at 40 m^3 per year (Margat & Vallée, 1999).

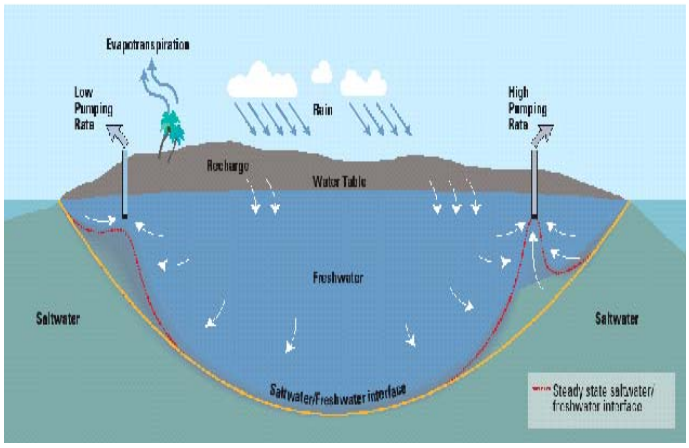


Water balance of Malta

Policies aiming at a better use of the islands rainfall should tend to increase infiltration of rainfall to recharge the aquifers. Opportunities for capturing and storing rainfall water in cisterns and reservoirs need to be realized. Some years bring little water and it is therefore important to secure carryover of water from wet years into dry years through storing prudent reserves.

1.2 Groundwater resources

Groundwater resources in Malta are contained in a number of aquifers. By far the largest underground water storage capacity, yielding about 80% of groundwater extracted in the country, is provided by the sea-level aquifers of the islands of Malta and Gozo. The body of freshwater stored in aquifers of this type tends to have the form of a lens that floats on denser saltwater. These freshwater bodies are fragile structures that require careful management. In practice, boreholes sunk into the sea-level aquifers outside of technical control, and water extraction without regard for sustainability of the resource, has resulted in damage to the resource and bears a severe risk of wiping out, for practical purposes, the underground freshwater storage capacity provided by the sea-level aquifers. The aggregate optimum storage capacity of the main sea-level aquifers of Malta and Gozo is estimated at 1.5 billion m^3.

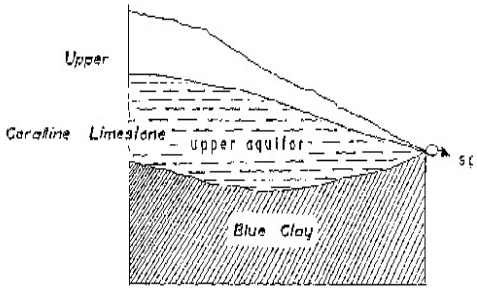


Scheme of a sea-level aquifer (courtesy of UNDP)

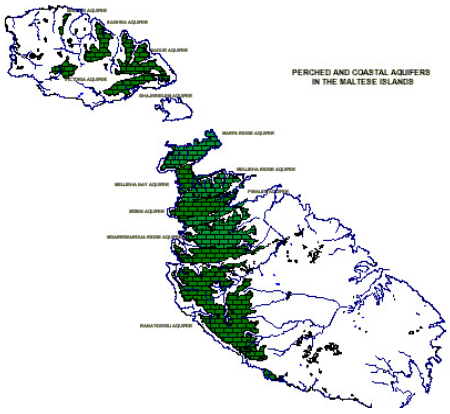
The "perched aquifers" of Malta sit on impervious strata above sea level. Their overall renewable freshwater capacity is estimated at 10 million m^3 per annum Most of these aquifers are over-exploited, meaning that they are driven down to a small volume of water stored, and poorly protected insofar as the infiltration of pollutants, including toxic substances, has been allowed. The springs that arise from these aquifers, after their flow dwindled over the years, have all but been abandoned for the purpose of obtaining drinking water. Freshwater ecosystems in inland valleys depend on adequate aquifer management to keep enough water available to continue sustaining life. There are also a few significant "coastal aquifers" where groundwater is retained because of the higher density of seawater at the aquifer's outlet.

The continuation of present practices in drilling boreholes and pumping water can lead, in the case of the sea-level aquifers, to further upconing of saltwater and loss of freshwater storage as saltwater fills the space left by extracted freshwater and eventually reaches sea

level. Once the sea-level aquifers are overtaken by saltwater, it takes a very long time to restore the capacity to store freshwater in them. Policies for better management of groundwater resources should aim at controlling the actual positioning of the boreholes and the volume and quality of water abstracted in order to gauge the status of the aquifers. Drilling and pumping should be guided by scientific knowledge, proven technology and the common interest of all users in preserving the functionality and storage capacity of aquifers. The important policy point that emerges concerns Malta's groundwater resources as a strategic resource. In events of general power failure or breakdown in desalination capacity, unforeseen increases in oil prices, groundwater is the only alternative source of water that can be economically mobilised.



Scheme of a perched aquifer



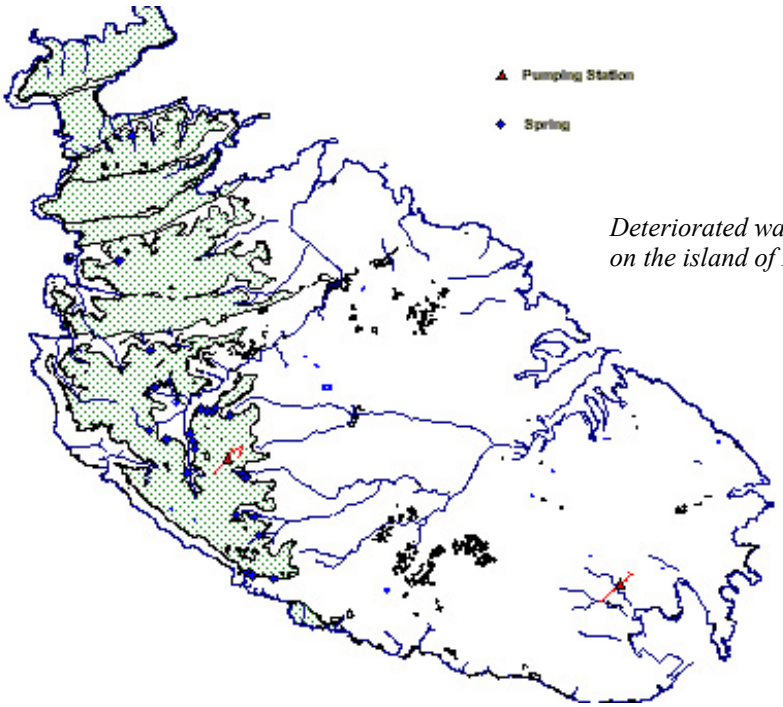
Perched and coastal aquifers of the Maltese islands

1.3 Groundwater quality

The leading indicators of groundwater quality are: overall content of salts, nitrate content, and pathogens. Contaminants have been found in many sources of previously clean water and, while the situation varies from one site to another, it is clear that the overall water quality situation in Malta has deteriorated in recent years. Pathogen germs usually stem from improperly disposed waste and wastewater. The presence of nitrates in groundwater is attributed to leakage from sewers and leaching into the aquifer of agricultural contaminants, in particular fertilizers applied in excess in the fields and greenhouses, and animal husbandry wastes. Certain sources of freshwater have been closed to use for drinking water purposes owing to excessive nitrate levels. At the same time, increasing salinity of pumped water stems from extracting water from depleted or deteriorated aquifers. The combination of pollution and saline intrusion results in rising cost of water treatment. The "polluter pays" principle is as yet not applied and it is the user of clean water who usually pays for clean-up of the degraded groundwater. In addition, certain sources have become unusable because of chemical spills (hydrocarbons, for example) that have left a permanent pollution imprint. To restore such aquifers requires a long time for the natural hydrochemistry to be re-established and it is generally uneconomic to undertake aquifer remediation.

Groundwater contamination is impacting the islands water economy and a policy to curb such contamination is required to avoid incurring in further water treatment costs. Industrial, agro-industrial and agricultural water users can be induced to apply good

practices that isolate their activity, and the wastes they generate, from the underlying aquifer. The technology to apply agricultural fertilizers and pesticides in a scientific way is available, so that these chemicals are effective on the crop plants while no toxic residues are left to infiltrate the underground. The use of certain land areas that are important for groundwater recharge should be regulated in a way that will prevent groundwater pollution; this may exclude industrial and agricultural activities as well as housing and urban development. Effective land use planning requires legal and political support to resist the implantation of uses that can deteriorate the aquifers, even when local interests see their advantage in allocation of land to such uses.



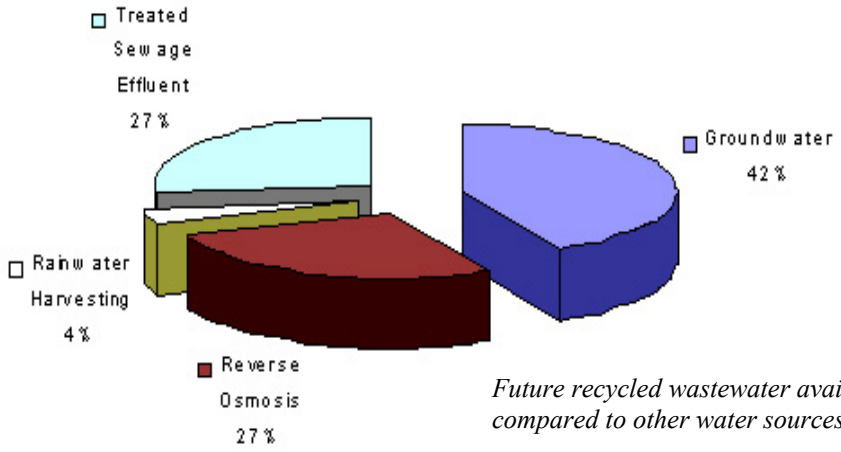
Deteriorated water sources on the island of Malta

1.4 Recycling wastewater

The primary aim of recycling wastewater is to prevent the adverse impact of releasing raw wastewater into the environment. In Malta, only about 12% of wastewater is currently recycled. In the context of European directives, it is foreseen to install new wastewater treatment plants for recycling all domestic wastewater by 2007, thus ensuring protection from wastewater contamination to the terrestrial and coastal marine environment. The only presently existing major wastewater recycling plant operates with problems caused by the high salinity of the wastewater treated. As a consequence, the recycled water is at times critically saline and its further use in agriculture subject to constraints. Salinity in wastewater stems from leaky sewers into which brackish or seawater infiltrates, and from discharging into the sewers of brackish water or seawater extracted for secondary uses. Leakage from and into the sewers needs to be corrected in the infrastructure by replacement of sewers and adequate monitoring. Dumping of seawater and other harmful substances into the sewers should be prevented through education and enforcement. As long as certain sewers carry saline water, this water should not be mixed with good non-saline sewage.

A policy of protection of wastewater from contamination with salts and chemicals,

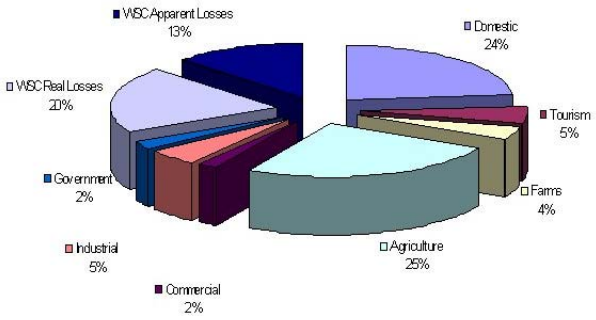
followed by recycling of such good quality wastewater, can provide as a bonus a significant source of water adequate for certain agricultural and industrial activities, for enhancement of the rural and urban environment and, under certain conditions, for recharging aquifers. The window of opportunity opened by wastewater recycling should be used to establish the islands' water management on a sounder basis.



Future recycled wastewater availability compared to other water sources

1.5 Water demand

Quality requirements for drinking water and domestic use are more stringent than for agricultural use. The domestic water supply and agricultural sectors exercise the major part of water demand in Malta. Total water demand is estimated to reach some 57 million m^3 per year, of which 29% for the farming and animal breeding sector and 29% for the domestic and tourism sector. Other sectors claim smaller parts.



Estimated water demand from various sectors (1999-2000)

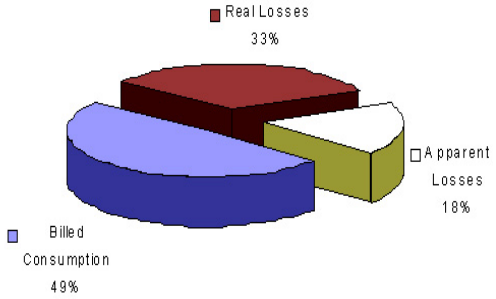
At present, a user of public water supply for an average 140 litres per day spends approximately Lm50 per year on water. A user of an average very low 70 litres per day spends less than Lm17 per year on water. Water tariffs are dissuasive for users of more than 100 litres per day per person.

The tourism sector takes at present an estimated 3 million m^3 of potable water per year. Roughly half of this amount is produced by the tourist services sector itself, partly through desalination of seawater and partly through abstraction of groundwater. Given the current

cost of public water supply to hotels, it can be assumed that major hotels and resorts that could be established in the future, in particular those on the coast or close to it, are likely to cater for their water requirements through their own desalination and water production and recycling facilities.

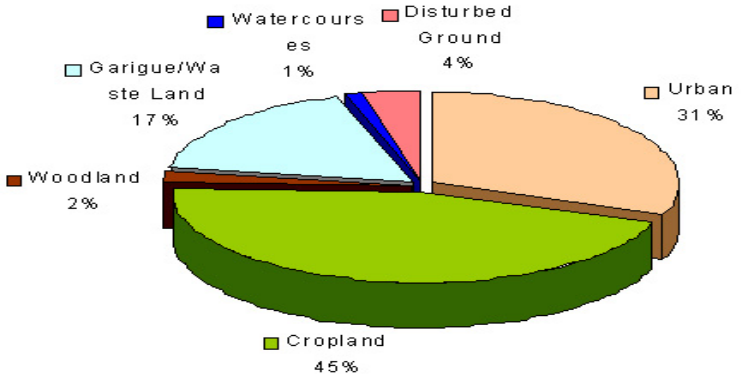
A mix of policies to conserve drinking water may include tariffs that further discourage wastage. For social and public health reasons, financially stressed persons should in any event have access to sufficient water for their basic needs. Widespread use of water-saving devices and tight pipes and fittings can ensure less wastage. Conservation of publicly distributed domestic water has made large strides in recent years; however, the still high levels of "unaccounted for" potable water in the public water distribution networks is a cause of concern and water policy needs to encourage further sustained efforts to reduce unaccounted water. Such systematic efforts would include identification of the points where water leaves the system, stopping leakages and replacement of failing pipes. To keep abreast of the situation, generalized accurate water metering and monitoring is required. Education and public information can effectively support frugality in the use of water.

Billed water consumption and losses in the public distribution system (1999-2000)



Agricultural water use includes farming needs and agricultural irrigation. Water demand for agricultural irrigation is self-served through abstraction from groundwater, with minor contributions from rainwater harvesting and treated sewage effluent. Given that these abstractions are not reported, the real situation is not accurately known. As a first approximation, the volume of water involved is estimated at 14.5 million m^3 per year. This figure can be visualized as 1200 mm of irrigation water applied to 1200 ha of irrigated land.

Land use distribution on Malta



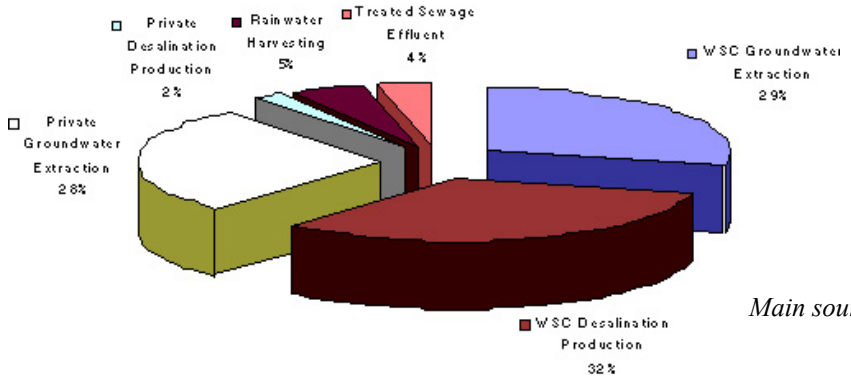
Given the size of agricultural water demand, policies generally need to call for reporting of the quantity and quality of water used. The demand of the sector can be reduced through technology that allows for accurate application of water in the quantity needed at the time needed. Certain crops and crop varieties are less water-intensive than others and may be

preferred in a context of water scarcity. Under the already accepted policy of recycling all wastewater, the foreseen future availability of relatively large quantities of recycled water could benefit agriculture. Given the opportunity cost of water in Malta, there is room for adjustment of agriculture to higher socio-economic and environmental benefits per m3 of water used; policies should support such adjustments.

Besides potable and agricultural water supply, the commercial, industrial, government and other sectors are also water users. The current aggregate demand of these sectors amounts to 9% of the total, of which an estimated 30% is taken directly by the users from groundwater or produced through desalination.

In urban areas, a pleasant environment attractive for a developed services sector requires trees and parks that need to be maintained and irrigated. In rural areas, certain wetlands, park areas and recreation areas require a water allocation to be maintained in good shape. Water demand for environmental purposes has not been quantified. Clearly, however, a volume of recycled water could be allocated to this end.

Water demand is satisfied through a mix of desalinated seawater, which has a high cost, with water abstracted from aquifers, which has a variable cost, generally lower than the cost of desalinated water. Public supplies are complemented through rainwater stored by users in cisterns and groundwater directly abstracted from the underground by the user. A certain amount of water is also taken by intermediaries ("bowsers") from various non-descript sources and distributed to customers by lorry. Bowsers provide a service that is as yet unregulated. Seawater desalination has ensured a continued supply of good quality drinking water for domestic purposes, including the economically important tourist industry. Generally, agriculture cannot afford desalinated water in a competitive environment, except in special niches where location provides a comparative advantage. While providing an immediate solution to a serious problem, desalinating water represents a trend that leads the island's water security into growing dependence on oil imports. As oil is a non-renewable resource, adjustments can be expected in a future when oil becomes scarce and its price rises.



Main sources of water

1.6 Economic considerations

There is an economic cost to producing or abstracting, conditioning and distributing water. This cost is normally borne by the user of the resource, but certain users have successfully called for other users, government, or the taxpayer, to contribute to payment of the water they use. Public supply of potable water is ensured through a mix of desalinated water and

groundwater at a rate that hovers around 50/50. The rate at which groundwater can participate in the mix is constrained by groundwater quality, as the water mix distributed has to conform to standards. The reference charge for water supplied by WSC is Lm1.10 per m3. Preferential tariffs are however available for certain uses and certain steps in the quantity used. Some preferential rates are below the cost of water production and distribution. The overall result of various tariffs applied to different users is that there is a cross-subsidization of water across various economic sectors.

Water tariffs (4-month cycle)

Type of Consumer	Meter rent	Consumption charge	Tariff (2002)
Domestic	Lm4	0 - 11m^3 /person	16c5/m^3
		> 11m^3/person	110c/m^3
Social Assistance	Free	0 - 5.5m^3 /person	Free
		- 11m^3/person	16c5/m^3
		> 11m^3/person	110c/m^3
Agriculture and agrofoods	Lm8	0 - 2270m^3	18c/m^3
		>2270m^3	35c/m^3
Personal health use in field	Lm4	0 -5m^3	22.5c/m^3
		>5m^3	60c/m^3
Industrial	Lm8		85c/m^3
Food and beverage	Lm8		60c/m^3
Tourist Flats	Lm8	0 - 84m^3	75c/m^3
		> 84m^3	Lm1.10/m^3
Hotels	Lm8	0 - 14m^3/bed	90c/m^3
		>14m^3/bed	Lm1.10/m^3
Laundry	Lm8	0 - 2270m^3	75c/m^3
		> 2270m^3	Lm1.10/m^3
Sea Craft	Lm8		Lm1.10/m^3
Government	Lm8		Lm1.10/m^3
Boat-house, Garden, Garages	Lm4	0 - 10m^3	85c/m^3
		>10m^3	Lm1.10/m^3
Non-commercial	Lm4	0-57m^3	free
		>57m^3	35c/m^3
Commercial and other	Lm8	0 - 57m^3	50c/m^3
		>57m^3	Lm1.10/m^3

The domestic, tourism, farming and irrigation, and the industrial sectors, secure directly a part of their water, either through desalination or groundwater pumping, for a rounded total of an estimated 20 million m^3 per year. Most of this water is pumped from aquifers and used in farming and irrigation. The quality of water abstracted in this way is variable, with a growing number of boreholes yielding brackish water, because the aquifer tapped has been depleted or the borehole is taking water from a point close to the freshwater/

saltwater interface in the case of the sea-level aquifers. The cost of extracting this water varies from one place to another, depending on the capital cost of drilling the borehole and on the running cost of pumping the water to its application. In any event, the cost is generally lower than purchasing the water from WSC. When these groundwater abstractions occur in aquifers used by WSC for drinking water supply, there is a high chance for user conflict.

The scrutiny of the economic aspects of water management brings to light a number of important and complex policy questions. Overall, the recovery of Malta's aquifers is a strategic action aiming at less dependence on seawater desalination.

Policies should ease the collection of data on quality and quantity of water extracted from the aquifer, as otherwise the discussions around alternative courses of action will lack objective and quantitative references. The cost of water production and distribution and the nature and amount of cross subsidies should be made transparent to the stakeholders and the public, as the public should be able to know who pays for whom and why. Scarce groundwater resources can be allocated preferentially to the demonstrably most worthwhile beneficial use in terms of national income, employment and welfare. Water use policies can provide disincentives for water uses that result in a low value per m^3 of water use and/or generate limited or low quality employment.

1.7 Legal and institutional framework

All along history, Maltese society organized its legal and institutional framework in order to cope with water scarcity and water security. Competition for access to the resource was put, more or less successfully, into an accepted framework of rules that could be perceived as just and equitable. More recently, advances in drilling and pumping technology have made it possible to access the aquifers through thousands of boreholes, in practice drilled to any depth and pumped in any way. Realization of basic groundwater notions has been slow: among other facts, that groundwater renewal is limited, that the main groundwater bodies are fragile, that aquifer and groundwater contamination can be as destructive as poisoning, and that the use of the resource abstracted through one borehole almost unavoidably has consequences on other water users.

The legal sources regulating groundwater have evolved but their application is as yet not effective. The assessment of existing legal sources should lead to understanding the legal position regarding groundwater regulation, the institutions involved in regulation, the public perception of the regulation of groundwater resources, and the shortcomings and lacunae that must be addressed in order to provide the legal framework necessary to back up a sound groundwater policy.

As a result of its status as a country acceding to the European Union, Malta needs to harmonize its laws, including those concerning groundwater, with the body of laws already agreed within the EU (the *acquis communautaire*). During the last two years more water quality legislation has been published than ever in the past, and more legislation is coming in the next months. It appears however that it will not be possible to successfully regulate groundwater management unless groundwater is declared a national resource wherever it occurs. Only such an amendment in the law can fill a lacuna which has persisted despite excellent legal instruments recently published which aim at the regulation

of the resource.

The repeal of ordinances such as the Water Pumps Ordinance of 1938 providing for the registration of all water pumps; the Underground Water Ordinance of 1943 providing power to enter, survey and inspect any land and any well; and the Irrigation Ordinance of 1939 providing the power to declare "irrigation areas", exposed some lacunae that are not addressed by legislation currently in force. Groundwater protection zones have to be established and managed as an enhancement of the current wellhead protection areas. Certain administrative practices may have to be reviewed, especially if these no longer have a legal backing. It is also important to identify the specific functions of the different public entities that have a regulatory role to play in the management of groundwater and to include them in memoranda of understanding to ensure a smooth administrative network as a guarantee for effective management.

On basis of the groundwater policies that will have been identified, MRA with the support of FAO will draft legislation and administrative rules for groundwater management. These will be submitted to Government for approval.

Part II: Outline for a water policy

2.1 Existing threats to integrity and sustainability of Malta's water resources

The purpose of a national water policy may be summarized as follows:

- prevent further deterioration of water bodies and improve their status in relation with their function and use;
- promote sustainable water use based on long-term protection of available water resources,
- protect and improve the aquatic environment, including coastal waters and groundwater;
- ensure progressive reduction of pollution of groundwater and prevent its further pollution;
- contribute to mitigation of the effects of floods and droughts.

This purpose contributes to the provision of a supply of good quality water as needed for sustainable, balanced and equitable water use. It also contributes to achieving the objectives of relevant international agreements.

The first part of this report assembles general facts concerning the water balance of the Maltese islands, its groundwater resources and aquifers, the quality of groundwater, the perspectives and problems of recycling wastewater, the water demand situation, economic considerations regarding markets for water, and the existing legal and institutional framework. In each case, inefficiencies in water use and threats to resource integrity and sustainability were identified, pointing to directions in which water policy should be reformed and adjusted.

The identified threats to attainment of the purpose stated above reach beyond the area of competence and capacity of the Malta Resources Authority alone and concern everybody.

It is recognized that establishing policy and setting water resources management on the most desirable course requires consultation with stakeholders and the harmonization of policy and action among the actors at the national level, and with international partners to achieve the objectives of international agreements. The problems identified can be classified and allocated to technical and administrative areas in order to facilitate needed substantive action. The relevant technical and administrative areas recognized are the: legal and institutional instruments for effective regulation and action; economic instruments for better water management; regulation of land use, as related to groundwater protection needs; regulation of water extraction for equitable, secure use and sustainability of the resource; agricultural and industrial good environmental practices; and promoting the transparency and public information that is a part of good governance. Policy questions and their implications for stakeholders are clustered according to these areas and discussed below.

2.2 Legal and institutional instruments

Some aspects of water policy are covered by MRA's statutory powers while elsewhere, where it is not possible to use the control powers mandated to other Regulators, the Authority will have to seek introduction of legislation and subsidiary legislation. MRA is mandated under Article 2(b) (i) of the founding Malta Resources Authority Act XXV Chap. 423 of 2000, to *secure and regulate the acquisition, production, storage, distribution or other disposal of water for domestic, commercial, industrial or other purposes.*

MRA is the designated competent authority for the EU Groundwater Directive (80/68/EC) to which Malta adheres through its adhesion to the European Union. This directive requires the protection of groundwater regardless of its current use and aims to control pollution. MRA is also the designated authority for inland waters under the Water Framework Directive (WFD). The WFD is a results-oriented directive that aims to achieve quantitative and qualitative "good status" of surface water and groundwater by 2015. It requires holistic management at water-catchment scale to deliver environmental objectives. The water policy needs to be consistent and in harmony with the relevant directives acquired through adherence to the European Union.

The European Commission recognises the need for water management policies to be integrated within the wider scope of other policies concerning various economic sectors. In this context, groundwater management should be adaptive to account for changing community needs in the light of environmental factors.

MRA operates within a regulatory framework that is recognised by other regulators, organisations and the general public. Within this perspective, the MRA will apply the identified policy in exercising its mandate and also in exerting its influence on decisions of others that affect the quality and quantity status of water. The Authority will seek to encourage an ethos for the sustainable management of water resources and facilitate its practical application by the community and the agencies dealing with the management of the resource.

Reversal of the degraded situation of Malta's groundwater requires full engagement of the state in regulation and control of the aquifers and the water contained in them. The body of

legislation and regulations available to MRA to carry out its role has shown voids that need to be corrected through issuance of secondary legislation. A law declaring a national resource the country's aquifers and the water contained in them could enshrine Malta's water policy and enhance the overall ability of MRA to carry out its appointed tasks.

2.3 Economic instruments for water management

The potable water supply is already dependent on seawater desalination for over 50%, entailing a high cost to the consumer and to the national economy. While water supply is adequately covered in this way, the conventional water resources system based on the islands' aquifers, has continued deteriorating to the point where the main sources of fresh groundwater (contained in the sea-level aquifers) are in jeopardy, leaving the country's water security almost fully dependent on imported oil supplies and desalination capacity. This uneasy situation can be led to an acceptable level of water security through the aquifer and groundwater recovery objectives mentioned above, so that in an emergency resulting, for example, in shutdown of the desalination plants on which the potable water distribution systems relies, a minimum water supply will remain secure.

Water is both an economic and a social resource. With water defined as a national property, policy would aim at allocating it to the most beneficial use, measured in terms of income, employment generated, environmental benefits and other factors that may be identified. The full cost and benefits of the social, economic and environmental implications of water use will need to be considered in the decision making process of any competing use of the resource. Beneficial use should be interpreted broadly but does need to be subject to specific and regular checks: water resources should be applied in a way that generates income also for the community and the state, creates employment, does not produce negative externalities and contributes to a desirable environment.

Under certain circumstances, access to basic water supply may be granted to disadvantaged persons or institutions. Tariffs of the public water distribution system were identified to contain cross-subsidies among sectors. The economic efficiency of these subsidies will have to be brought in line with general policy. Generally, cross-subsidies, where one sector pays for another sector's water use, are discouraged and slated for phasing out. In the interest of efficient water use and of fair and transparent governance, any subsidy deemed necessary for social or security reasons should be targeted at the persons or institutions in need, and revised as circumstances may grant.

"Polluter pays" is a generally accepted policy in water quality management. This policy is however often found difficult to apply, both because responsibility has to be proved beyond reasonable doubt, and also because damage caused by water contamination can be very high and drive the originating activity into bankruptcy, with a sequel of economic and social consequences. Generally, emphasis is put on preventive measures so that no pollution accidents occur. Such measures are developed in close cooperation between the regulating authority and the owner of the activity carrying a significant water pollution risk.

2.4 Regulation of land use for water resource protection

Inappropriate land use was identified as a major cause of problems with groundwater and aquifer conservation. These problems result from infiltration of contaminating substances and also from damage to geological formations that are important for groundwater transmission and containment. The geology of the Maltese islands is diverse and fractured and what is appropriate or inappropriate land use can change within short distances. Certain geological formations are highly permeable and of utmost importance for groundwater recharge; substances that may be released on their surface are likely to be carried into the groundwater body in a more or less short time. For example, one source has already been contaminated with hydrocarbons (potentially carcinogenic) and its recovery will be a major, expensive and long-term task. Activities derived from land use that carry a high risk of impact on groundwater include drilling or digging into aquifers and geological formations; quarrying within the aquifers and quarrying activities that threaten the integrity of groundwater.

The task of disposing of certain substances and wastes produced in Malta must be faced under sound technical and economic conditions. In general terms, the fact that Malta has a small, insular territory, and vulnerable hydrogeology, calls for policies reducing the generation of wastes and encouraging or making waste recycling mandatory. In specific terms, in the context of groundwater management, unavoidable waste disposal has to be directed towards sites, either natural or artificially habilitated, where such wastes can be safely stored. Waste manipulating and recycling activities carry their own risks of contamination and need to be subject to regulation and confined so as not to externalize any contamination

The Malta Environment and Planning Authority (MEPA) is the agency responsible for planning of land use. The Structure Plan provides strategic guidance conforming to the main policies on both urban and rural environment. The European Groundwater Directive specifies in particular the substances whose migration into the ground is to be prevented. Groundwater policy will in general require situating land development away from aquifer-sensitive areas and ensure that discharge of substances on the land is regulated. Certain areas require to be designated for groundwater protection.

Detailed scrutiny to protect the integrity of groundwater is generally warranted in the selection of location for waste management facilities, including scrap yards, garbage dumps and landfills; selection of sites for new industries and commercial developments, and of waste management with particular attention to those that make use of List I substances (EU Groundwater Directive); selection of sites for installation of fuel transport and storage facilities; laying of sewerage pipelines, driving of galleries and construction of pumping facilities; selection of sites for major works, such as power generators, treatment facilities, hospitals, roads, industrial estates, incinerators and slaughterhouses; and selection of sites for new cemeteries and extensions of existing ones.

2.5 Regulation of water abstraction for sustainability of the resource

The Maltese aquifers are tapped through wells, galleries and literally thousands of boreholes. With possible local exceptions, the Maltese groundwater resources are basically

depleted and largely overexploited. This state of things has lead to suboptimal use of scarce water resources and there is an acute threat of a partial or total, sometimes irreversible, degradation of the major aquifers, with long-lasting consequences. It is a matter of national interest and priority to ensure a reversal of the current dropping trend of water levels in the major groundwater sources in Malta and Gozo, and to restore the quality and capacity of these aquifers. Protection of the aquifers and their restoration to a reasonably optimal functionality requires to re-establish discipline in drilling into the aquifers and in pumping water from them. Generally, the existing situation calls for effective control of all drilling and of any significant water pumping so as to ensure a balance between abstraction and recharge, prevent the loss of groundwater storage by over-exploitation, restore freshwater support to important biota and ecosystems, and prevent degradation of quality.

Concession of water rights should be registered and abstraction of water for stated purposes subject to a license/permit containing certain constraints and obligations. Guiding criteria for granting water licenses would be: availability of water in the aquifer, protection of the integrity of the resource and protection of the rights of previously licensed users of the same water body. As water policy should be updated from time to time as circumstances evolve, abstraction licenses should carry a time limit.

2.6 Direct and indirect discharges to groundwater

The EU Groundwater Directive requires the implementation of measures to prevent or limit indirect discharges into groundwater. Special reference is here implied to discharges from small-scale septic tanks and cesspits, treatment works, industrial sites and other urban areas that are historically known to generate a wide range of substances including heavy metals, oils and hydrocarbon products and microbiological contaminants.

It should be clear that only the discharge of water of at least equal quality to the one existing in the aquifer is permissible. In particular, discharge of EU Groundwater Directive List I substances into underground strata will be banned and the entry of List II substances will be limited. Existing facilities prone to cause leakage into the groundwater, such as cesspits and septic tanks, will undergo inspection and certification for tightness. Improved practices will generally be incentivated.

2.7 Agricultural and industrial good environmental practices

Certain agricultural and industrial practices generate a high amount of liquid wastes, including in particular industrial sludges, both organic and inorganic; sewage sludge produced at sewage treatment plants or collected in cesspits and/or by septic tanks; and wastes from agricultural and agro-industrial premises namely piggeries, cowsheds, slaughter pens, etc. Generally, due to the small size of the Maltese territory, the high density of population inhabiting it and the permeable nature of the local terrain, applying liquid effluents to land can threaten public health and groundwater quality and is not a good practice and a precautionary approach is required. Such wastes will have to be disposed in suitable facilities, possibly after treatment. In the terms of the European Groundwater Directive, any liquid waste containing List I substances will generally be

banned. The application of sludge containing List 2 substances will be limited. In accordance with the EU Nitrate Directive, application of animal slurries requires control with regard to hydrogeological matters and groundwater quality.

Several sources of groundwater have been permanently decommissioned due to high organic loading and microbiological contamination. Agricultural pollution stems partly from point sources derived from the leaching of animal manure, spillage of agro-chemicals and of farm wastes, particularly where intensive livestock is housed. Agricultural pollution may also stem from diffuse sources related to the losses of pesticide and fertilisers through soils into the underlying strata. It is to be noted that the Maltese islands do already have a large nutrient load with regard to carrying capacity.

According to the given policy principles, regulation will generally aim at promoting agricultural practices that protect groundwater from pollution. Existing livestock establishments will have to comply with engineering standards such that no leaching of animal wastes or pesticides into the ground is possible. Agricultural practices that involve the application of fertilisers and pesticides within groundwater protection zones, in particular greenhouses that apply intensive cropping techniques, would be subject to critical scrutiny with regard to the possible leaching of nitrates, pesticides and other agrochemicals into the ground.

Groups of pollutants listed in the EU Groundwater Directive

List I

- Organohalogen compounds
- Organophosphorous compounds
- Organotin compounds
- Mercury and its compounds
- Cadmium and its compounds
- Cyanides
- Substances which are carcinogenic, mutagenic or teratogenic

List II

- Metalloids, metals and their compounds: zinc, copper, nickel, chrome, lead, selenium, arsenic, antimony, molybdenum, titanium, barium, beryllium, boron, uranium, vanadium, cobalt, thallium, tellurium and silver.
- Biocides and their derivatives not appearing in list I.
- Substances which have a deleterious effect on the taste or odour of groundwater.
- Toxic or persistent organic components of silicon.
- Inorganic compounds of phosphorus and elemental phosphorus.
- Fluorides
- Ammonia and nitrites.

2.8 Promoting transparency and public information

As an element of good governance, participation and information of stakeholders and the general public in water affairs would be encouraged and supported by MRA. Specifically, it is intended to regularly publicize relevant, updated information on standing and current water affairs through the media. In particular, information concerning licensing policy,

procedures and development will be issued and updated regularly. Publicized water information will disclose and discuss the water tariff schedule. Preparation and diffusion of educational material concerning water management will be supported.

2.9 Concluding message to stakeholders

The policy elements mentioned in this document throw light on the current threats to Malta's water resources and identify a number of strategic directions to guide future water policy. It is accepted today as a fact that our water resources are a fragile asset worth preserving to serve our future needs. At the same time we must take stock of today's reality and strive to reach a balance between economic development and resource sustainability. Economic and environmental consequences of specific pressures need to be considered jointly when identifying management issues.

To achieve a balanced approach, MRA needs the involvement of stakeholders and civil society, and it is for this reason that MRA invited all stakeholders and agencies to come forward for joint work, so as to ensure that the desired targets are reached. Anybody directly or indirectly involved in water management issues is invited to participate in this consultation process and present views on matters that need to be included in future policy.

It must be stressed here that this document is intended to stimulate further discussion and synergy in the process of consultation. The position and views of any stakeholder is welcome and respected. The consultation is an important cornerstone in the road to development and evaluation of water policies and strategies. MRA will ensure that all shall have an opportunity to influence the decision-making process and ultimately concur to the implementation of a national water policy that will be owned by all.

Feedback is most welcome.

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Manuel Sapiano:	Groundwater Resources
Kevin Gatt:	Quantifying Water Consumption
Andreas Angelakis:	Wastewater Recycling and Re-use
Carmen Delia:	Economic Considerations Regarding Markets for Water
Simone Borg:	Maltese Legislation Regulating Groundwater

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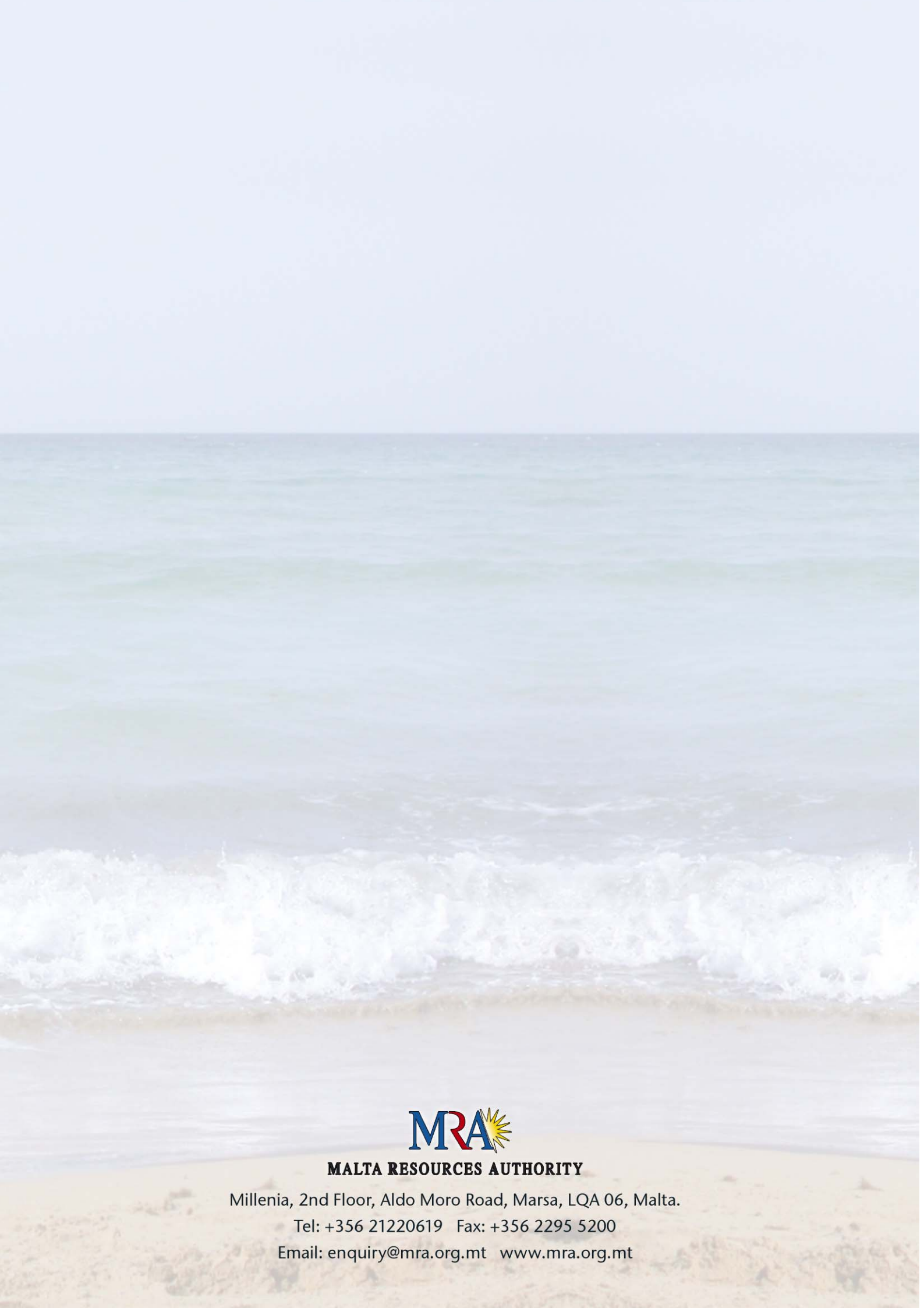
March 5, 2004



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