MALTA RESOURCES AUTHORITY

ANNUAL REPORT 2004 - 2005

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MISSION STATEMENT

The Malta Resources Authority seeks to serve the Maltese community through effective, coherent, holistic and transparent regulation of the energy, minerals and water resource sectors of the economy, ensuring their advancement and sustainable use to support the integrated environmental, social, economic and business development in the Maltese Islands. It further seeks to contribute to and participate in ongoing regional development and assist in the nation's efforts to fulfil its international obligations in these spheres.

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CHAIRMAN'S STATEMENT

The Malta Resources Authority has now been established since 2001 and I am pleased to present my first report as Chairman of the Authority.

The primary objective of the Authority is to regulate effectively and in a transparent manner Malta's energy, water and mineral resources. In order to carry out its functions the Authority assists Government to introduce the right policies and enact functional laws.

In the past years the Authority has strived to take stock of the practices set on the local market of the resources under its responsibility to regulate. It was a time to endeavour on carrying out studies, collecting data, examine models implemented in our countries and propose effective solutions given the island's market size and particular circumstances. The ultimate objective is to move forward towards a liberalised market having the appropriate mechanisms resulting in the market's self regulation. This cannot be done in isolation and there will always be the need to safeguard the environmental and social aspects. Experience has shown that these aspects require regulation and constant audit and verification as these safeguards cannot be left at the mercy of the market forces or in the hands of market players. To arrive at a perfect blend is not an easy task, therefore one has to tread with caution. The Authority now faces the tasks of establishing measures that cater for the interests of the market players, consumers and at the same time protecting the environment.

During this year the Authority continued to fulfil its role as arbiter in cases of dispute and litigation between operators within the existing market structures. In all cases the Authority diligently examined all the information at its disposal, so as to deliver an impartial and transparent decision. These decisions not only act as guidelines for current market practices but also have a bearing on future regulation and policies.

The Authority is fully aware that regulation has to be dynamic and it needs to keep abreast with the technologic innovations in the sectors in order to enhance market efficiency. The Authority ensures that our staff is being continuously updated with these improvements and this is shown through the Authority's commitment to send its officers to participate at European and International conferences, seminars and workshops.

Considering the financial and environmental costs incurred whilst making use of resources, it is not wonder that on an international and European scale the amount of research involved in finding ways to increase efficiency is overwhelming. Efficiency in these sectors is beneficial not only to market players but also to the national economy.

The Authority is aware of this and throughout this year it has continued to promote research in a number of fields, including Renewable Energy Sources, electricity generation and better water resources management.

Ensuring sustainable management of water and mineral resources requires a knowledge of the availability of these resources in both quantitative and qualitative terms. Data for these resources is continually being updated. This work is being done in collaboration with the stakeholders involved in these sectors. This will not only ensures data harmonisation but by the pooling of resources will also avoid duplication of work.

Promotion of efficient uses of resources is also a function of the Authority and within the coming months, the Authority will be embarking on an energy efficiency campaign. This publicity campaign is envisaged to create public awareness on the need to economise on the use of energy. At the same time, guidelines will be issued to consumers on how the end users can increase the efficiency at their level and therefore reduce their bills.

A forward looking organisation also strives to increase internal efficiency for the benefit of all stakeholders. The streamlining and harmonisation of the existing licensing schemes is always high on the Authority's agenda. In line with this strategy, the Authority will be embarking on a project to establish a Quality Management System, with the aim of obtaining certification from an international accredited body.

Finally, I would like thank all members of the Board, for their continuous support and enthusiasm towards achieving the Authority's goals. I would also like to thank the CEO and all members of staff for their continued pursuit to satisfy our customers and accomplish a high level of professionalism.

Austin Walker
Chairman

CHIEF EXECUTIVE'S INTRODUCTION

It is my pleasure to introduce the fourth report of the Malta Resources Authority, covering the twelve month period ending 30th September 2005.

The major target of the Authority during this year was to set the ball rolling for the reforms identified in the various sectors during the past years. Needless to say these tasks could not be accomplished through a paper-based desk exercise. From the onset the Authority decided to take on board the participation of stakeholders. Whenever possible the networking approach was adopted. This approach is not limited to initiatives taken by MRA but Authority's officials actively participate in working committees setup by other regulating Authorities.

Foremost in this list of reforms is the liberalisation of the inland fuel market, especially considering Malta's EU obligation in this regard. This reform presents a significantly large challenge considering the number of complications that are unique to these islands; including our geographical isolation, a small market size which limits the introduction of competition and a state monopoly at the importation stage. The initial step taken by the Authority was to commission a study, which involved all stakeholders, to map out the current situation and recommend future scenarios. Concurrently the expertise of foreign agencies was sought on technical guidelines. From the number of contacts received, it is evident that the introduction of safety regulations for fuel storage has become pressing and the Authority feels that it is its obligation towards the public to introduce certain measures.

Whilst concentrating our limited resources on the fuel sectors, investigative studies were still continued in the other fields falling within the Energy sector, namely electricity and renewable energy sources. These studies resulted in a number of recommendations being forwarded to Government.

Another milestone achieved by MRA is the issue of the first utility licence to the Water Services Corporation. This licence initiates a new era in the regulation of Public Utilities falling within the sectors being regulated by MRA, with the objective of increasing transparency and efficiency, for the benefit of all stakeholders and in particular the consumers of these utilities.

In line with its obligation to monitor sustainable development in Malta's limited natural water resources the Authority is responsible to implement the requirements of the water framework directive. Data going back a number of years is being collated and analysed and as detailed out in this

report a number of studies have been completed and initial reporting under Article 5 of the Directive were presented to the EU. Programmes to meet the obligations under Article 8 are also being prepared. The findings in these reports will aid in the formulation of future policies for the holistic management of these resources.

This is but one example of our contribution towards the national obligations required by EU legislations and as an organisation we endeavour to provide recommendations and assistance in our areas of our proficiency. As an annex to this report a number of papers prepared by Authority personnel are being presented as a sample of our work towards national development.

To maintain a highly knowledgeable organisation the Authority believes in investing in the training of personnel through exposure to international fora and research programmes. The knowledge gained is disseminated through the recommendations forwarded to Government, both for policy making and the introduction of the best tools for regulation.

This year saw an increase in the compliment of our personnel, in particular in the Energy Director. This augurs well for the output of the Authority in the coming years and whilst welcoming them, I expect them to integrate with the existing team to expand upon the achievements of the Authority so far.

For the coming year it is envisaged that the reforms mentioned earlier will be established and that the task of implementation will be at hand. Managing this change is expected to be very challenging and promises a hectic year for the Authority. Other plans for the coming year include the introduction of an efficiency campaign in the energy sector. Internally the organisation will continue to monitor its working procedures, so as to increase efficiency.

I hope this report fulfils its objective to identity the activities being performed by the Authority in its efforts to fulfill its functions and I would like to invite any comments which can improve these activities.

Antoine Riolo
Chief Executive Officer

THE AUTHORITY

Mr. Austin J. Walker *FCCA, FIA, CPAA*	Chairman
Dr. Joe Cilia *B.Elec. Eng., M.Sc. (Nott.), PhD. (Nott.), MIEE.*	Deputy Chairman
Dr. Eugene Buttigieg *LL.D., LL.M. (Exon.), Ph.D. (Lond.)*	Members
Ing. Marthese Dimech *B.Eng. (Hons.), M.Sc.*	
Ing. Carmel Ellul *Dip. Eng. (Hons.) Mech.*	
Mr. Louis Padovani *FIA CPAA*	
Mr. John Bonello *B.A. (Law), Dip. N.P.*	Secretary to the Authority

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Ing. Antoine Riolo *B.Sc, (Eng.) M.Sc. (Glas.), M.I.Mech E., C.Eng.*	Chief Executive Officer
Ing. Godwin Sant *B.Eng. Elec. M.Sc.*	Director for Energy Resources Regulation
Dr. Godwin Debono *B.Sc., M.Sc., D.I.C., Ph.D (Lond.)*	Director for Minerals Resources Regulation
Dr. John Mangion *D.Geol. (Milan), FGS*	Director for Water Resources Regulation

INTRODUCTION

This report outlines the activities undertaken by the Malta Resources Authority in the period 1st October 2004 to 30th September 2005.

The work carried out can be categorized as follows, and is described in more detail in the various sections of this report.

- Reform of the Sectors:
  - Liberalisation of the Inland Fuel Market
  - Reform of the Electricity Market (including competition in generation and investigation of interconnections with Europe)
  - Introduction of Renewable Energy Sources
  - Water Supply and Sewerage Regulation
- Resource Management and Protection:
  - Implementation of the Water Framework Directive
  - Water Quality Analysis
  - Consultations for MEPA
  - Mineral Resources
- Support to Government in its dealings with the EU and on policy development
  - Transposition of Directives
  - Negotiations on Pipeline directives
  - National Energy Policy
  - Water Policy Development
- Licensing and Arbitration between market players
  - Licensing and Licence Schemes
  - Ensuring fair practices in the internal market (The Decisions of the Authority)
- Participation in International Fora and in Research and Development Projects.

GOVERNANCE AND CORPORATE ISSUES

Networking with Stakeholders

MRA recognises that since it is a 'vertical' regulator of three sectors, its competence crosses those of the thematic 'horizontal' regulators. Accordingly, in its initiatives serious efforts were made to involve all other authorities as well as other stakeholders through networking.

Networking and stakeholder participation has obvious advantages. It enables the best resources of the country to be brought to bear on a particular problem, thereby getting best results without avoidable use of outside consultants except when the necessary expertise is not available locally. Ownership of projects by various stakeholders also contributes to successful implementation of results.

This networking approach was adopted for most initiatives that MRA worked on in the current year – energy policy and offshore wind studies – as well as in developing new regulations.

REFORM AND DEVELOPMENT OF THE MARKETS

The present is a time of rapid change in the energy and water sectors. Malta is working to implement the EU Directives as negotiated at the time of accession, and otherwise upgrade standards to EU levels. It is also participating in the development of new Directives and subsequently seeing to their implementation.

The main reforms currently taking place are in the direction of the liberalisation in the case of the fuel and electricity markets, creation of new initiatives in the case of renewable energy and better resource management in the case of water and minerals.

LIBERALISATION OF THE INLAND FUEL MARKET

Fuel Supply Chain

Enemalta Corporation is responsible for the importation, distribution and sale of all fuels for the inland and aviation markets. The market in the oil bunkering sector is liberalised and a number of players are active in this market. The fuels that are imported for inland use are fuel oil used for power generation, gasoil for electricity generation and for use by industry, light heating oil (light cycle oil), unleaded petrol, kerosene, jet A1, avgas and liquid petroleum gas. The supply chain is shown diagrammatically in Figure 1.

Enemalta Corporation markets these fuels in wholesale to retailers who are licensed by the MRA for that specific activity. While fuels for automotive use, i.e. diesel and petrol (leaded and lead replacement petrol) are retailed through fuel-filling stations, other fuels, namely kerosene, gas oil and light cycle oils used by industry, commercial outlets, and households are sold through a retail distribution system of 'jobbers' and 'hawkers'.

Strategic Objectives and Vision for the Reform

In the beginning of 2005 the Authority issued a public calls for tenders for consultancy services to assist it in the reform of the inland fuel market.

The overall objective of the study was to enable the MRA to evaluate and to select the most suitable strategy for the liberalisation of this market, based on Government's sectoral policy and Malta's international obligations undertaken with the Treaty of Accession of Malta to the European Union. It will assist the Malta Resources Authority to develop an effective, fair and transparent regulatory framework, thereby leading to an improvement in the overall quality of the services provided to consumers.

The project assignment included an assessment of options for managing the liberalisation process, socio-economic impact assessments on the basis of the options identified, submissions to Government to assist in the selection of the preferred option and detailed recommendations on regulatory interventions and associated strategic measures.

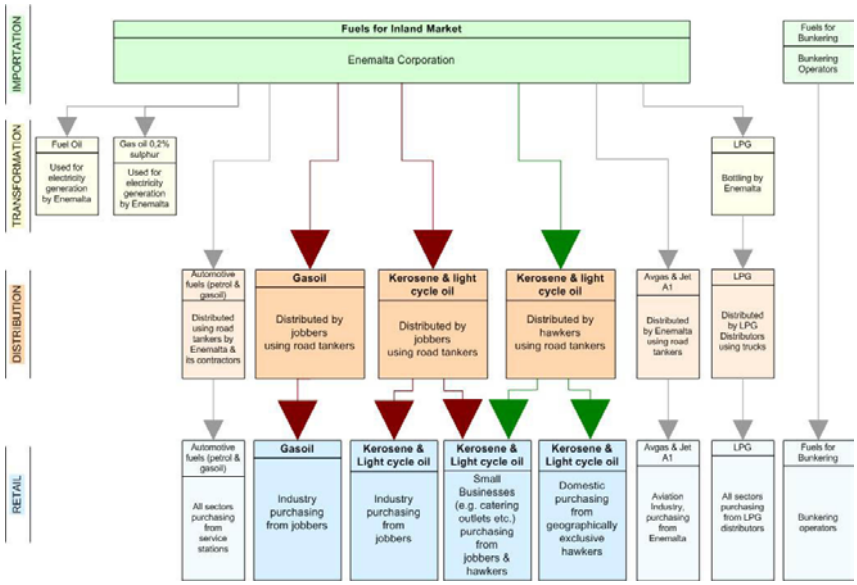
The results of the study are expected to contribute to:

(i) a full understanding of the economic mechanisms underlying the developments in the market, market drivers and influences, both in relation to the various segments of the Malta's fuel supply market and to the market as a whole;

(ii) the development of the optimal strategy for the liberalisation of the fuel supply market including the regulatory regime that may be adopted based on:

  (a) consideration of the economic dynamics of the market, and the timeframe constraints;

Figure 1: Fuel Supply Chain



(b) a careful and thorough assessment of the market and a comparative analysis of liberalisation scenarios;

(iii) Ensuring that the optimal strategy for the liberalisation takes into consideration the local market situation, the need for a sustainable market and fair competition in the market, the need for security of supplies, consumer choice, as well as other criteria, both pre-established and also those suggested in the study;

(iv) Ensuring that the optimal strategy for the market liberalisation is such as may be introduced gradually and without unnecessary disruption of the supply chain.

The project proposal by Ernest & Young was selected following the public call for tenders and the project commenced in May 2005. Discussions were held with various entities such as the Customs Department, the Office of Fair Trading, the Federation of Industry, the Ministry of Finance, the Malta Standards Authority, the Malta Environment and Planning Authority, the Transport Authority as well as the Federation of Industry and the General Retailers and Traders Union. Enemalta Corporation was also consulted in its role of former Regulator.

The project is expected to be completed in November 2005.

Current Work in Progress

Concurrently with the development of the strategic vision, the Authority is carrying out complementary support work on a number of issues:

- A study on the present fuel storage on the island and its implications for liberalisation;
- A study on the use of biofuels, with special reference to present activities and impact of liberalisation;
- Drafting the legal framework for liberalisation;
- Consultation with other regulating and fiscal Authorities to co-ordinate the implementation of all the necessary changes so as to achieve a transparent and smooth transition.
- Preparation of procedures to be adopted after liberalisation.

Concurrent with the liberalisation process, the upgrading of fuel installations and infrastructure, as well as operations will be given priority. The Authority will work with and support market players in achieving this objective. Accordingly the Authority has made initial contact with the UK based Association of Petroleum and Explosives (APEA) and the Council for Registered Gas Installers (CORGI). APEA visited Malta to aid the Authority to prepare an audit and inspection exercise of all petrol stations and prepare a training course for engineers and other interested personnel who shall be in future conducting

inspections and technical design of petrol stations as well as operators.

Security of Energy Installations and infrastructures

The Authority is working with Enemalta Corporation regarding an initiative of the European Commission to compile a database of the critical installations and infrastructures. This is required to identify risks due to hazards arising out of malicious acts, accidents or acts of God and which can have a catastrophic effect on the installations themselves, other installations by cascading effect and ultimately have a negative effect on the whole nation. Among the infrastructures that are considered critical are energy installations and networks (e.g. electrical power generation plant, storage facilities transmission and distribution system). The process involves the understanding of risk involved and the action to be taken to reduce risk to an acceptable level at an acceptable cost.

Bulk LPG Installations

Taking into account the sharp rise in the use of LPG in various sectors of the Maltese economy, and with bulk LPG storage facilities being installed even in residential areas, the Authority responded to the need to issue Regulations to ensure safety of consumers and third parties. The Authority set up a Working Group chaired by itself and made up of MEPA, MSA, CPD, ADT, OHSA and BCID to work on drafting regulations to regulate the use of Bulk LPG. Enemalta Corporation participated in its role of previous regulator and in view of its knowledge of the local market. Since the MSA were also working on regulations for post-installation checks on lifts, and pressure systems, the legislative requirements of the two authorities have been combined to take advantages of similarities in the monitoring required.

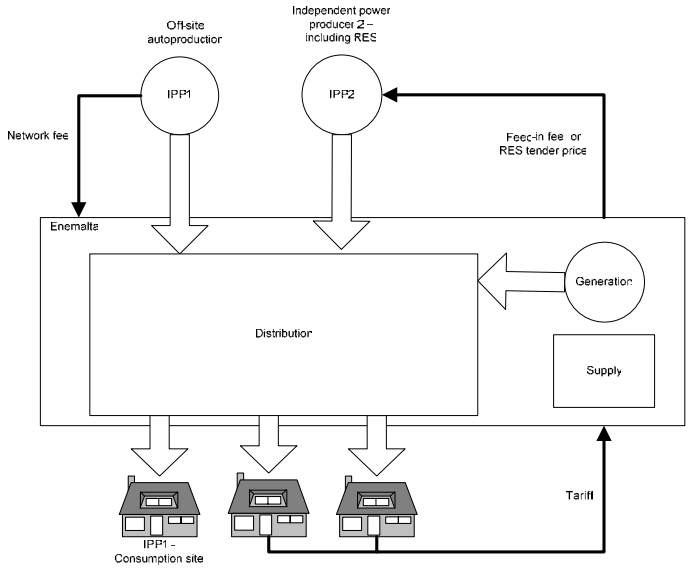
The first suite of regulations relating to the use of LPG in bulk is at a very advanced stage. The Code of Practices has been identified and transposition is underway. These regulations also identify persons competent to install and certify such installations. The MRA consulted with foreign institutions and the Employment and Training Corporation to ensure the competence of current and future players in the field.

Reform of the Electricity Market

During 2004, the Authority had presented a set of options to Government for an electricity market structure, covering the three types of operators in the market:

- producers – who generate electricity;
- the distribution system operator – this is a natural monopoly and Enemalta Corporation

Figure 2: Electricity Market Model



will continue to operate this network; and

- suppliers – who do not have electricity transportation functions but only retail electricity.

Government chose the option described in Figure 2- Electricity Market Model. In this case, Enemalta Corporation remains a vertically integrated monopoly, though where the generation, distribution and sales activities of Enemalta Corporation are operated with adequate independence from each other and are financially unbundled to ensure fair access to the new power producer. Customers would purchase electricity from Enemalta Corporation based on the published tariff. Enemalta Corporation would purchase electricity from independent producers (IPP2 in Figure 2) at published feed in fees or tender RES prices. Off-site autoproduction would also be allowed (IPP1 in Figure 2) where a customer produces electricity off-site and then pays a network fee to Enemalta Corporation for the use of the network to carry electricity from the point of generation to the point of consumption.

The Authority was requested to assist Government in presenting its case for derogation from the Electricity Directive 2003/54/EC.

In its presentation, the Authority noted that the electricity directive 2003/54/EC in recital 31 identifies the objective of the directive – i.e. "the creation of a fully operational internal electricity market, in which fair competition prevails."

The directive further amplifies (recital 2) that experience in implementing directive 96/92/EC showed that the benefits arising from the internal market in electricity included "efficiency gains, price reductions, higher standards of service and increased competitiveness." However, 2003/54/EC was required to "*ensure a level playing field in generation and to reduce the risks of market dominance and predatory behaviour, ensuring non-discriminatory … distribution tariffs through access to the network on the basis of tariffs published prior to their entry into force, and ensuring that the rights of small and vulnerable customers are protected and that information on energy sources for electricity generation is disclosed*."

Security of supply is another aspect that the directive considers, and is given prominence in the directive in Articles 3, 4, 7, 9 and 24.

The directive, therefore, (Article 1) "establishes common rules for the generation, transmission, distribution and supply of electricity. It lays down the rules relating to the organisation and functioning of the electricity sector, access to the market, the criteria and procedure applicable to calls for tenders and the granting of authorisations and the operation of systems."

The Authority noted that Malta's adherence to the rules specified in 2003/54/EC for the organisation of the electricity sector will not contribute towards the internal market.

While the Authority emphasised its statutory duty to promote competition in the energy sector, it also noted that fully effective competition cannot prevail in Malta since the necessary conditions for free competition cannot exist. Therefore, in order to meet the spirit of the directive of maximising competition and protecting vulnerable customers, while ensuring security of supply and economic sustainability, it proposed that Government derogates only from those parts of the directive that are necessary to ensure that the market structure and regulatory mechanisms are consistent with the size of the market.

The Government accepted the logic of the presentation of the Authority but took into account other considerations when finally deciding the position and derogations requested.

The Legal Notice issued by Government therefore limited the types of licences that the Authority may issue to:

1. One licence to Enemalta Corporation to produce, distribute and supply final customers;
2. Licence to produce electricity for own use;
3. Licence to produce electricity to supply Enemalta Corporation.

The market for generation is now open to competition. The Authority therefore proposed, and the Government accepted, that autoproducers less than 500kW be exempt from the requirement to hold a licence. In addition, the Authority also proposed a set of criteria on which an application for an authorisation to construct a generator be determined. These criteria include safety and security of the system, efficiency, pubic health and safety, protection of the environment, ancillary services and other qualifications of the applicant.

Interconnection with Mainland Europe

Malta currently relies on imported fossil fuel (oil) for practically all its energy needs. Biodiesel, produced from waste cooking oil, may account for around 1%, while renewable sources of energy (for electricity generation) may account for a maximum of 2.5%. Energy efficiency measures may lead to some reduction in the long run, but Malta would still have to rely heavily on imported fuel. So far, oil exploration efforts have not been successful.

At the same time, our reliance on fossil oil does not help Malta to participate effectively in global efforts to mitigate climate change or to improve air quality.

In practice, the only effective option to diversify significantly our energy sources is to interconnect with Europe. Although Enemalta had in the past carried out two studies on the feasibility of a natural gas connection and a study on an electricity connection, none of the studies appear to have been conclusive, no decisions were taken on the matter and Governments kept their options open. Recent developments in the oil market, together with the financial support that could be provided under the trans-European energy networks programme is an opportunity to revisit the issue.

During the first half of the year, the Authority drafted terms of reference for a study of options for alternative fuels for the generation of electricity or for the direct importation of electricity. The study is intended to consider options for diversification of fuels – by considering natural gas and liquefied natural gas as alternatives to the existing fuel oil/gas oil mix – and the option of interconnecting the Maltese electricity system to mainland Sicily.

It is anticipated that the study will be submitted under the TENS project once a call for applications for which Malta is eligible to apply is issued. This is expected to be early 2006.

Electricity Network Code

A key instrument to ensure interconnection and interoperability of systems is the electricity network code – i.e. "technical rules establishing the minimum technical design and operational requirements for the connection to the system of generating installations, distribution systems, directly connected consumers equipment, interconnection equipment and direct lines." The network code is developed by Enemalta Corporation, subject to the approval of the Authority and needs to be in notified to the Commission.

Enemalta Corporation prepared a draft network code in February 2004. The draft network code is divided in six parts:

- General conditions setting out general framework including responsibilities, review procedures and other general conditions;
- Planning code containing details of the standard supply as well as the design principles to which the distribution system is constructed, allowing users to obtain certain information on the distribution system in certain circumstances from Enemalta Corporation (as the distribution system operator);
- Connection conditions providing details of the technical and other requirements to be met by those requiring connection to the distribution system;

- Generator requirements setting out rules and operating conditions for generators connected to the distribution system;
- Distribution operating code dealing with the various operational matters affecting users such as provision of forecasts of demand, planning distribution system outages, generation outages, reporting of operational changes and events, safety matters and procedures for dealing with emergency situations;
- Data registration code summarising in tabular form the data requirements under the network code.

Although substantial parts of the network code will replace parts of the existing Electricity Supply Regulations, the draft code will break new ground in that it establishes, for the first time, quality of service standards that Enemalta Corporation will be required to adhere to. These include voltage and frequency standards and limits of operation. In addition, they also specify requirements that will allow producers to connect their equipment to the distribution system – a first step towards opening up the generation sector outside of Enemalta Corporation. At the same time, the network code also specifies the obligations of customers particularly with reference to the creation of voltage disturbances and harmonics that would affect other customers.

Following a technical review, the Authority submitted its opinion on February 2005, following which Enemalta Corporation revised their position marginally. As at July 2005, the main outstanding issues involved:

- the inclusion of what the Authority consider to be commercial conditions as part of the network code;
- obligations on consumers who intend to connect to the network, intended to increase the efficiency of the distribution network, but that are not sufficiently justified by Enemalta Corporation;
- minimum quality standards that seem well below the current operational capabilities of Enemalta Corporation and which prima facie are unacceptable.

Following agreement, the code will be published in draft form for public consultation and also notified to the MSA (and other notification bodies in the EU).

Electricity Supply Regulations

Concurrently, the Directorate for Energy Resources Regulation is formulating a strategy combining various studies to be undertaken by the Electricity Division of Enemalta Corporation with a view of upgrading and harmonising its operations and service in the coming years. These relate to the Quality of Supply, Asset Management, and Customer related issues amongst others.

Introduction of Renewable Energy Sources

Development of a Strategy for the Exploitation of Renewable Energy Sources

The development of a strategy for the exploitation of renewable energy sources was continued in earnest during the past year through a project with the following specific objectives:

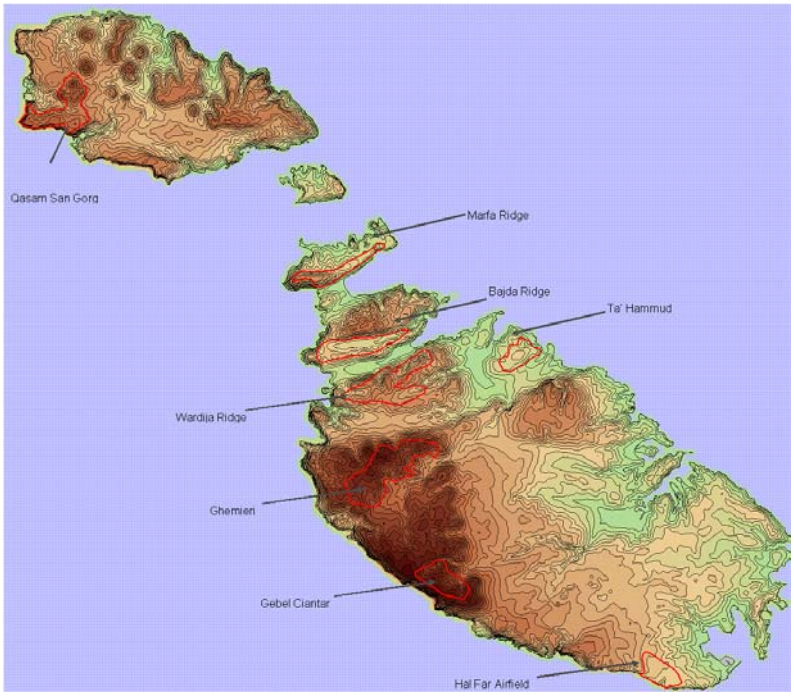
- to provide a roadmap for the introduction of renewable sources of energy, including an assessment of their potential, their integration with conventional sources and the methodology for their regulation. The project covers both large-scale and small scale electricity generation at consumer level for own use and with access to the national electricity distribution grid for the balance.
- to work out and recommend a knowledge-based national indicative target for generation of electricity from RES in accordance with the requirements of EU Directive 2001/77/EC.

The Authority retained Mott McDonald of the U.K. as its consultants.

The project included:

- Resource characterisation, consideration of barriers to renewable electricity development and recommendations for an indicative target for electricity produced from RES as a percentage of electricity consumption in 2010;
- Development of Policy options and analysis of measures to support electricity generated from renewable sources;

Figure 3: Potential Onshore Windfarm Sites Investigated



A high level screening exercise on the resource availability of the sources specified in the EU Directive and consideration of available renewable energy technologies was carried out. In this screening exercise it was concluded that the technologies which may be suitable for Malta and warrant further investigation are wind, solar photovoltaic (PV), biomass wastes, landfill gases and sewage treatment plant gas. The following renewable energy sources are not considered suitable given existing technologies and resource potential: tidal flow; geothermal; hydropower; biomass energy crops and wave.

The project was thus in practice limited to wind and solar and considered both large scale and small scale RES generation.

Scenarios and Targets for Electricity Generation from Wind and Solar

The methodology adopted in determining different target levels for wind and solar was based on an optimisation model incorporating the following parameters:

1. Model Inputs namely:
   - screening exercise identifying renewable technologies that can be applied in Malta;
   - characterisation of the available resource for the selected technologies to identify the maximum potential renewable capacity;
   - analysis of environmental and planning barriers to the exploitation of the available resource to ascertain how much renewable capacity may be installed in Malta;
   - legislative review to identify any potential justified legislative barriers to the implementation of renewables in Malta;
   - analysis of the project and systems costs that may stem from the integration of renewables into the Maltese electricity system to allow the calculation of the costs associated with different renewable technology mixes.
2. Constraints to development namely:
   - analysis of technical, environmental, legislative and planning constraints.
3. Development of three scenarios and their implications namely:

- Scenario A – reaching 5% of demand by 2010;
- Scenario B : Feasible technology penetration rates;
- Scenario C: Windfarm installation post 2010.

4. Sensitivities to handle different sets of constraints including:
   - three capital expenditure scenarios for both the wind and PV alternatives;
   - sensitivities to operational expenditure;
   - electricity demand projections: 'Low', 'Medium' and 'High' demand patterns;
   - turbine sizes for medium wind farms (20kW and 60kW considered);
   - turbine sizes for large wind farms (850kW and 2MW considered).

The results of the modeling and analysis concluded that the potential for RES adoption in Malta was expensive and lower than the reference value for electricity generated from RES set during the accession process to the European Union. On this basis the Authority submitted its report to the Minister in pursuant to the requirements of Article 3 of Legal Notice 186 of 2004 outlining its recommendations on setting feasible national indicative targets for consumption of electricity produced from renewable energy sources for 2010.

Analysis of Barriers

Phase 1 of the Strategy for Renewable Electricity Exploitation in Malta also analysed existing environmental and planning barriers. It provides an analysis of how the current planning framework in Malta functions and considers the main environmental impacts associated with the proposed development options identified in for wind and solar. This analysis highlights environmental and planning issues that have the potential to restrict or halt development and suggests recommendations for reducing such potential issues. In addition, a review of the current legislative framework in Malta was carried out, identifying the gaps that need to be addressed relating to renewable electricity resources.

Phase 1 of the project was completed in mid-2005. In the course of this phase consultations with various key stakeholders and other entities were held. The conclusions of the first phase of the study carried out to determine the best RES utilisation strategy for Malta indicate that:

- Large onshore wind is the most cost-effective technology; visual impact and cumulative effects are likely to be serious obstacles to large onshore wind farm construction in Malta and Gozo.
- Offshore wind is the second best technology option in terms of costs. There is one marginal site identified in Malta. Developing it would require resolving technical issues as well as issues relating to the conflicting use of the site. Even if a developer was prepared to develop this marginal site, it is unlikely that the windfarm would be installed and functional before 2011.
- Micro-wind has not been considered a feasible option for Malta because of the planning constraints that are likely to originate due to visual impacts on the Maltese townscape.
- The current Maltese planning framework is more favourable to medium scale wind exploitation but this comes at an economic cost.
- The PV resource potential in Malta is enormous, but the cost implications of supporting PV are likely to be very high.

Preliminary Studies on the Visual Impact of Windfarms

A preliminary study related to the visual and landscape impact assessment of hypothetical wind farms at Marfa Ridge and at Sikka l-Bajda was carried out.

For Marfa Ridge a 2 MW wind turbine (hub height = 80m) was selected and sited at an elevation of 91 m above mean sea level. The maximum elevation at Marfa Ridge is approximately 122 m AMSL at the cliff edge. An 850 kW turbine would on the other hand have a hub height between 40-74 m. These studies were carried out to obtain an initial understanding of the extent of visual impacts of wind farms . Further detailed studies are however warranted.

Figure 4 is a map showing the zones of visual influence for this 2 MW wind turbine at Marfa Ridge. Figure 5 shows the zones of visual influence in Malta and Gozo for a 3 MW wind turbine sited at Sikka l-Bajda. In all cases the zones of visual influence were drawn up taking into account only the topographical variations.

Figure 4: Zones of Visual Influences—2 MW wind turbine at Marfa Ridge (views of hub height @ 80m)

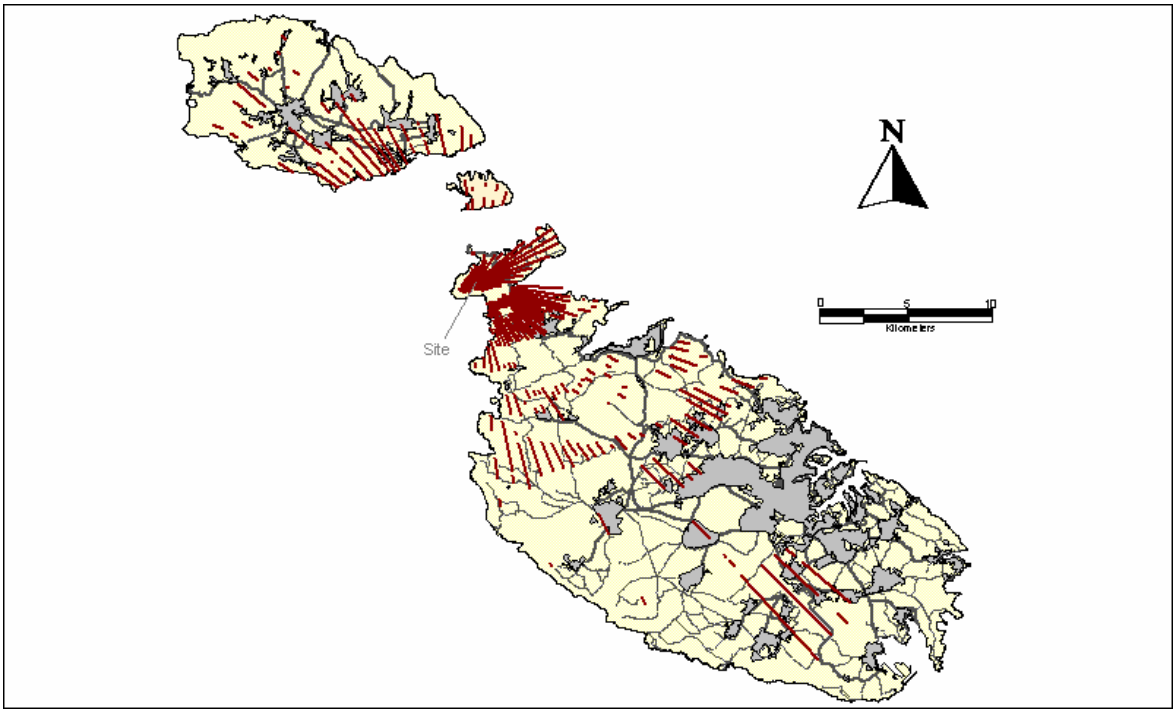
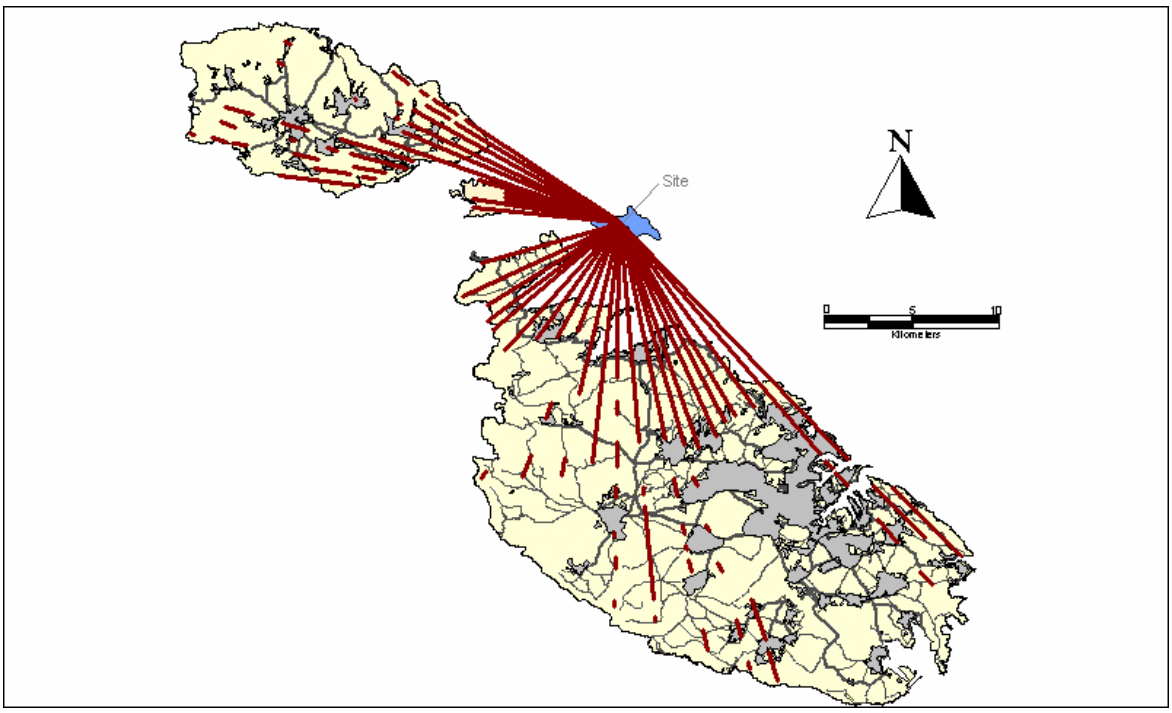


Figure 5: Zones of Visual Influences — 3 MW wind turbine at Sikka l-Bajda (views of hub height @ 80m)



Phase 2 - Review of Policy Options for Supporting RES

Phase 2 of the Strategy development consisted in a review of policy options and identifications of support and financing mechanism. The options were reviewed include tax incentives, investment grants, guaranteed generation tariffs, quotas and green certificates.

The strengths and weaknesses of the various support mechanisms against the following criteria were analysed in order to select those most appropriate for Malta and with a successful track record. The criteria used were:

- Public acceptability;
- Fit with market structure in Malta, applicable in the case of market-based policy interventions, which would require a liberalised electricity market to function effectively;
- Administrative burden reflecting the cost of implementing the measure, in addition to any direct subsidies that the relevant policy involves.
- Flexibility, so that the policy applied can be adapted to advances in renewable generation technology (e.g. offshore wind), changes in the economic climate, or shifts in public opinion.
- General applicability to Malta particularly with reference to other technical, economic and social grounds.
- Success of precedents, including presentation of similar policies previously implemented in other countries, particularly in the EU.

Financing Mechanisms

On the basis of the analysis carried out on Support and Financing Mechanisms, it was recommended that

- a combination of capital grants and net metering to support medium-small scale RES in Malta are used;
- a tendered-PPA system to support the introduction of large scale wind developments, both onshore and offshore is employed;
- financing of RES is made through the electricity tariff branded as an eco-tax, to reflect the purpose of the funds raised and to foster awareness of sustainability issues among the Maltese public;
- a programme of public awareness to ensure that RES support is welcomed is executed;
- any developments not explicitly covered by the set of support measures chosen are catered for through the development of a reserve fund and consideration to providing support via feed-in tariffs for large-scale schemes and net metering and capital grants for small-scale schemes on a case-by-case basis is made.

Studies on Offshore Wind Potential

During 2005, the Authority was requested by Government to investigate and study in further detail the potential of offshore wind in Malta.

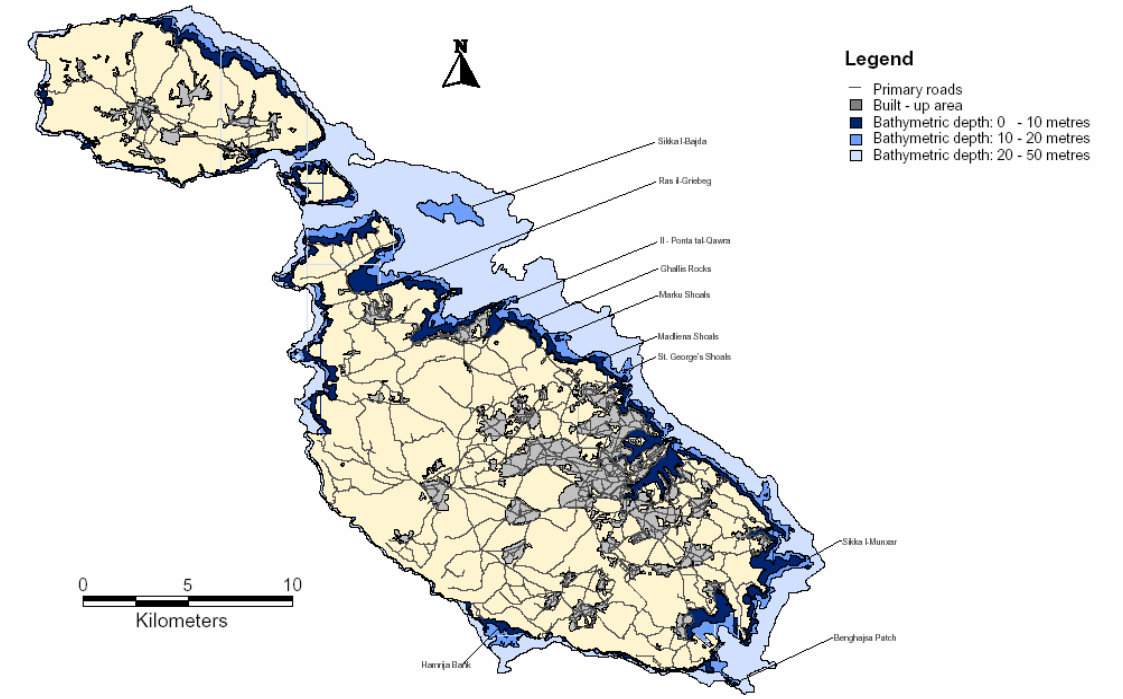
In order to identify sites with potential to host large scale offshore wind farms, a sieve mapping approach was adopted. Site selection was based on the depth of the sea using a 20m depth contour. This takes into account current thinking and development of offshore wind turbine foundations. The following sites were short listed and investigated in detail: Sikka l-Bajda, Ras il-Griebeġ, Il-Ponta tal-Qawra, Għallis Rocks, Marku Shoal, Madliena Shoals, St. George's Shoals, Sikka l-Munxar, Bengħajsa Patch, Ħamrija Bank.

A networking approach was adopted with consultations with key stakeholders and government entities including: Malta Maritime Authority Malta Environment and Planning Authority, Malta Tourism Authority, Fisheries Conservation and Control Division (FCCD), Enemalta Corporation, Malta Communications Authority, Department of Civil Aviation, Malta International Airport, Malta Air Traffic Services Ltd., Oil Exploration Department, Armed Forces of Malta, Malta Enterprise and Kunsill Malti Għall-Isport.

In this study it was concluded that:

1. All sites investigated were considered to have a very significant impact on tourism in general and on niche markets – diving and water sports- in particular. This is still being debated.
2. Most sites are adjacent to the coast, are considered sensitive from a tourism and other perspectives and would be highly vulnerable to visual and landscape impacts.
3. Sikka il-Bajda was identified as the main potential site for wind farm development from a resource and economic point of view although it is still considered a marginal site in comparison to other

Figure 6: Potential Offshore Windfarm Sites Investigated



international offshore sites. Other local sites have lower capacity factors leading to higher average costs of power.

4. Bengħajsa Patch is considered highly sensitive in view of its proximity to the airport and impacts on air traffic and is categorically to be excluded from consideration.
5. Sikka il-Bajda is a potentially important site from a marine conservation point of view Ħamrija Bank is sited near a highly environmentally sensitive area (ecology, impacts on birds and visual impact) and should be excluded due to this factor.
6. Sikka il-Bajda is used for bunkering purposes in certain adverse weather conditions.
7. All sites are important from a fishing perspective although development at Sikka l-Bajda may be accepted by the FCCD if impacts of development are limited and less than existing damage from bunkering activity.
8. There may be other secondary effects generated by some sites, such as interference with navigation instruments and radar apparatus and T.V. reception.

Following the submission of this report, Government directed the Authority to investigate the possibilities of deeper water offshore wind farm sites and report on their suitability and potential with respect to a particular site (north of Sikka l-Bajda) where seabed varies between 20-50 meters.

The study concluded that:

(i) Currently there are no windfarms in the world located at the depths indicated for the proposed site. There appears to be significant technical limitations to construct offshore wind turbines at the suggested depths.

(ii) The wind resource at the proposed site should not be very different from Sikka l-Bajda which has been noted to be marginal and which is much less than offshore wind farm sites constructed elsewhere in Europe. It would not appear that this site would benefit from the advantages associated with offshore wind farms sites i.e. higher long-term annual wind speeds, lower wind turbulence, lower wind shear, increased inter-turbine spacing and corresponding reduction in wake losses and wake loads, reduced visual impact, increased noise emissions allowing higher rotor speeds and therefore smaller rotors.

(iii) While some adverse effects are mitigated, there would still be some undesirable impacts such as on telecommunications, small aviation, on maritime traffic entering the harbour, on bunkering activity and on the environment.

Recommendations to Government on the National Indicative Target for RES

On the basis of the work carried out in Phase 1 of the Strategy and a separate exercise carried out by WasteServ Malta Ltd on details of electricity generation from waste including targets for electricity generation from waste, the Authority drew up and submitted a report to the Minister for Resources and Infrastructure in June 2005, on the setting of feasible national indicative target for electricity produced from renewable energy sources for 2010. This report was submitted in accordance with the requirements of Article 3 (1) of LN 186 of 2004.

Following the Authority's submissions, it was concluded that:

- Setting an indicative target of 1.93 % electricity consumption from wind is considered exceedingly ambitious and would be difficult to attain. The studies that have been carried out indicate lower capacity factors for electricity generation from large scale wind farms and a higher gross electricity consumption in 2010 than the corresponding figures that were used as a basis for this indicative reference value.
- The construction of onshore windfarms, noting their significant intrusive characteristics is not considered a realistic option.
- In the circumstances, the target for generation of electricity from RES (wind and solar) by 2010 would be very low and estimated at 0.07 – 0.09% of gross electricity consumption.
- Policies also need to be developed to remove existing barriers and encourage medium scale wind and PV to levels commensurate with the rates assumed in the Mott MacDonald report (2005a): i.e. 40-80 rooftops/year for PV and 5x60kW wind turbines a year. This would require developing incentives aimed at commercial users in particular.
- The 2003 indicative figure of 3 % of electricity generated from waste by 2010 can only be achieved through the construction of a waste combustion plant at significant investment costs. Construction of this facility will require detailed environmental impact studies.
- It appears unlikely that this facility will be constructed by 2010. Without this plant the national indicative target for electricity generation from waste in 2010 would realistically be around 0.24 %.

In view of the above Government concluded that the national indicative target for electricity generated from renewable energy sources by 2010 is set at 0.31% of gross electricity consumption by 2010 excluding large windfarms and waste combustion plants. The national indicative target may be increased to 1.37% of gross electricity consumption by 2010 if a land-based windfarm were to be approved and constructed.

Introduction of Transitory Measures for Uptake of RES

The generation of electricity using PV panels with a peak installation capacity of 3.7kW is being permitted to connect to the electricity grid subject to established conditions. Procedures for the issue of permits by MRA for connection to the grid have been simplified during 2004 and only a notification is now being required where the maximum capacity of the installation is less than 3.7 kWp. As part of the transitory arrangements, the amount of electricity generated in such cases and supplied to the grid is purchased by Enemalta Corporation at the rate of 2 c/kWh.

During 2004, the Malta Resources Authority has also recommended to MEPA the review and amendments to the Policy and Design Guidance 2000 with respect to planning permits for photovoltaic installations and solar water heaters. This was done with the aim of reducing existing planning barriers. The Policy and Design Guidance 2005 was reviewed by MEPA in 2005 and a number of the amendments recommended by MRA have been incorporated in these revised guidelines.

Between September 2004 and June 2005, the MRA received 6 notifications for installation of photovoltaic installations with a capacity less than 3.7 kWp. The total installed capacity of these installations is estimated at approximately 10 kWp. The annual electricity generation by these devices is estimated to be around 14 MWh.

While the current transitory measures have facilitated the administrative aspects for licensing of small-scale solar energy installations, the uptake has up to now still been low.

Promotion of Biofuels for Road Transport

Regulations on the Promotion of the Use of Biofuels or Other Renewable Fuels for Transport

In 2004, the Minister for Resources and infrastructure after consultation with the Authority issued regulations on the use of Biofuels or Other Renewable Fuels for Transport. These regulations came into force on 31st December 2004 and transposed Directive 2003/30/EC. The main aim of these regulations is to promote the use of biofuels or other renewable fuels to replace diesel or petrol for transport purposes in Malta, with a view to contributing to objectives such as meeting climate change commitments, environmentally friendly security of supply and promoting renewable energy sources.

The Regulations seek to:

1. ensure that a minimum proportion of biofuels or other renewable fuels is placed on the market.;
2. adopt measures to establish targets, monitor biofuels etc.;
3. ensure labelling of biofuels.

These Regulations require that specific labelling of biofuels at point of sale is required to “ensure that ensure that information is given to the public on the availability of biofuels and other renewable fuels. For percentages of biofuels, blended in mineral oil

derivatives, exceeding the limit value of 5 % of fatty acid methyl ester (FAME) or of 5 % of bioethanol, a specific labelling at the sales points shall be imposed."

The Malta Standards Authority was consulted prior to the publication of these Regulations. Further consultations with the MSA are also planned on the details of labelling and record-keeping.

In addition the Authority carried out consultation with the Malta Transport Authority on the car fleet in Malta in an effort to investigate the effect of use of biofuels in diesel blends (particularly blends above 5 %) by non-adapted vehicles and compliance with relevant EU legislation on emission standards. The Authority also consulted with car manufacturers on the modifications required (if any) to vehicles such that they may take diesel blends of up to 5% or more.

The MRA has also appointed a local consultant to assist it in studying the regulation of biodiesel taking into account all aspects of this segment of the fuel market in a holistic fashion including :

(1) manufacture of biodiesel and associated reporting requirements;

(2) importation of biodiesel, either as finished product or as now material for further processing) including reporting requirements;

(3) placement of the product in the market for local consumption including distribution, standards, regulation and product labelling;

(4) matters arising out of directive 2003/30/EC, particularly the monitoring of biodiesel blends above 5% by non-adaptive vehicles, identification of non-fiscal measures recommended to promote use of biofuels, drafting of the 2006 report to the Commission including indicative target for 2010 (and motivation for difference from 5.75% if necessary);

(5) issues connected with prices and fiscal matters, including if deemed appropriate schemes intended to encourage particular aspects of production, manufacture and marketing.

Implementation Measures to Promote Biofuels

In October 2004, the Authority participated in and information exchange meeting for organised by DG Energy and Transport experts in Brussels, Belgium on the implementation of the Biofuels Directive. Member states presented their national contributions outlining the efforts and achievements towards the implementation of the biofuels directive.

The presentations were followed by a discussion on a number of general issues that arose from them including:

- publication of national reports;
- obligations for fuel suppliers to sell biofuels;
- exemptions from fuel taxes;
- NO_x emissions from biodiesel;
- imports of biofuels from outside the Community;
- the measurement of the energy content of biofuels for the purposes of the directive

In the case of Malta it has been noted that there is no potential of significant production from agriculture (feedstock for biodiesel of rapeseed or sunflower or feedstock for bioethanol) because of its limited territory.

A source of collecting biofuels is waste edible oils and a local company is involved in such biodiesel production. Biodiesel produced from such spent oil is being tested in Government-owned heavy plant and results are being evaluated. Another private company has also started testing this biodiesel in its heavy plant. During 2004 biofuel use in Malta amounted to 0.02% of road transport fuel.

DEVELOPMENT OF THE WATER SECTOR

Water Supply and Sewerage Services Regulations (LN 525/2004)

The Water Supply and Sewerage Services Regulations were issued this year under the MRA Act. These Regulations provide in detail for regulating water suppliers and sewerage services operators according to the operations and services provided. The legal notice was initially brought into force with respect to water supply through the public distribution network and sewerage services using the public sewage collection system.

It requires all water suppliers and sewerage services operators providing or offering any water or

Courtesy of Water Services Corporation

wastewater service to operate under licence. As the WSC is a public utility falling under the classification of regulation 3 (a) (i) of this legislation, it became subject to this legal obligation on the 1st January 2005. The licence to the WSC for the provision of these services was issued and brought into force on 1st August 2005. This is the first regulatory instrument of its kind issued to the water industry, in Malta. The second licence for the provision of sewerage services using the public sewage collection system is expected to be issued by the end of October.

Several discussions were held between the MRA and the Water Services Corporation to align with these regulatory procedures. The MRA is currently assessing an information dossier prepared by the WSC on compliance with laws and directions, and on compliance with quality standards as required under Articles 6 and 9 of the licence.

Drinking Water Quality Monitoring

The Malta Resources Authority and the Department of Health have formulated and agreed on a Memorandum of Understanding setting an agreed framework for the co-operation between the two parties in the field of water quality. The principal objectives of this agreement are:

- to clarify the roles and define the responsibilities of the participating and competent authorities in support of the achievement of the relevant regulations;
- to foster cooperative working relationships among the participating authorities, to help co-ordinate and, where possible simplify the procedures for ensuring implementation and compliance to the relevant regulations.

Under this Memorandum of Understanding, the two Authorities and the Water Services Corporation have established a joint working group with the aim of harmonizing water quality reporting requirements.
groundwater, the main aims of the legislation can be outlined as follows:

- Prevention of deterioration in the status of groundwater bodies;
- Protection, enhancement and restoration of all groundwater bodies;
- Achievement of good groundwater qualitative and quantitative status by 2015;
- Prevention of and limiting the input of pollutants in groundwater;
- Reversing any significant, upward trend of pollutants in groundwater;
- Achievement of standards and objectives set for protected areas in other National and Community Legislation.

RESOURCE MANAGEMENT AND PROTECTION

Implementation of the Water Framework Directive

Reporting Obligations under Article 5 of the Water Framework Directive

The Water Framework Directive (2000/60/EC), transposed into Maltese legislation as Legal Notice 194 of 2004 (Water Policy Framework Regulations, 2004) provides for the long-term sustainable management of water resources on the basis of a high level of protection of the aquatic environment.

The overall objective of this Water Framework Directive is to harmonise water environmental policy and regulation across Europe. As regards Article 5 of this Directive requires Member States to carry out an 'initial characterization' of the groundwater bodies within their Water Catchment Districts in order to identify those bodies of groundwater which are at risk of failing to achieve the Environmental Objectives of the Directive.

Annex II to the Directive outlines that this investigation should be based on existing hydrological, geological, pedological, land-use, discharge, abstraction and other data and should identify and outline:

- the location and boundaries of all groundwater bodies within the water catchment district
- the pressures to which the groundwater bodies are likely to be subject including:
  - diffuse sources of pollution,
  - point sources of pollution,
  - abstraction,
  - artificial recharge;
- the general characteristics of the overlying geological formations and strata in the catchment area from which the groundwater body receives its recharge;
- those groundwater bodies for which there are directly dependent surface water ecosystems or terrestrial eco-systems.

This analysis should be accompanied by a review of the impact of human activity on the status of groundwater as well as an economic analysis of water use within the Water Catchment District.

During the year under review, the Directorate therefore compiled four reports:

(i) Introductory Document to the Article 5 Report under the Water Policy Framework Regulations, 2004

(ii) Initial Characterisation of the Groundwater Bodies within the Maltese Water Catchment District under the Water Policy Framework Regulations, 2004.

(iii) Review of the impacts of Human Activities on Groundwater Bodies within the Maltese Water Catchment District

(iv) Establishing Drinking Water Protection Areas under the Water Policy Framework Regulations, 2004.

Further details of these reports are given in Appendix 1.

Figure 7: Authority's Water Framework Directive Web-interface

Launch of WFD Web-site and Public Consultation

The MRA is currently in the process of building up the necessary framework to actively involve the public during the several phases leading to the implementation of the WFD.

The first phase of this process involved the presentation of technical information on the main groundwater bodies in the Maltese Islands. Initially this information has been made available on a web-interface which can be accessed from the Authority's Web-Site.

The web-interface supports downloadable documents on each WFD 'Characterisation' theme as well as summarized data-sheets presenting basic information on each groundwater body. The public was thus invited to submit relevant comments on the data submitted by the Authority and the subsequent conclusions reached on the 'risk status' of each Groundwater Body.

The Authority initialised the 'Public Participation' process well ahead of the 2006 deadline recommended by the WFD since it considers early active stakeholder involvement as one of the main cornerstones in the process of setting up a comprehensive broad-based socially acceptable Management Plan for Water Resources in the Maltese Islands.

The WFD Web-Server is divided into seven principal themes which can be accessed through links in the initial page. (http://www.mra.org.mt/wfd_introduction.shtml) Once accessed, the link refers to a web-page presenting concise general information on the specific theme, downloadable summary-sheets on each groundwater body and downloadable full reports on the investigations carried out by the Authority. The Web-Server was also linked with the European Commission's web-site. (http://europa.eu.int/comm/environment/water/water-framework/links.html).

Reporting Sheets required by Article 5 of the Water Framework Directive

Article 5 of the Water Framework Directive requires Member States to submit summary reports of the analysis undertaken for the purposes of the first river basin management plan within three months of their completion. The reporting requirements were

developed within the Reporting Working Group under the Common Implementation Strategy of the Directive, in which officials from the Authority are participating.

The reporting requirements were structured into four sections, with a number of reporting sheets being requested for each section. Further details are given in Appendix 1.

The Authority, in March 2005, submitted a consolidated report comprising all these reporting sheets to the European Commission. This submission was acknowledged in the Commission's web-server and positively classified as shown on the score-board below.

The WFD Scoreboard provides an overview on the state-of-play of transposition and reporting, thus providing a quick overview on the performance of the Member States as regards the legal transposition and the implementation elements of the Water Framework Directive 2000/60/EC (WFD) which have deadlines during 2004 and 2005.

Figure 8: Water Framework Directive Scoreboard

Country	Notification (Art. 24)	Intercalibration sites	River Basin Districts Report (Art 3 report)	River Basin Districts Analysis (Art 5 report)
Austria	☺	☺	☺	☺
Belgium	😐*	☺	😐	☺
Cyprus	☺	☺	☺☺	☺
Czech Republic	☺	☺	☺	☺
Denmark	☺	☺	☺☺	☺
Estonia	☺	☺	☺☺	☺
Finland	😐**	☺	☺	☺
France	☺	☺	☺☺	☺
Germany	😐	☺	☺☺	☺
Greece	☺	☺	😐	☹
Hungary	☺	☺	☺☺	☺
Ireland	☺	☺	☺☺	☺
Italy	☹	☺	☹	☹
Latvia	☺	☺	☺	☺
Lithuania	☺	☺	☺☺	☺
Luxembourg	☹	☺	☺☺	☺
Malta	☺	☺	☺	☺
Netherlands	☺	☺	☺☺	☺
Poland	☺	☺	☺☺	☺
Portugal	☹	☺	☺	☹
Slovakia	☺	☺	☺☺	☺
Slovenia	☺	☺	☺	☹
Spain	☺	☺	☹	☹
Sweden	☺	☺	☺	☺
United Kingdom	☺	☺	☺	☺

Problems were encountered in the electronic submission of data through the Water Information system for Europe (WISE) portal and the Directorate is currently involved in consultations with the Joint Research Centre (JRC)and the WRc in order to solve these problems.

Joint Study with MEPA on the Identification of Surface Water Ecosystems which are Directly Dependent on Groundwater

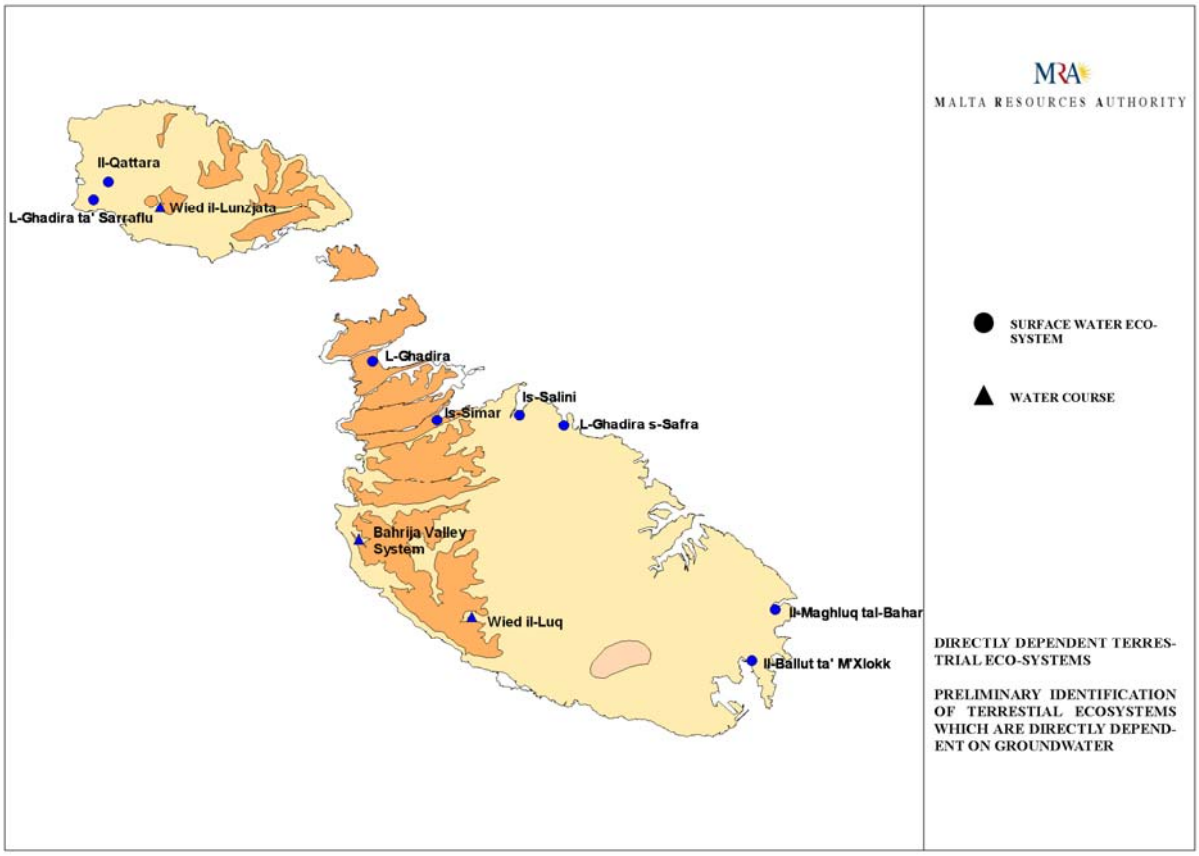
The definition of good groundwater chemical status in the Water Framework Directive implies that the concentration of pollutants in a defined body of groundwater should not result in failure to achieve the environmental objectives for associated surface water nor any significant diminution of the ecological or chemical quality of such bodies nor any significant damage to terrestrial eco-systems which depend on the groundwater body.

A number of candidate sites supporting surface water ecosystems which could potentially be dependent on groundwater were identified during the 'initial characterisation' process.

However, owing to the fact that almost all the groundwater bodies are ‘at risk’ of failing to achieve the environmental objectives on grounds of attainment of good qualitative and quantitative status, it was deemed appropriate to investigate the degree of dependence of these eco-systems on groundwater during the formulation of the conceptual model of each groundwater body in the ‘further characterisation’ stage.

Explanation of symbols and colours	▪
Report or information submitted electronically via the WFD report prototype	☺☺
Report or information submitted	☺
Requirements only partially fulfilled	😐
Report or information not submitted	☹
Transposition for Brussels Region missing	*
Transposition only for Province of Aland missing	**

Figure 9: Preliminary Identification of Terrestrial Eco-systems during the Initial Characterisation



The Authority in conjunction with the Malta Environmental and Planning Authority is therefore currently finalising a background report investigating the dynamic linkage between surface water bodies and adjoining groundwater bodies as part of the 'further characterisation' process. This report investigates in further detail the sites which were identified in the 'initial characterisation' process as possibly dependent on groundwater. These terrestrial and/or surface water ecosystems are found at these localities:

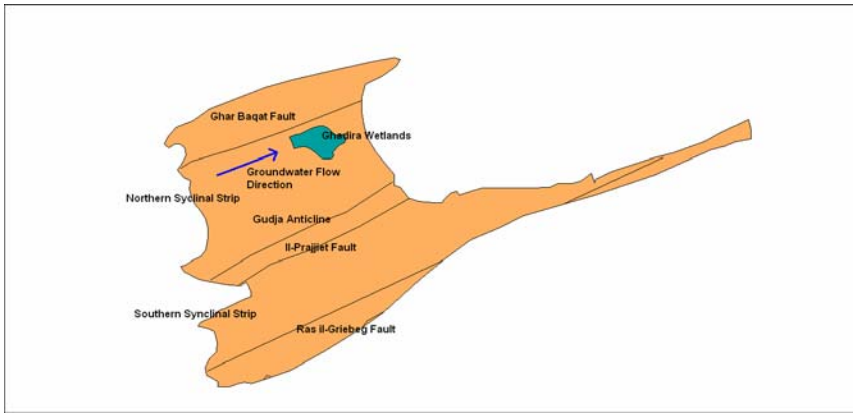
(i) Is-Simar water body
(ii) L-Għadira
(iii) L-Għadira s-Safra
(iv) Il-Qattara
(v) L-Għadira ta' Sarraflu
(vi) Wied il-Luq
(vii) Baħrija valley system
(viii) Wied tal-Lunzjata
(ix) Is-Salini
(x) Il-Ballut ta' Marsaxlokk
(xi) Il-Magħluq ta' Marsascala

This report analyses the hydrological, geological and topographical characteristics of the local aquifer formations, and the preliminary conceptual models of the groundwater bodies in order to determine the degree of dependence (if any) of the identified terrestrial eco-systems and surface water bodies on adjacent groundwater bodies.

Groundwater Monitoring Plan

Article 8 of the WFD sets a requirement for establishing programmes for the monitoring of groundwater, which must provide information to enable the assessment of groundwater quantitative status, chemical status and significant long-term pollutant trends resulting from human activity. Programmes to meet these requirements must be operational by December 2006 at the latest.

Figure 10: Regional Groundwater Flow Directions in the Għadira UCL Aquifer)

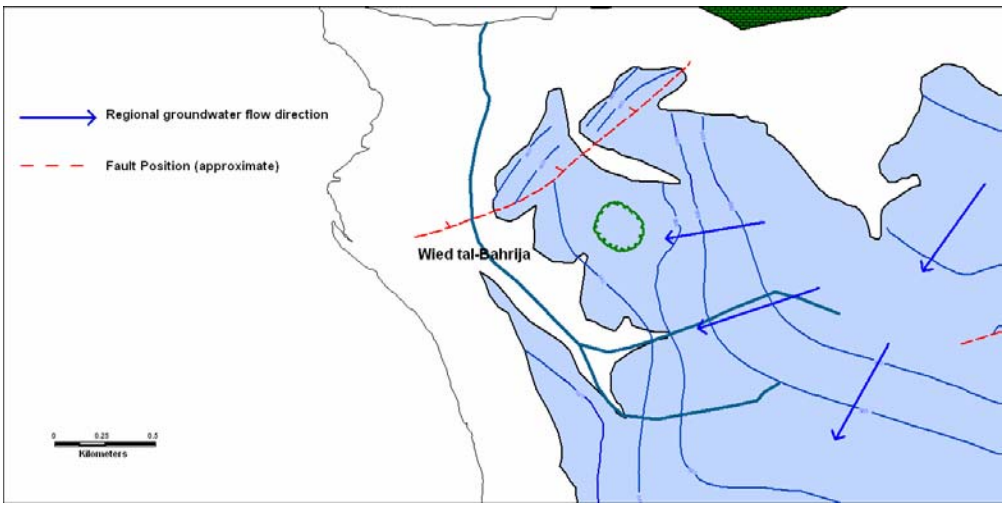


The groundwater observation networks which are currently being established by the Authority for the monitoring of groundwater status in line with the WFD requirements will be based on the conceptual models of groundwater flow which have been developed for each groundwater body. This will ensure that these networks will be appropriate to the hydrogeological characteristics of the particular aquifer systems and, where relevant, the behaviour of the pollutants in the groundwater system.

Initially, it was proposed that a minimum threshold of three sampling sites per groundwater body would be established. However pending the results of the further characterisation process; corroborated with the initial monitoring results, groundwater bodies with similar characteristics may be aggregated for the purpose of future monitoring. Aggregation will however still be subject to a minimum network density of 1 monitoring site per single groundwater body. This implies that the first monitoring networks to be established are to be considered as preliminary networks which will be subsequently modified and verified according to the incoming data. Eventually following initial testing the structure of the monitoring networks will be confirmed by the December 2006 deadline for making these networks operational.

The Authority is currently assessing various funding possibilities in view of the capital investment required to set up and operate a fully fledged monitoring network.

Figure 11: Regional Groundwater Flow Directions Sustaining the Baħrija Valley System



WATER QUALITY

Water Quality Analysis

Another analysis was carried out this year on the chloride levels of groundwater abstracted from the mean sea level groundwater body. The chart below shows the production and weighed average chlorides of the water abstracted. Only abstraction from the Malta lower coralline limestone aquifer was included. The methodology used was to average chloride data for each individual source over a calendar year, and weigh using the production for that year from that source.

The chloride levels for 1995 are influenced by high results and infrequent (two samples per year compared to 12 samples per year) sampling for the pumping stations. Chlorides levels between 1996 and 2002 are well lower than the figures between 1982 and 1993.

Though no statistical analysis has been carried out, it is interesting to note the seeming close relationship between abstraction and chloride levels. The chart also seems to indicate that, at least over the range of variation of abstraction in this chart and at the level of aggregation of data considered, the increases in chlorides noted in the early eighties are reversible.

The chlorides for 2002 are higher than the chlorides for the previous four years but still lower than those in the late eighties. The main driver for this increase was Speranza pumping station. A substantial increase in abstraction rates (from approximately 80,000m^3/month to 130,000 m^3/month during the summer period) saw chloride levels soar from an average of around 500mg/l to around 1,300mg/l (peaking at 1,800mg/l during July 2002).

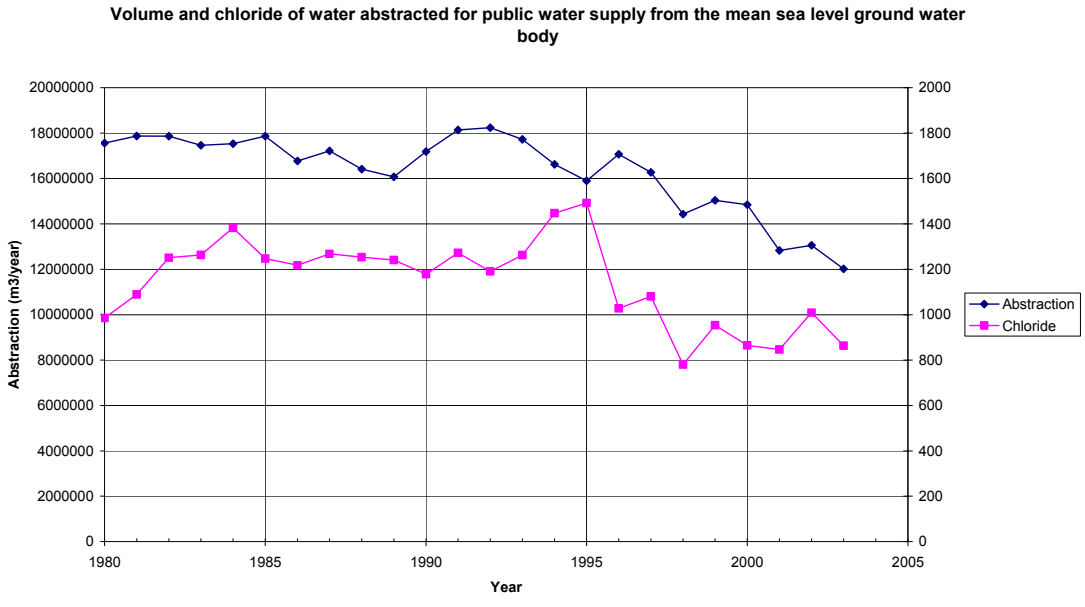
A revision of abstraction policies during 2003 showed a return to average chloride values of around 540mg/l.

CONSULTATIONS TO MEPA ON DEVELOPMENT APPLICATIONS

The Malta Environment and Planning Authority carries out consultations regarding development applications with the Water Resources Directorate on a regular basis. The majority of these development applications deal with agricultural developments and irrigation reservoirs, greenhouses, stores, tool rooms, pump rooms, farms and manure clamps. However there are a number of other consultations that request the Directorate's advice on hydrogeological and hydrological matters.

The existing legislative framework is the backbone to every development application reviewed by the Directorate, in that essentially, each proposed development has to be in line with those conditions set out in various Directives dealing, directly or indirectly, with groundwater quality and quantity. Since the majority of applications received deal with

Figure 12: Chloride vs Production



agricultural practice and the impact of agri-development on groundwater, the legislation mostly referred in the course of processing these applications includes the following:

- Regulations for the protection of groundwater caused by certain dangerous substances (LN 203/2002), known as the Groundwater Directive
- Protection of water against pollution caused by nitrates from agricultural sources (LN343/2001), known as the Nitrates Directive
- Groundwater Sources Registration Regulations (LN 120/1997),
- Sewer Discharge Control Regulations (LN139/2002).

In addition to the aforementioned legislation, the Directorate for Water Resources Regulation rigorously applies the provisions leading to the objectives of the Water Framework Directive, being that the MRA is competent authority for inland waters by virtue of the transposed directive, LN203/2004.

There are other policies that form part of the rationale when deciding upon each application to further ensure the protection of groundwater. Such policies include those designated by the MEPA (Policy and design guidance on Agriculture, farm diversification and stables), as well as the Code of Good Agricultural Practice implemented by the Ministry of Rural Affairs and the Environment. The Directorate for Water Resources Regulation has held regular discussions with the MEPA and Agricultural Department in order to harmoniously integrate both of these policies within the consultation process of development applications as well as with the issuing of conditions for the operation of the long-term running of the development being applied for.

Due to the potential threats that such developments could inflict on groundwater resources, an in-depth study of those factors considered essential in determining the vulnerability of the aquifer in the area earmarked for development is required.

The study focuses on the location and surrounding hydrogeological environment with particular attention given to neighbouring sources of abstraction, both public and private. Special attention is given to new developments requested within the Drinking Water Safeguard Zones where strict conditions are imposed or the development not recommended for the sake of groundwater protection, Apart from providing advice on any possible conditions, the Directorate for Water Resources Regulation also lays down a set of measures to mitigate potential groundwater pollution risks or excessive abstraction.

Before actual assumptions on the impacts of each application can be made or mitigation measures can be recommended, in-depth research is carried out where a thorough analysis is made on the impact of each development on groundwater throughout its construction phase, life stage and decommissioning. Once each stage of the project is fully understood, mitigating measures and conditions are specified on a case-by-case basis.

Environmental Impact Assessments and IPPC Permits

Apart from the normal development applications, research is also performed on major projects that require Environmental Impact Assessments. The Directorate for Water Resources Regulation is a regular consultee to MEPA and other agencies (WasteServe etc.) on issues requiring expertise in hydrology and hydrogeology, whenever expertise in these fields is required to assess the environmental impact arising from land development.

Table 1: Consultations on Environmental Impact Assessments

Environmental Impact Assessment	Number
Construction Industry	1
Farms	2
Trailer Park	1
Pharmaceutical Installations	1
Quarries	2
Petrol Station	1
Waste Facilities	4
Total	**12**

Initially the Directorate examines the submission of the Project Description Statement by the developer, and examines the different processes involved in the development. Following this, the Directorate issues a set of conditions for the Terms of Reference. Basically consultation with MEPA occurs in two stages:

(1) during the drafting of the terms of reference for the Environmental Impact Assessment
(2) during the critical analysis of the EIA.

All Environmental Impact Assessments and Statement go through a rigorous process of study. before comments are submitted to the MEPA. During the period under review a total of 12 EIA's have been viewed at different stages of the EIA process.

The Directorate is also requested to formulate a set of conditions for the issuing of *Integrated Pollution Prevention and Control* (IPPC) permits particularly for regulating sewage disposal and groundwater protection. These permits are aimed at those industries that are required to comply with the IPPC Directive 96/61/EC of the EU in order to ensure full environmental protection and minimise pollution through the implementation of best available techniques (BAT). Through a series of IPPC meetings held at the MEPA the conditions are set out and agreed upon. During the period under review two such permits have been completed for a non hazardous engineered landfill and a pharmaceutical installation.

Analysis of Planning Development Applications Received for Consultation

The Directorate for Water Resources Regulation has processed a total of 343 development applications during the period under review (Table 2). 178 applications have been recommended for approval, 5 have been recommended for refusal whilst 160 are still awaiting the submission for further information.

Animal Husbandry

Farm applications often require waste management plans that are revised in light of the Code of Good Agricultural Practice and Policy Guidelines together with the Nitrates Directive transposed to Maltese law. Through waste management plans submitted the Directorate is ideally given the precise quota of animals being reared and how the different waste streams generated are to be stored and disposed of. A certification of impermeability of each manure clamp or cess-pit is to be guaranteed in order to prevent any escape of effluent to the outside environment. More importantly, the safe distance of waste storage and disposal as well as fertiliser storage and application from potable water resources, is the main influential factor determining the acceptance of a farm development application.

Farm applications are subject to a recommendation for refusal once the Directorate envisions that the farm is located in a highly sensitive area of groundwater protection and thus the waste management plan proposed is insufficient for water protection due to the extremely high aquifer risks of the area.

Agricultural Stores and Reservoirs

These applications are the most common ones that require an assessment of both the design and the intended use. The Directorate has expressed it's serious concern with MEPA as several of these "stores" are in fact being used for recreational purposes, and short term habitation. Such a practice often leads to groundwater pollution through the disposal of grey-waters in make-shift cesspits. Even worse, the handling of pesticides and fertilisers in these stores often lacks sufficient precautions to prevent leaching of dangerous substances into the ground.

Reservoir applications are also checked to verify the existence of an associated surface water catchment area as the Directorate advocates in favour of rain-water harvesting for irrigation purposes.

Greenhouses

Due to the cultivation of crops in a concentrated and controlled environment, greenhouse developments can have undesirable effects on groundwater if inappropriate cultivation and irrigation techniques are employed. The Directorate has emphasised the importance of drip irrigation, fertigation and the monitored application of both fertilisers and pesticides during greenhouse cultivation. On going discussions between the Agricultural Department and the Directorate has led to the setting up of basic conditions that greenhouse developments have to adhere to. These include recommendations on fertiliser, fungicide or pesticide application and storage and the construction a reservoir for the collection of surface runoff for irrigation purposes.

Pump Rooms

Pump room applications are processed by requesting detailed information on the water source that is going to be utilised in conjunction with the pump room. The issuing of clearance for a pump room application is of concern to the Directorate since these applications can be used as a gambit for unauthorised pumping of water from illegal boreholes.

Table 2: Consultations on Development Applications

Type of Development	Number
Agricultural Tool Rooms	5
Agricultural Stores	66
Agriculture	3
Apiaries	1
Car Wash	2
Cemetery	3
Cess-pits	2
Pump rooms	23
Farms	58
Farm Houses	6
Fuel Related	4
Greenhouses	33
Industrial Development	12
Manure Clamp	9
Quarries	10
Residential	18
Reservoirs	60
Soil Removal	1
Vineyards	4
Waste Facilities	6
Various	17
Total	**343**

Waste Facilities

A number of applications concerning the management of wastes have been received for consultation process. These range from the smaller bring-in sites and civic amenity sites, to the larger applications proposing the infilling of exhausted quarries, a composting plant and recycling facility, and engineered landfills. All applications dealing with the infilling of waste are revised under the Waste Management (Landfill) Regulations (LN168/2002). The geological structure of the land being earmarked for infilling or waste management is studied since geological instability could have dire consequences and increase aquifer vulnerability risks. Water abstraction sources in the proximity of the area are again the major cause of concern when analysing the impacts of waste disposal sites or waste facilities.

Fuel Stations and Industrial Facilities

The Water Directorate for received several requests for consultations regarding the construction of new petrol stations. A suite of measures based on European standards is now being recommended to protect groundwater quality including:

- mandatory double skin underground storage; tanks and ancillary pipework;
- live leak detection system;
- land impermeabilisation of the entire premises;
- installation of an oil/petrol separator.

Several applications of an industrial nature require research to be carried out with regards to the different stages of production in order to fully comprehend the potential impacts that the industrial development in question could have on groundwater quantity and quality as well as on sewage treatment and infrastructure. Water sources and supply, water use, grey water disposal and treatment are often issues that need to be thoroughly studied for each stage of the industrial process concerned. Due to this need for research, the process of industrial applications is often prolonged.

MANAGEMENT OF MINERAL RESOURCES

The functions, policies and strategic objectives of the Directorate for Minerals Resources are directed towards the promotion, regulation, exploration and management of Malta's mineral resources. The Directorate's purpose is to facilitate the development of the mineral extractive industry in harmony with contemporary social, economic and environmental policy targets. Thus, the strategic objectives of the Directorate are:

- to provide a coherent legislative framework and policies for the extractive industry so that a competitive environment for resource exploration and development is maintained.
- to develop a consistent and transparent regulatory regime for the extractive industry;
- to ensure consumer confidence on services provided by the minerals industry;
- to meet the targets and international obligations set by the Government;
- to address minerals related issues through sound science and credible technological methods.

In attainment of the above objectives, various actions were undertaken during 2004-2005 as amplified below.

Management of Mineral Waste

To achieve the targets and international obligations set by Government in relation to the management of mineral waste, a board was set up jointly between several governmental authorities. This Board has been established to discuss the implementation of a proposed directive on 'The Management of Waste from the Extractive Industry'. This directive aims to provide a regulatory framework specifying the requirements for the control and management of mineral wastes from the extractive industry by specifically addressing environmental and human health risks that may arise from the treatment and disposal phases of such waste.

Establishing Quarry Regulations

The process of establishing effective regulations on the economic operations of quarries, ensuring acceptable environmental impacts, conservation of the

resource and fair competition. To accomplish this, the Directorate has translated the policies into rules and will establish the legislative instruments and mechanism for their implementation. These regulations will complement the planning guidelines on quarries of MEPA.

They relate to new operations, reactivation of old quarries, extensions, renewals, restoration of disused quarries, conservation of mineral resources, protection of the environment, social and community issues, fair competition, price regulation, quality standards, information, consultations with interested parties and national and international obligations.

Restoration of Disused Quarries (and Parts of Active Ones)

Efforts to restore disused quarries continued during the period under review and as a result, several disused soft-stone quarries are being reclaimed by filling with inert stone waste. Such back-filled quarries are eventually topped with soil and returned to agricultural use. Restoration works were also initiated in active quarries, and this in compliance with MRA's new regulations which provide that quarry extension

works are granted subject to the restoration of the disused parts of quarries. This practice is expected to drastically reduce the negative visual impacts of extractive works on the environment.

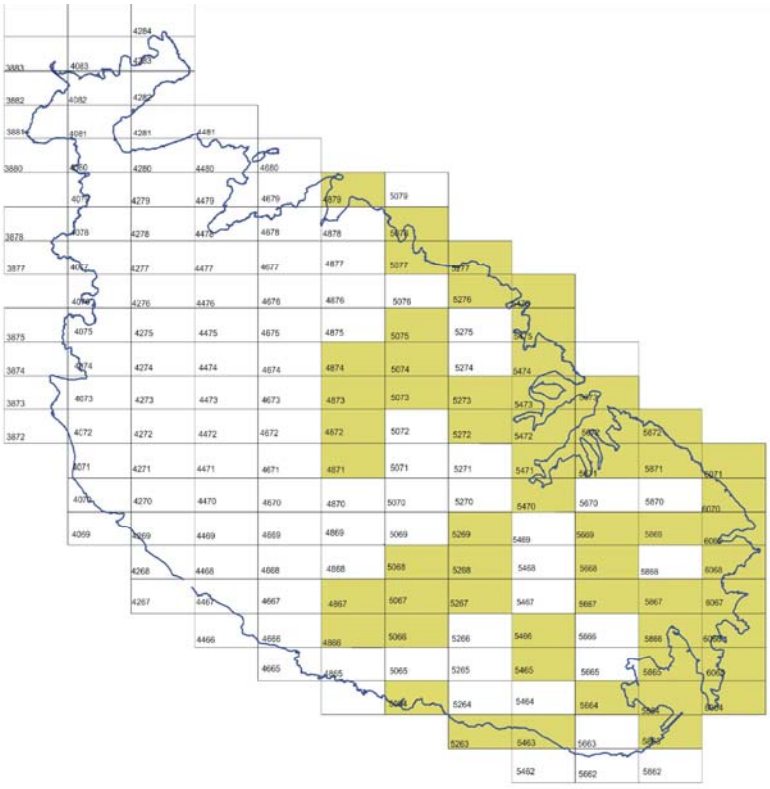
Mining of Hardstone and Softstone

A study to assess the potential and implications for the extraction of stone by mining techniques was completed in 2004 and a pilot project was commissioned. The introduction of mining techniques as a substitute to the current open pit extraction would safeguard the continued production of aggregates and dimension stone while drastically reducing the negative environment impacts. Additionally, it would also make a considerable volume of minerals that are presently inaccessible by traditional quarrying methods, available for extraction. The study recommended two pilot projects to assess in practice the extraction of both dimension stone and hard-stone. One pilot project was initiated in 2004 at a site at "Wied Bir ir-Rix" limits of Kercem, Gozo, to assess the mining of dimension softstone. A second pilot project is expected to be conducted in the future to assess the mining of hard-stone.

Geological Map of the Maltese Islands

The availability of high quality geological information on Malta's mineral resources is considered essential towards an efficient development of the extractive industry. In 2003 the Directorate acquired a GIS and proceeded to set up an effective geological data bank. Since then work on the project has been ongoing, this year the Directorate continued with fieldwork to survey each sheet, and many more blocks have been included in the data base. Each survey sheet is now at a scale of 1:2,500, ten times greater than the previous version of the geological map. This historical geological database will be an important tool for architects, civil engineers, agricultural scientists, geoscientists and environmentalists as it provides a detailed view of the geological formations and members outcropping at the surface of the Maltese Islands. Once all the blocks in the map are completed, the database will continue to be upgraded to include the bed subdivisions of the members. The areas covered are highlighted in Figure 13.

Figure 13: Progress on the Geological Data Bank



Upgrading of the Database

During this period there were a total of 84 quarries operating in Malta and Gozo, 54 soft-stone quarries and 30 hard-stone quarries. The Directorate for Minerals Resources Regulation together with the Licensing Unit of the MRA processes licences for these quarries and collects the annual fees. To facilitate the monitoring of these licences, the Directorate embarked on the compilation of a quarries database containing all the relevant information of every licensed quarry. This database provides structured information to enable the Directorate discharge its duties and it consists of a fact file, applicant's profile, and the case history of the quarry and any extension thereof. The case-history includes the quarry registration number, site plan, geology, and details of any enforcements and planning applications. The database has identified that a number of licences were in fact not compliant with MRA policies and appropriate action was undertaken. Apart from facilitating the monitoring process the database has also considerably reduced office paper work.

SUPPORT TO GOVERNMENT IN ITS DEALINGS WITH THE EU AND ON POLICY DEVELOPMENT

EU MATTERS

The ultimate objective of the European Union is to achieve increased rates of progress in all sectors within the Member States. EU directives enable and oblige each national government to strive towards the achievement of this universal goal. National legislation transposes such directives whilst safeguarding the unique characteristics of each member state within the parameters established by the directives themselves.

The Authority continued to provide technical support to Government in its dealings with the EU, particularly the legislative process. It was requested to review documentation on policies and proposals, formulate recommendations for positions to be established by Government and to attend meetings in Brussels.

The specific input required from the Authority included:

- drafting of memoranda on proposals or other commission communications dealing with the energy and water sector. These memoranda are approved at Ministerial, inter-ministerial, Cabinet and Parliamentary levels, with the input in certain cases of MRA staff;
- drafting of instruction notes for the Maltese Permanent Representation staff to allow them to participate actively in Council and Commission meetings and to present Malta's case and position;
- attendance as necessary to Commission and Council working party meetings, and other meetings, where technical input was essential. This was particularly the case for the proposal on protection of groundwater from pollution, where MRA staff attended every meeting on Government instructions;
- preparation of background notes and other documentation for the bi-annual Council meetings where political level discussions and agreements are reached;
- drafting and proposing transposition of EU directives into Maltese law;
- monitoring and follow up of the reporting to the Commission as required by the EU directives.

This annual report has already covered several of the above aspects in some detail, further specific information in given hereunder.

Directives Transposed into Maltese Legislation

The year under review saw the entry into force or transposition of three major pieces of legislation under the Malta Resources Authority Act.

Table 3: Directives Transposed / Brought into Force during 2004-2005

Directive title	Legal notice	Published	In force
Directive 2003/30/EC of 08.05.03 on the promotion of the use of biofuels or other renewable fuels for transport	LN 528 of 2004	28.12.04	28.12.04
Directive 2003/54/EC of 26.06.03 concerning common rules for the internal market in electricity and repealing Directive 96/92/EC	LN 511 of 2004	16.12.04	16.12.04
Directive 2003/55/EC of 26.06.03 concerning common rules for the internal market in natural gas and repealing Directive 98/30/EC	LN 432 of 2004	08.10.04	08.10.04

Directives to be Transposed During Next Financial Year

No new directives have been issued during 2004/2005 that require transposition under the MRA Act, the directives listed hereunder will need to be transposed during 2006. In addition, Government is also considering whether to transpose Directive 2002/91/EC under the MRA Act rather than through the proposed subsidiary legislation under Building Control Act as initially envisaged by Government.

The Government also requested the Authority to help prepare its case for derogation from the electricity directive 2003/54/EC.

Pipeline Legislation

A substantial part of the EU process consists of assessing proposals for new legislation issued by the Commission. The objective of the work carried out by the MRA is to establish the key features of the proposal, to identify the impact of a proposal on Malta and propose alternatives or amendments to the proposal. The technical advice to Government in the form of these memoranda is discussed at the inter-ministerial conference, approved by Cabinet, and subsequently presented by the Ministry to the Committee of the House of Representatives for Foreign and EU Affairs. The Authority also produces instruction notes used by the technical attaches (energy and environment) during the meetings when the proposals are discussed.

A review of the first three months of 2005 revealed that during the 62 days under consideration the Authority received approximately 670 emails from the Embassy in Brussels, OPM or MRES on EU legislation. Approximately 50% of these were clarifications or supplementary information on emails already received. Based on a stratified sample of these mails these included some 1000 documents attached totalling around 7000 pages.

Some 80 recommendations (in various formats) were issued to MRES. The Authority also presented reports on four draft legislation to the EU Affairs Committee of the House of Representatives, which permitted the Committee to lift scrutiny reservations.

The proposals discussed during this financial year are listed below in chronological order of their issue.

Com(2002)595 Proposal for a Directive on the Sulphur Content of Marine Fuels

This proposal envisages the use of low sulphur fuels used by the marine industry. It was noted that the prices of HSFO is lower than that of LSFO in the Mediterranean. During the past three months, HSFO was roughly 25% cheaper than LSFO. The Authority pointed out that the proposal implies that bills for ships

Table 4: Directives to be Transposed into Maltese Law

Directive title	Deadline for transposition	Comments
Directive 2004/8/EC of 11 .02.04 on the promotion of cogeneration based on a useful heat demand in the internal energy market and amending Directive 92/42/EEC	21.02.06	To increase energy efficiency and improve security of supply by creating a framework for promotion and development of high efficiency cogeneration (simultaneous generation) of heat and power based on useful heat demand and primary energy savings in the internal energy market, taking into account the specific national circumstances especially concerning climatic and economic conditions. Although the use of large scale cogeneration is probably limited in Malta, there may be scope for small scale cogeneration units in industry or large buildings (for cooling). Little work has been carried out so far on this directive.
Council Directive 2004/67/EC of 26.04.04 concerning measures to safeguard security of natural gas supply	19.05.06	Considering that there is no natural gas in Malta, this directive has no immediate impact, though it may be a significant factor in the cost-benefit analysis of future developments.

taking on fuel from Malta would be 25% higher than in neighbouring non-EU countries. This may not only have an impact on the bunkering industry, but also on related industries including transhipment, cruise liners and ship repair. Instruction notes (led by MRAE) were coordinated with MEPA, MIIIT and other bodies. A presentation was given to the inter-ministerial conference.

Com(2003)319 Proposal for a Directive on the Management of Waste from the Extractive Industries

The proposal is led by MRAE and the mineral directorate's contribution was limited to comments on the proposals.

Com(2003)550 Proposal for a Directive on the Protection of Groundwater and Pollution

Groundwater is the only reliable non-seasonal natural source of water available for human consumption and agricultural purposes in Malta. It is also important in providing the baseflow for some freshwater ecosystems and wetlands. At the same time, groundwater in Malta has certain natural 'coastal' characteristics differentiating it from that in continental Europe. Furthermore, intensive land use in Malta puts higher pressure on Malta's groundwater. The proposals of the Directorate for Water Resources Regulation aimed to ensure implementation in a manner that allows the protection of groundwater to be consistent with Malta's natural and geographical characteristics, that does not result in disproportionate remediation costs, and that permits its sustainable exploitation.

This required the drafting of a memorandum to be submitted to Cabinet and subsequently to the House of Representatives, drafting of instruction notes for each working party meeting. The proposal was also discussed by a number of EU parliament working parties and a number of amendments proposed.

Com(2003)739 Proposal for a Directive on Energy End Use Efficiency and Energy Services

This aims to enhance cost-effective improvement of energy end-use efficiency in Member States. The potential cost of providing such services, based on the costs in other member states was established as a pro-rata of the cost of energy services in Ireland, the cost for providing such services in Malta to achieve the targets identified in the proposal would be approximately €4million per year. As a result, Government decided to support indicative rather than mandatory targets as originally proposed by the Commission. Other parts of the directive conflicted with the request for market structure for electricity as requested by Government. Instruction notes were prepared for the weekly working group meetings and discussions were held with ADT, Enemalta Corporation and Ministry for Finance.

The Authority also prepared documentation to make a presentation on the current position of the proposal to the EU Affairs Committee of the House of Representatives. The presentation allowed the Committee to lift its parliamentary scrutiny reservation.

Com(2003)740 Proposal for a Directive on Measures to Safeguard Security of Electricity Supply and Infrastructure Development

Concerns were raised on the original proposal on the importance given to interconnection, and the role of the Commission in interconnection. The proposal was discussed in the Council working group and the latest amended version is generally acceptable. It was also discussed in the EU Parliament ITRE Committee, where 125 amendments were proposed. The Authority prepared a brief to Malta's MEPs for their reference during the plenary voting session. As for other proposals, the Authority also prepared a presentation for the EU Affairs Committee of the House of Representatives, allowing the lifting of the parliamentary scrutiny reservation on this proposal as well.

Com(2003)741 for a Regulation on Conditions of Access to Gas Transmission Networks

Since the proposal was amended such that emergent and isolated systems (as defined in directive 2003/55/EC) automatically are eligible for a derogation from the regulation, the Authority did not continue to participate as actively in the drafting of the proposal. A number of amendments were proposed by the EU Parliament and it was discussed twice at Coreper level. Instruction notes were required in all such

cases. The Authority also prepared documentation to make a presentation on the current position of the proposal to the EU affairs committee of the House of Representatives. The presentation allowed the Committee to lift its parliamentary scrutiny reservation on this proposal as well.

Com(2003)742 for a Decision Laying Down Guidelines for Trans-European Energy Networks

This essentially lists projects eligible for (10%) funding from the EU and the mechanisms of submission/ acceptance/ implementation of projects. Council accepted Malta's proposal to include the following projects in Annex III as they are of common (European) interest:

- (Electricity networks) – Submarine electricity connection Malta (MT) – Sicily (IT).
- New wind energy connections in Malta.
- 6.15 LNG in Malta
- 8.38 Malta (MT) – Sicily (IT) pipeline.

Discussed at a number of EU Parliament committees, (ITRE, TRAN, ECON, BUDG, ENVI, IMCO) 83 amendments were proposed. One committee proposed deleting a number of projects including those of Malta, while another voted in favour of retaining the projects. The Authority presented its reaction to each amendment in the working group (in April). As for other proposals, the Authority also prepared a presentation for the EU Affairs Committee of the House of Representatives, allowing the lifting of the parliamentary scrutiny reservation on this proposal as well.

Com(2004)2 Proposal for a Directive on Services in the Internal Market

The proposal envisages that market for services be opened in all Member States, with barriers being removed and providers being subject to the legislation of the country of origin. Discussions are led by the Ministry for Competitiveness, so participation of the MRA was limited to providing advice. The Council accepted the Authority's recommendation that electricity transmission, distribution and supply, gas transmission and distribution, water services and sewerage services be excluded from the country of origin principle – in other words, the legislation and standards of Malta apply to such providers, rather than the legislation of the country where the provider is established. The Authority also advised that as a result any restrictions on licensing, of petrol stations for example, would need to be lifted once this proposal becomes directive. After discussion by the EU Parliament IMCP Committee, amendments to further liberalise the market were proposed.

Com (2004)475 Proposal for a Regulation Determining Rules for Financial Aid in the Field of Trans-European Energy and Transport Networks

Two fiches presented by the Commission with regards to the impact of enlargement on the TEN-E programme were considered. The response of the MRA was submitted through the Malta Group on Financial Perspectives established under the Ministry for Finance.

Com (2005)265 Green Paper on Energy Efficiency

The Commission presented a green paper making a strong case for energy efficiency because of:
high and volatile oil prices, which have led to a downgrading of the prospects of economic growth in Europe;

- its contribution towards competitiveness and the Lisbon agenda, since it believes that 20% of present energy could be saved;
- it is considered the quickest and most cost effective way of meeting environmental protection and Kyoto targets; and
- the need to reduce reliance on imports of oil in order to improve security of supply.

The green paper then proposes a number of key actions as ideas for discussion:

- establishing Annual Energy Efficiency Action Plans at national level. The plans could be complemented by a "benchmarking" and "peer review" process at European level;
- giving the citizens better information, for example through better targeted publicity campaigns and improved product labelling;
- improving taxation, to ensure that the polluter really pays, without however increasing overall tax levels;
    - better targeting state aid where public support is justified, proportionate and necessary to provide an incentive to the efficient use of energy;
    - using public procurement to "kick-start"

new energy efficient technologies, such as more energy efficient cars and IT equipment;
- using new or improved financing instruments, both at Community and national level, to give incentives, but not aid, to both companies and householders to introduce cost-effective improvements;
- going further regarding buildings, where an existing Community Directive applies, and possibly extending it to smaller premises in a manner that ensures cost-effectiveness and minimum additional bureaucracy; and
- using the CARS 21 Commission initiative to speed up the development of a new generation of more fuel-efficient vehicles.

The green paper then put 25 questions that are intended to stimulate public debate, and the results of the debate will be laid before the Council of Ministers by December 2005. The Authority has reacted tentatively to the proposal by identifying the key issues that could be implemented in Malta, and will follow up with consultation with other involved Government entities.

EU – Russia Energy Dialogue; EU-OPEC Dialogue; South – East Europe Energy Treaty

In view of Malta's isolation MRA's participation was limited. Though these processes will not have an immediate/direct impact on Malta, they should lead to more stable and environmentally friendly supply of energy to the European Market, lower demand by the parties concerned and thus lower and stabilise energy prices at international level. Malta had to take a position on the Treaty, one memorandum (for submission to the HOR), three instruction notes for the energy working party and COREPER meetings were drafted by the Authority. These were discussed in the June Energy Council.

Reporting to the European Commission

Practically all recent directives require Member States to report regulatory on their implantation. Substantial reporting was required this year in connection with the Water Framework Directive though more reporting will be required next year as part of the tri-annual cycle reporting requirements.

In the energy sector, reports were required in connection with the implementation of the natural gas and electricity directives and with the use of biofuels. Monthly reporting continued in connection with the oil stocks directive, and an annual report on the implantation of the co-generation directive was also requested.

Annual Report on the Electricity and Gas Market

Directive 2003/54/EC required the Authority to report in July 2005, on:

- measures adopted to fulfil universal service and public service obligations, including consumer protection and environmental protection, and their possible effect on national and international competition, whether or not such measures require a derogation from this Directive;
- security of supply issues. This monitoring shall, in particular, cover the supply/demand balance on the national market, the level of expected future demand and envisaged additional capacity being planned or under construction, and the quality and level of maintenance of the networks, as well as measures to cover peak demand and to deal with shortfalls of one or more suppliers.
- effective competition and the efficient functioning of the market, monitoring in particular:
  - the time taken by distribution undertakings to make connections and repairs;
  - the publication of appropriate information by distribution system operators concerning interconnectors, grid usage and capacity allocation to interested parties, taking into account the need to treat non-aggregated information as commercially confidential;
  - the effective unbundling of accounts as to ensure that there are no cross subsidies between generation, transmission, distribution and supply activities;
  - the terms, conditions and tariffs for connecting new producers of electricity to guarantee that these are objective, transparent and non-discriminatory, in particular taking full account of the costs and benefits of the various renewable energy sources technologies, distributed generation and combined heat and power;
  - the extent to which distribution system operators fulfil their tasks;

- the level of transparency and competition.

- market dominance, predatory and anti competitive behaviour. This report shall, in addition, review the changing ownership patterns and any practical measures taken at national level to ensure a sufficient variety of market actors or practical measures taken to enhance interconnection and competition.

The Authority prepared a report to meet these requirements in the format as agreed at the European Group of Energy Regulators.

Biofuels

The Use of Biofuels or Other Renewable Fuels for Transport Regulations, 2004 require the Malta Resources Authority to prepare a report annually on:

- the measures taken to promote the use of biofuels;
- the national resources allocated to biomass for energy uses other than transport; and
- total sales of transport fuel and the share of biofuels.

The Authority's report is intended to form the basis for the annual report from Malta to the Commission.

Measures taken during 2004, included the publication of Legal Notice 528 of 2004 establishing regulations on the promotion of biofuels or other renewable fuels for transport. This legal notice transposes Directive 2003/30/EC. Furthermore, during November 2004, Government announced that as from 2005, the biomass content (i.e. the percentage element) in biodiesel is exempted from the payment of excise duty under fiscal control where such energy products are made up of, or contain, one or more of the following products:

- products falling within CN Codes 1507 to 1518;
- products falling within CN Codes 3824.90.55 and 3824.90.80 to 3824.90.99 for their components produced from biomass;
- products falling within CN Codes 2207.20.00 and 2905 11 00 which are not of synthetic origin;
- products produced from biomass, including products falling within CN Codes 4401 and 4402;
- products which contain water (CN Codes 2201 and 2851.00.10).

Another measure taken by Government is that a number of departments and agencies have started using biodiesel. These include the Environment Department, the Agriculture Department and the Malta Environment and Planning Authority. The Ministry for Resources and Infrastructure will also start using biofuel during 2005.

During 2004, total production of biodiesel during 2004 was around 400Mlitres, of which 55% was used for industrial purposes, and 45% for road transport. Biodiesel accounted for 0.1% of total fuel used for road transport in 2004, a significant improvement on the 0.02% achieved in 2003. The target for 2005 is 0.3% of road transport.

NATIONAL ENERGY POLICY

Government had requested that the Authority draft a national energy policy for its consideration. Energy policy is not the sole prerogative of one particular Ministry, but cuts across a number of Ministries. Various Government entities are also involved in implementing policy that is, albeit sometimes indirectly, a pillar of energy policy or a policy that influences radically the direction of energy policy.

The Authority therefore identified its role primarily as a coordinator of the process. The first task was to establish the objectives of the policy, and the strategic areas – the framework – that will lay the foundation of the policy proposal.

Ministries, departments and entities which are currently formulating or implementing energy related policy were then identified. All these entities were consulted through an initial letter requesting their opinion of the considerations that they believe should form part of an energy policy and which specific measures and targets are recommended, together with information on financing and implementation measures. Each entity was also asked about their role in implementing the recommended measures. These letters were followed up with a meeting and in most cases, written feedback was submitted.

The policy considered that a secure, competitively priced, and environmentally sound energy supply is a basic requirement for a competitive Maltese economy. Without an energy supply with these characteristics, sustained economic growth, employment and prosperity will be jeopardised.

The draft energy policy, not yet approved or adopted by Government, proposes the following policy areas:

- Ensuring that the demand is justified and that no energy is wasted.
- Reducing dependence on foreign sources for energy.
- Ensuring fuel availability and protecting against price volatility by diversifying sources of energy and planning for disruption.
- Ensuring that the delivery of energy in Malta meets highest international standards in term of quality of service, standards and competitive pricing.
- Participating in research and development activities and ensuring an educated workforce capable of serving the sector.
- Applying a fiscal policy that supports the objectives of the energy policy.

This Authority has proposed a consolidation of the input from various Ministries, and is proceeding with the second round of consultation.

A finalised draft was expected to be submitted to Government in 2005.

Water Policy Development

During the current financial year the Directorate for Water Resources Regulation continued the final drafting of the Water Policy statement, focusing on four priority areas:

- integrated management of all water resources
- restoration of groundwater and maintenance of strategic reserves.
- achievement of good status in compliance with the WFD.
- reduce the social implications arising from dependence on desalination.

The draft policy recognises the importance of groundwater for Malta aiming at managing the resource in a sustainable fashion, taking into consideration environmental factors that influence the status of the aquifers. Measures are proposed to:

- regulate abstractions in a sustainable manner;
- reduce the threats on groundwater quality arising from land development;
- guarantee an equitable allocation of groundwater thus reducing constraints to economic development.

Proposals are also presented to ensure the conservation (and sustainability) of Malta's renewable water resources, as a strategic source of freshwater. The document provides, the fundamental and requisite framework to guide the sustainable use of Malta's groundwater.

Six consultants from Food and Agriculture Organisation (FAO) of the United Nations provided expert assistance for the undertaking of supporting studies, namely:

- the water resources review.
- the economic evaluation of water use.
- a critical assessment of the legal framework for groundwater.
- an assessment of irrigation water use on Malta.
- governance and administration of water rights.

A brief overview of the each study, the resulting findings and recommendations is reported below and further details are provided in Appendix 1.

The Water Resources Review was conducted to:

(i) assess the current status of water resources;
(ii) evaluate the demand trends of different sectors;
(iii) provide information; and
(iv) identify opportunities for improving the sustainability, efficiency and equity of water resource management.

This review showed that, although the demand for groundwater is outstripping supply, there is scope to reverse current trends through demand management, supply augmentation and strategic protection of groundwater resources. Groundwater quality can be protected and the mean sea level aquifer stabilized. Policies and practices to do this need to be based on accurate information and acceptance that solutions must be applicable in the long term.

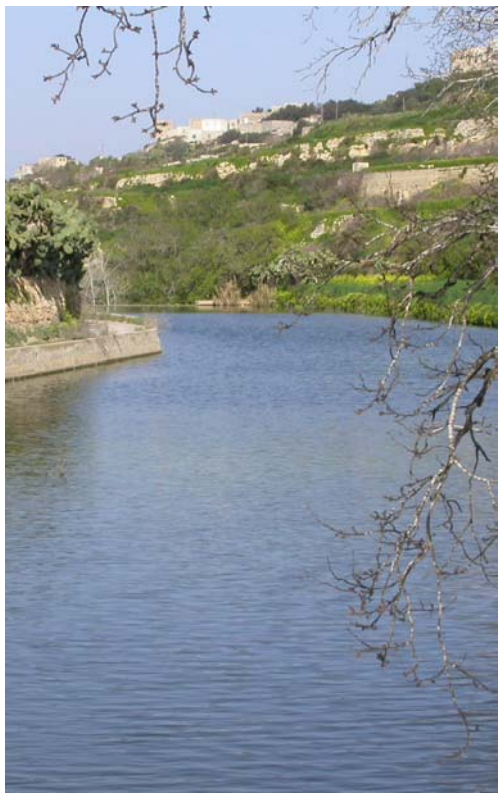
The economic study established important facts necessary for the formulation of an effective water policy and strategy in the Maltese Islands. Official figures underestimate by a wide margin, the true volume of water consumed annually while some data gaps have emerged regarding in particular the evaluation of the amount of water used by industry and agriculture

In fact agriculture has been identified as the major consumer with an aggregate of 43%, i.e. 37% for irrigation and 6% for farms whilst the domestic sector follows with 34%. Thus the need to integrate agricultural policies with water policy appeared as a major requirement in order to reach the objectives of the Water Framework Directive and to develop synergies between both policies.

The assessment of irrigation water use confirmed that almost half of the renewable groundwater is used for agricultural purposes and revealed the pressures on the aquifer based on a scientific estimate of crop water requirement.

Another study concerned the establishment of a Water Rights Administration System and was aimed to set the administrative structure and capacity for implementing an abstraction-permitting system, as a key process in the regulation of groundwater resources. Current abstraction processes by water service providers were first assessed, a series of hypothetical permitting strategies analysed and the necessary administrative capacity identified in order to implement a regulated abstraction.

The Draft Water Policy was submitted to Government. Details of the respective studies are given in Appendix 1.



LICENSING AND ARBITRATION BETWEEN MARKET PLAYERS

Licensing and Licence Schemes

Licensing schemes are tools to regulate market operations and activities. It therefore follows that more meaningful licensing will be a product of the reforms currently being planned and implemented, and described elsewhere in this report.

Operations as in the past are now being overtaken by the new market scenarios - reform leading to the liberalisation and competition in line with new national policies – as well as by the demand for higher standards and better service. This year has been characterised by in depth reviews of the more relevant licences and the development of the new licences to respond to current and future needs.

Accordingly, the Authority operates a number of schemes that are in line with the above, and another group that are a legacy of earlier times, and are in line for review and revision. The Authority is conscious that avoidable, inefficient bureaucracy is a handicap to industry and commerce and can cause frustration to customers and market operators. Therefore it keeps its licensing process and procedures continually under review, to ensure that they are the barest minimum possible.

The Licence schemes in forces at the beginning of the year were:

Directorate for Energy Resources Regulation

- Bunkering Operations
- Gas Distributors
- Jobbers / Kerosene Hawkers
- Kerbside Pumps / Petrol Stations
- Wiremen
- Notifications of installations of solar photovoltaic systems

Directorate for Minerals Resources Regulation

- Quarries

Directorate for Water Resources Regulation

- Swimming Pools

Others added or put into operation in the course of this financial year were:

- Licence to the Water Services Corporation for the supply of water through the public water distribution network.

Licences in the Regulation of the Fuel Sector

The fuel sector is in a period of rapid transition brought by frequent upheavals in the international price of oil and changes in local pricing policies to ensure sustainability. These changes will be further compounded by the reforms that are currently being worked out and that lead to liberalisation after the 31st December 2005.

In the transition period, a number of interim solutions had to be adopted in response to these changing situations, including:

- The revision of licence conditions for the Jobbers and Kerosene Hawkers Licences with the ultimate aim of having a single fuel distributor category.
- The decision to limit the issue of new licences so as not to prejudice the decisions leading to holistic reforms.
- The authorisation to Enemalta Corporation to explore new distribution channels for bottled

LPG, subject to approval of the final proposals by MRA.

In the transition period, the Licensing Unit dealt with numerous complaints and queries on most licences as it endeavours to administer the unwieldy existing schemes in place today.

Currently the MRA issues the following licences in the fuel sector:

1. Licence for petrol stations (Petrol Stations and Kerbside Pumps – 83 in no.). These are licensed to retail fuel for automotive use, i.e. diesel and petrol (leaded and lead replacement petrol), from fixed localities

2. Jobbers (6 licences). These are licensed to distribute fuels in bulk mainly to industrial and commercial concerns.

3. Kerosene Hawkers (22 licences). These are licensed as street hawkers to serve the domestic market with kerosene.

4. Gas Distributors (31 licences). These are licensed as street hawkers to retail LPG cylinders. In the past year this licence has been extended to retail from specific fixed points.

The basis of the existing licensing regime is not considered satisfactory. It has developed and grown up with successive agreements between the previous regulator and trade associations and was not administered properly, transparently or uniformly. The whole regime will be upgraded as part of the work in connection with the liberalisation of the sector

Swimming Pool Licences

A review of the process used for the application for a Swimming Pool Licence showed that the consultation process by MEPA and MRA prior to the issue of a development permit was causing an unnecessary administrative burden to both Authorities and increased the application processing time for the applicant. As this procedure had no regulatory implication concerning either of the Authorities it was decided to cease this consultation process. Discussions with MEPA also considered streamlining the procedure for the issuing of a discharge permit to coastal zones and the procedure for the revocation of the licence. Proposals to amend LN 146 of 1998 in this sense were put forward to Government.

During January and February 2005 the Unit also administered a number of on-site inspections to enhance data verification of its database.

Wiremen's Licences

It is clear that this licence scheme is based on out-of date concepts, is no longer meeting national needs and is detached from international thinking.

The Authority is therefore coordinating a study to:

- Establish the utility or otherwise of such a licence, and if found beneficial to review and revise the concepts and how they are best put into effect;
- Develop procedures, regulations and other tools required for correct application.

This work will specifically address, with reference to wiremen/technicians:

- The legal framework;
- The functions and responsibilities towards the Community and other employers;
- The academic standard and other qualifications including the evaluation of foreign nationals desiring to work in Malta.

A transition plan that will take us to the new scheme will be devised.

This exercise, which will be completed by November 2005, is being carried out with the full cooperation of all stakeholders, including the Employment and Training Corporation, the Department of Education, MCAST and other vocational institutions, Chamber of Professional Engineers, the Occupational Health and Safety Authority and Enemalta Corporation.

Quarry Licences

The land-use aspect of quarries remains regulated through a development permit issued by the MEPA after due consultation with MRA through the Directorate for Minerals Resources Regulation. This

process ensures the harmonisation of planning, environmental and mineral resources requirements. Several consultations were held with the MEPA on applications for the extension of soft-stone and hard-stone quarries, applications for development, and applications for the restoration of exhausted quarries as shown in Figure 14.

Consideration is based on a mineral resources management plan which takes economic, social and environment considerations into account. Such considerations are formulated in a comprehensive list of policies relevant to all phases of the extractive industry.

Ensuring Fair Practices in the Internal Market

One of the main functions of the Authority is to "ensure fair competition in all practices, operations and activities in the water, energy and mineral sectors".

As such, private operators have recourse to the Authority in cases of disputes.

During the year under review, the Authority intervened and decided on the following major issues. The decisions are produced in full on the MRA website www.mra.org.mt

Decision No 01/ED of the 7th July 2004 Concerning a Request to 'Reactivate' a Petrol Station

A request was filed with the MRA requesting it to reactivate a licence for the operation of a petrol station in Valletta, which licence was allegedly issued in 1987.

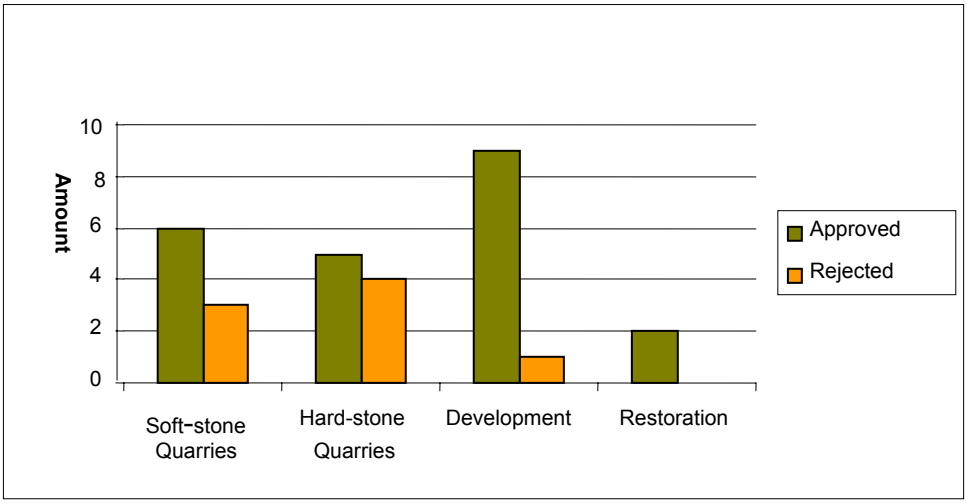
The Authority, on the basis of the documentation provided decided that the complainant did not hold a valid licence to operate a road station and so his request 'to make the licence operational' could not be entertained.

Decision 01/ED of the 21st April 2005 on a Request for a Clarification Ruling with Reference to the Earlier Decision No 004/03/ED of 14th October 2003, Malta Freeport Terminals Ltd vs Enemalta Corporation

In the earlier decision, MRA had determined that the charge for sale of fuel by Enemalta Corporation to Malta Freeport Ltd. was abusive in that it was a misinterpretation of the elements which are to be included in the selling price of the duty free fuel, in the light of the Malta Freeport Terminal's right to duty free fuel by virtue of the Malta Freeport Act.

The Authority was requested by Malta Freeport Terminal to clarify its previous decision by providing a ruling on what constitutes a non-abusive mark-up and an effective date of refund of overpayments.

Figure 14: Applications for Quarry Licences Process 2004 –2005



Decision No 02/ED of 9th June 2005 with regards to the Provision of Fuel and Oil Handling Services by Shell (Represented by Attard Services Ltd) vs Enemalta Corporation

The complaints by Shell/ASL concerned the use of 'common infrastructure' for refuelling of aircraft at Malta's International Airport and appropriate access to this infrastructure on fair, transparent and non-discriminatory conditions so as not to hinder effective access or frustrate competition. Shell also indicated the need of establishing appropriate market and efficient industry practices allowing for fair competition. Finally Shell/ASL complained that Enemalta's price for the services requested was neither relevant nor transparent and was not objective and discriminatory.

The Authority held that though it is outside the competence of MRA to establish whether the facilities in question constitute common infrastructure or not, access to this infrastructure was not in dispute. MRA declared that while it does not condone that blatant inefficiencies are absorbed into cost-based prices, Enemalta's pricing methodology does not per se constitute unfair competition or barrier to entry. The Authority also noted that it is not competent to rule on matters falling under the Competition Act properly.

It concluded its decision by inviting the parties to continue to negotiate on the basis of the above and to give MRA or other competent Authority the mandate to establish such a change if no agreement is reached within four weeks. The Authority had asked both parties to give it a mandate to determine the price to be charged for use of common infrastructure, but no such mandate was given by either parties.

Decision No. 03/ED of 24th June 2005 on Charging for Electricity Supply - Verdala Mansions Ltd vs Enemalta Corporation

The dispute centred around the definition of 'multiple consumer' and 'bulk supply' for the purposes of applicable articles under the 'Electricity Supply Regulations and Rules' of 1939 for the extension of electricity supply, and how these rules apply to a particular development, and the tariff and charges applicable to the circumstances.

The Authority in its decision, ruled on the status of the particular development vis-à-vis the Electricity Regulations and directed the parties to negotiate on that basis.

ELECTRICITY SURCHARGE

The electricity surcharge of November 2004 was decided by Government after consultation in the Malta Council for Social and Economic Development.

The Authority was requested to give its views on the methods of implementation as proposed in the legal notice drafted by Government. It presented its views in line with the legal framework regulating the operation of the Authority. In effect, a legal notice was published giving effect to the surcharge in 2005.

Courtesy of Enemalta Corporation

PARTICIPATION IN INTERNATIONAL FORA & IN R&D PROJECTS

Regulation of the sectors is an important activity at international level. With the Union striving to hasten the development of the Single Internal market, coordination between Regulators to harmonise regulatory policy and decisions is indispensable. Also effective regulation should be based on sound science and up-to-date knowledge.

Accordingly, the Authority participates in appropriate international fora and in research projects where and when issues relevant to its mandate are on the table.

Our participation contributes to inform the Authority and to provide awareness of current thinking and innovative approaches in its sphere of activity.

PARTICIPATION IN INTERNATIONAL FORA

CEER and EGREG

The MRA registered its membership of the Council of European Energy Regulators (CEER) in September 2004, automatically becoming a member of The European Regulators Group for electricity and gas (ERGEG), as from 1st May 2004.

CEER facilitates the cooperation of all European national energy regulators and provides joint liaison with EU institutions. EGREG was established by the European Commission and acts as an advisory group of independent national regulatory authorities to assist the Commission to ensure consistent application of the electricity and gas directives in all member states. Members are the heads of the national energy authorities and the EC is represented at high level at meetings.

The Authority is participating actively in both groups and has benefited from the discussion of regulatory issues, exchange of experience, and particularly the issues identified amongst other energy regulators in the building of common policies.

Energy Charter Treaty (ECT)

The ECT is a legally binding multilateral instrument covering investment protection, liberalisation of trade, freedom of transit, dispute settlement and environmental aspects in the energy sector. The energy charter protocol on energy efficiency and related environmental aspects (PEEREA) is also a legally binding instrument signed together with the ECT. A requirement of the protocol is the formulation of energy efficiency strategies and policy aims, the establishment of appropriate regulatory frameworks, the development of specific programmes for the promotion of efficient energy usage and the reduction of harmful environmental practices in the energy sector. During this financial year, the MRA limited its participation in meetings to those where the most relevant issues were being discussed.

Promotion of RES

The Authority participated in a number of international fora and experts meeting on the implementation of the RES Directive. This included:

- a workshop on the status of the implementation of the Directive 2001/77/EC in the new member states organised by the German Federal Ministry for the Environment, Nature, Conservation and Nuclear Safety in co-operation with the Deutsche Energie-Agenteur (DENA). This workshop dealt with the current overall situation of renewable

energies for power production in the EU and the effects of the German support system. Delegates presented the situation of renewable energy in their respective countries. In addition, the workshop considered in detail the technical aspects of the integration of renewable energies, the effectiveness and combination of measures supporting renewable energies and the administrative issues.

- a stakeholder consultation workshop for southern European countries Italy, Greece, Cyprus and Malta on the European Tracking System for Electricity (E-Track project) organised by *Gestore Rete Transmissione Nazionale* (GRTN) of Italy. The overall goal of this EU-funded project is to draft a harmonised standard for tracking electricity generation attributes in Europe. The additional project objectives are to:
  - cover all relevant tracking requirements which are imposed by European and national policies (disclosure, guarantees of origin, support schemes, green power etc.);
  - facilitate cross-border trade of electricity and generation attributes;
  - avoid multiple counting of electricity attributes (e.g. from renewable energy sources);
  - simplify verification of tracking procedures
- a workshop organised by the EU Commission in cooperation with the Joint Research Centre on the management of solar electricity systems in distributed energy generation network. The workshop aimed at providing a forum for communication of the ideas and initiatives related to effective exploitation of solar energy resource and effective management of various solar energy applications. For this reason, the goal is to promote an interrelation of researchers, decision makers and industry associations responsible for developing and implementing energy strategies in European Union. The workshop dealt with :
  - Technical and geographical aspects of solar generation in Europe;
  - Provision of energy services;
  - Implementation of solar electricity strategies;
  - Pathways for fast conversion of research outcomes to practical applications.

The Common Implementation Strategy of the Water Framework Directive

EU Water Directors Meeting

MRA officially attended the meetings of the Water Directors of the European Union, the Candidate Countries and EFTA Countries, which were held in Amsterdam and in Luxembourg, during the period under review.

At these meetings the Commission presents the developments on the salient issues related to the implementation of the Water Framework Directive, namely:

- the progress of the Common Implementation Strategy for the Water Framework Directive during the previous six months;
- the new Common Implementation Strategy work programme for the following twelve-month period;
- integration of water policy in other policy areas, in particular agriculture policy, cohesion policy, research and LIFE funding;
- current developments linked to the reporting function, in particular, those related to WISE (Water Information System for Europe);
- the progress in the preparation of a EU Marine Strategy;
- the issue of flood prevention and protection;

- the EU Water Initiative and link to the Water Framework Directive;
- the issue of climate change and water policy;
- the new Bathing Directive and the new Daughter Directives for groundwater and the preparation for a Directive on priority substances and
- the state of play and reporting regarding the Urban Waste Water Treatment Directive including issues of waste water reuse.

At the Luxembourg meeting the Presidency and the Commission promoted an initiative of policy oriented debate on key water issues and on the appropriate remedial actions, that may be taken both at Member State and EU level. Due consideration was given to a possible need for prioritization of the actions and on how the actions will depend on setting of the environmental objectives. Four parallel discussion groups were therefore set up to discuss the same themes and water topics related by region, corresponding more or less to the eco-regions as identified in the WFD. The topics were:

- Key issues arising from Art.5 report – *Gap analysis between the implementation of existing legislation/pre-WFD Community legislation and the achievement of the WFD objectives;*
- Environmental objectives *–Exemptions and uncertainties;*
- Water policy and other EU-policies – *The integration aspect;*
- Fora, mechanisms and processes for development and implementation of EU-water policy – *Review of the mode of working*.

The resulting debate gave Water Directors the possibility to express whether future activities should continue to be focused on the implementation of the existing EU-water policy or on the development of further policy (e.g. climate change) or on ways how to balance these two issues. The structures and the functioning of the, mechanisms and processes in place, required to develop and implement EU-water-policy (CIS,SCG, WDs) were given special attention. At the end of the meeting, the Water Directors released a statement on the future of EU water policy, highlighting the future challenges of the Water Framework Directive and emphasising amongst other issues, the need for integration of water policy with other policy areas.

Groundwater Working Group

The Groundwater Working Group is part of the Common Implementation Strategy of the Water Framework Directive. It aims both to clarify groundwater issues that are covered by the WFD and prepare the development of technical guidance documents in the light of the orientations given by the future Groundwater Directive upon its adoption. Officials from the Authority participated in the three plenary meetings of this working group:

- Plenary meeting which discussed groundwater chemical status assessment with particular reference to monitoring, trend assessment and groundwater threshold values.
- Plenary meeting during which drafting groups on Groundwater Monitoring, Protected Areas, Discharges, Status and Trends were set-up with the aim of developing practical guidance documents for Member States which would

possibly be adopted by comitology. MRA will be participating in the 'Groundwater Monitoring' and 'Status and Trends' drafting groups.
- Plenary meeting during which progress by the various drafting groups was discussed.

The Working Group, in December 2004, also published a Technical Report on Groundwater Monitoring which included contributions from the MRA on groundwater monitoring in Malta.

Groundwater Monitoring Drafting Group

The main objective of this drafting group is to discuss the core elements on groundwater monitoring already embedded in the WFD and compile a guidance document of technical monitoring specifications as part of a groundwater guidance document. This part of the guidance drafting work will subsequently be complemented, as appropriate, with new elements arising from the adopted groundwater directive. The guidance document must also provide the basis for the development of consistent monitoring across Europe and must enable networks to be developed and maintained at high standards, thereby providing the necessary information to assess groundwater status, identify trends in pollutant concentrations, support the establishment and assessment of programmes of measures and the effective targeting of economic resources.

MRA's contribution in this drafting group was mainly concerned with the provision of technical details on groundwater monitoring in coastal and small-island situations. A case study on specific groundwater monitoring requirements in small islands was also submitted.

Drafting Group on Groundwater Issues in the Mediterranean

The objective of the MED-EUWI Groundwater DG is to exchange experiences, share common challenges and develop synergies between EU and non EU countries of the Mediterranean region, aiming at the adoption of a common vision on groundwater resources management, based on the Water Framework Directive (WFD) approach and objectives and the regional conditions.

The MRA is actively participation in the preparation of a "Mediterranean document on Groundwater" with specific technical contributions and recommendations on issues relating to the management of groundwater resources under conditions of saline intrusions. Further technical details on this drafting group can be obtained from http://www.emwis.org/HroundWaterHome.htm

Drafting Group on the Environmental Objectives of the WFD

Article 4 of the WFD sets out the 'environmental objectives' and provides that the most stringent shall apply. Thereafter, a number of 'exemptions' from the objectives are introduced which describe the conditions and the process in which they can be applied. These exemptions range from small-scale temporary exemptions to mid- and long-term deviations from the rule "good status by 2015", and include the following aspects:
- the extension of the deadline by two times six years, in other words good status must be achieved by 2027 at the latest;
- the achievement of less stringent objectives under certain conditions;
- the temporary deterioration of the objectives in case of natural causes or "*force majeur*";
- new modifications to the physical characteristics of a surface water body or alterations to the level of groundwater bodies, or failure to prevent status deterioration of a body of surface water as a result of new sustainable human development activities.

The Drafting Group therefore developed a Discussion Document on the Environmental Objectives which analysed key issues concerning the objective setting and exemption process outlined in the Directive and outlined a number of key-messages aimed to provide a common understanding of this preparatory process. The document also made recommendations for further work in the context of the WFD Common Implementation Strategy.

Officials from the Authority also participated in the 'Water Framework Directive Objectives Workshop' which was jointly organised by Germany's Federal Environmental Agency and the European Commission as part of the Common Implementation Strategy (CIS) for the Water Framework Directive which was held in Berlin on the 26th - 27th May 2005. This workshop discussed issues on:

i extension of deadlines and less stringent objectives;
ii cost-effectiveness assessment and proportionality of costs;
iii other EU-legislation and associated water bodies;
iv heavily modified water bodies and new modifications.

A case study entitled "Theoretical timeframes required for the remediation of groundwater in line with the achievement of the environmental objectives of the Water Framework Directive" was presented by the Directorate during this workshop. This presentation dealt with the timeframes which will be required to reduce the nitrate content in Malta's main sea-level groundwater body and examined the applicability of the extensions and exemptions outlined in the Water Framework Directive to such cases.

Working Group on the Reporting of the WFD

The issues that were discussed by the group were:

- the State of Reporting in WISE (Water Information System for Europe). Member States are encouraged to use WISE for the submission of Article 3 reports. Compliance for Article 3 reporting will be checked by the DG Environment and an assessment on a Member State basis will be made and feed back given to the individual countries.
- Preparation of 2007 Guidance for Reporting on Monitoring. The EU Commission presented the first draft of the reporting sheets for the Report to be prepared under the WFD in 2007. The MRA submitted its feedback on the reporting sheets emphasising the need for greater flexibility in the selection of monitoring sites typology so as to take into account the countries specificities.
- Establishment of a Drafting Group on State of the Environment and Trends Reporting.
- Preparation of 2010 Guidance for Reporting on River Basin Management Plan (RBMP). It was decided to agree on the monitoring guidance before starting on the RBMP reporting guidance. An outline will be presented at the October Working Group meeting. The format of current reporting sheets will be followed and Annex VII of the Directive used as the basis of the table of contents with at least one reporting sheet for each area. It is also envisaged that previous reporting sheets will be updated as necessary. It is anticipated that the Guidance will be completed in 2006. The debate on some of the integration aspects also needs to be continued and the message communicated to the Committees on other Directives of the need for integration with WISE.
- Report on the GIS Workshop. A new activity will be launched on the SDIC to make WISE an integrated part of the INSPIRE network. Issues relating to coding were discussed. Water Directors had agreed to develop a European coding system and thereafter to discuss the impact that this will have on Member States.
- Further developments in WISE and WISE GIS (e.g. visualisation of reports).

Euro Mediterranean Water Information System

A primary initiative of the Euro-Mediterranean Partnership was the establishment of the Euro-Mediterranean Water Information System (EMWIS) with the objective to collect and disseminate information on water know-how to decision makers.

This tool enables co-operation between Euro-Med countries in developing, sharing and facilitating access to information and to define common outputs and programmes. Twenty-seven partner countries are participating in this project and the information is made available by a "National Focal Point" and a central Technical Unit. MRA is the national focal point for Malta and it is a member of the Steering Committee and the Vice President of the Co-ordination Committee.

After the management meeting in Malta in May 2004, the programme has been used to support Malta (and other Mediterranean partner countries) in enhancing its national water information system. EMWIS carried out a series of feasibility studies in 12 Mediterranean countries, including Malta, to enhance their national water information system (NWIS). After a meeting held in Rabat, Morocco in July 2004, the required direct financial aid was confirmed to MRA to enable it to meet its commitments.

In November, 2004, MRA attended an information and training seminar for data managers in Madrid. To aid in the implementation of the NWIS the EMWIS Technical Unit supplied 10 National Focal Points, with IT equipment and a server worth €13000 is currently being installed at the MRA to mirror the web server hosted by the EMWIS Technical Unit.

In June, 2005, a representative from the MRA attended the eighth EMWIS Steering Committee held in Athens, when a number of proposals were made namely:

- to integrate within EMWIS the monitoring for the Mediterranean of trends towards the Millennium Goals relating to water and sanitation.
- the implementation of the Mediterranean Strategy for Sustainable Development as validated by the Mediterranean Commission on sustainable development in June 2005 in Athens.
- to stress the importance of the Water Framework Directive for the transfers of knowledge and experiences between the EU and the partner countries.
- to analyse the conditions of opening EMWIS at the civil society.
- to involve the European Commission departments working on the neighbourhood policy in order to improve the financing of the water sector in the partner countries.

The first results of the survey on the concepts of interest of the EU Water Framework Directive for Mediterranean Partner Countries (MPC) were presented prior to transmission the EMWIS NFP and the European Commission .

A concept note was also presented, introducing a potential topical study on the specificities of the Mediterranean islands based on a short state of art in Cyprus, Malta and Sicily. During the meeting several other topics were proposed, such as specificities of the oases, the intrusion of marine water or the exploitation of the coastal springs.

The Steering Committee also recommended collaboration with other initiatives and proposed:

- a memorandum of understanding between EMWIS and the regional monitoring and support unit (RMSU) of the European Commission's SMAP program (Euro-Mediterranean program for the environment).;
- The continuation of the discussions with the initiatives of Middle-East Peace Process in the water sector (EXACT and WaterNet);
- establish links with the Arab Water Council.

Finally the Steering Committee underlined the importance of the renewal of the partnership agreement between the EMWIS, INBO (International Network of Basin organisations) and the MENBO (Mediterranean Network of the Basin Organisations) signed in Marrakech in May 2005,

A 4-day visit by two experts during the first week of July, 2005 took place at the MRA between various organisations which were identified to be potential stakeholders in the coordination of the National Water Information System (NWIS). Identified stakeholders were the Malta Environment and Planning Authority, the Water Services Corporation, the Health Department, the National Statistics Office and the Malta Resources Authority.

Problems encountered in implementing the NWIS, particularly those of data accessibility and inconsistency were recognized and analysed. During a joint meeting held between all participating stakeholders possible solutions were agreed upon and

it was also concluded that since the MRA is the competent Authority for inland water it should also host the NWIS. It was also agreed that the MRA shall outsource the development and hosting of the NWIS. In becoming the National Focal Point for the NWIS, the MRA has taken up the responsibility for the coordination of agreements between all stakeholders as well as the NWIS.

The MRA is currently seeking to collaborate with information providers so as to improve the content of the five established EMWIS topics on the National Focal Point website www.emwis.org.mt. These include Data management, Documentation, Research, Training and Institutions/Organisations. In this way more data will be accessible to the public via the NFP internet site. With the implementation of the National Water Information System several local and foreign organisations would benefit from a centralised system of data retrieval.

EU Projects

Intelligent Energy for Europe

The Authority will also be participating in a project funded under the Intelligent Energy – Europe programme for monitoring energy efficiency in Malta and other states. The objectives of the project are to:

- Monitor energy efficiency progress (and CO2): use of aggregate indicators (energy efficiency index) to provide the synthetic overview and detailed indicators by sector / end-use;
- Comparison of differences between countries in their relative energy efficiency performance; comparison with EU-15 countries and benchmark values;
- Evaluation of national energy efficiency policy measures (and Community Directives): gathering information available on the impact of measures from existing evaluations and then identifying the successful and innovative measures;
- Use of two complementary tools:
  - a database on energy efficiency / CO_2 indicators;
  - a database describing energy efficiency measures by country.

This project was accepted and will start during 2006.

5th EU Framework Programme

WASAMED Workshop in Amman Jordan on Water-use Efficiency and Water Productivity

Under the 5th Framework programme, the Water Directorate is currently participated as partner number 16 in the thematic network WASAMED. The fifth thematic workshop on *Water-use efficiency and Water Productivity* was held in Amman in September this year. MRA collaborated with the other Maltese partners in the gathering of information concerning the workshop theme and presented a country-report jointly with, the University and WSC. The main objective of this Workshop was to assess the situation "on the ground" related to research on water use efficiency in agricultural practices and water productivity, in the Mediterranean region.

The workshop allowed an exchange of experiences in water-use efficiency techniques as applied in several Mediterranean countries. It provided an excellent forum for discussing the most common indicators used for determining sustainable water use in agriculture as well as the economic aspects of water use efficiency, such as, water[-allocation, optimisation of cropping patterns and the cost of different agro-practices. Special emphasis was laid on the implementation of *Deficit Irrigation* strategies and their relevance to address water shortage in the Mediterranean. A common consensus was expressed on the need to develop a knowledge base to support

policy makers, operators and different stakeholders in the decision-making process to promote water-saving in Mediterranean agriculture.

6th EU - Framework Programme

The Authority submitted two proposals for participation in projects under the Sixth EU Framework Programme for Research and Industrial Development (FP-6) programme.

- AQUALIT - *Detection , Assessment, Utilisation Strategies and Management of Sub-sea groundwater Discharge in the Mediterranean.*
- MELIA - *Mediterranean dialogue on integrated water management*

The Coordinated Action MELIA aims at structuring a dialogue among the key stakeholders concerned and affected by water use and management, such as scientists and professionals, decision makers, policy makers, water providers, citizens. This dialogue aims at creating a forum where water players can share knowledge, find consensus and propose new perspectives on the emerging needs and appropriate integration of knowledge for water management, in a region of scare resources such as the entire Mediterranean basin. The MELIA proposal was approved.

INTERREG B - ARCHIMED

The MRA, together with the Water Services Corporation and other partners from Italy, Greece and Cyprus has submitted six research proposals for funding under the Archimed programme. The overall objective of the Interreg B - Archimed programme is to promote trans-national cooperation between the regions of the South-eastern Mediterranean, including parts of neighbouring third countries with which Archimed regions wish to establish long-term relations. According to the Commission Guidelines, "transnational cooperation between national, regional and local authorities aims to promote a higher degree of territorial integration across large groupings of European regions, with a view of achieving sustainable, harmonious and balanced development in the Community and better territorial integration with candidate and other neighbouring countries".

Brief details of the research proposals are given below:

I-WATER - Innovative Water Application Technologies for Economic Reuse

The project aims to develop and implement a decision making support methodology that can be used by local authorities, so as to evaluate the sustainability of water-resources management solutions, including re-use and high quality water production technologies.

TALETE DSS - Development and Application of a GIS Decision Support System for Integrated and Sustainable Management of Water Resources in Water Districts, according to the Water Framework Directive 2000/60/EC.

The project aim is, through the development of a Water GIS decision support system and pilot applications in zones especially threatened by drought, to improve water demand-supply balances and to promote transnational cooperation for the implementation of integrated strategies for managing water resources, implementing the EU Framework Directive 2000/60/EC.

PRODIM - Proactive Management of Water Systems to Face Drought and Water Scarcity in Islands and Coastal Areas of the Mediterranean

The objective of this project is to device a comprehensive proactive management plan to combat drought and water scarcity in drought-prone areas of the Mediterranean region with particular reference to the islands and coastal areas.

WATER-MAP - Development and Utilisation of Vulnerability Maps for the Monitoring and Management of Groundwater Resources in the Achimed area.

The main objective of this project is the application of the DRASTIC method in the Archimed areas in order to produce vulnerability maps related to groundwater pollution, and the utilisation of these maps in a spatial model for the monitoring and management of groundwater resources.

MED_ISOLAE - The Mediterranean Islands Sustainability Framework

The promotion of a sounder and more sustainable evolution plan (environmental, social, economic and

administrative) for the Mediterranean islands is of paramount importance to the European Union. This requires the adoption of island-specific development models which:

- take more-fully into account the interests of all the stakeholders concerned;
- are based on a larger and more diversified palette of economic, social and administrative opportunities, and
- do not exceed the carrying capacity of the environment.

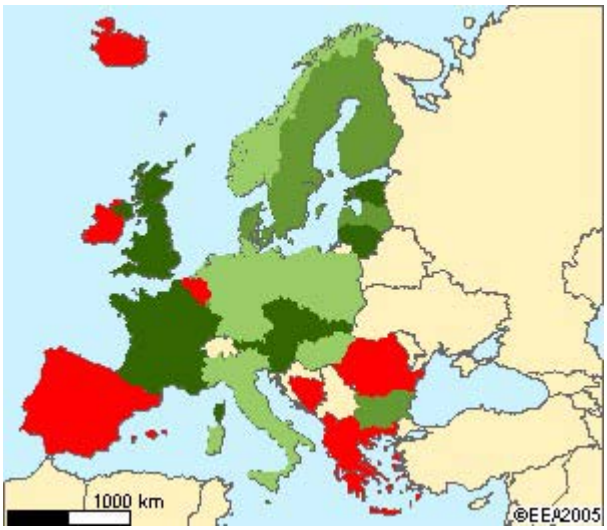
WR_SPA - Integrated Management of Water Resources Systems in Protected Areas

This project deals with the sound and integrated management of water resources and more specifically it will address issued that face inland groundwater resources (aquifers) with qualitative and quantitative degradation problems and coastal aquifers facing sea-water intrusion along with water reserves facing exhaustion problems.

All proposals are currently being evaluated.

The Directorate for Water Resources Regulation is also currently developing research proposals under the INTERREG IIIA - Italia-Malta programme and the INTERREG IIIB - MEDOCC programme. These programmes support projects aimed at cross-border and transnational co-operation in the field of territorial development of Western Mediterranean countries. The Directorate has also participated in a partner-search forum, held in Ragusa, Sicily by the Presidenza della Regione Siciliana, the managing authority of the INTERREG IIIA programme. The forum consisted of two sessions. The first part

Figure 15: EWN-3: Groundwater Quality– Draft Summary Results for 2004



		9 countries with a score of 3 points: Austria, Czech Republic, Estonia, France, Lithuania, Malta, Slovakia, Slovenia, United Kingdom
		7 countries with a score of 2 points: Bulgaria, Denmark, Finland, Latvia, Liechtenstein, Luxembourg, Sweden
		6 countries with a score of 1 point: Germany, Hungary, Italy, Netherlands, Norway, Poland
		10 countries did not deliver data: Albania, Belgium, Bosnia and Herzegovina, FYR of Macedonia, Greece, Iceland, Ireland, Portugal, Romania, Spain
Not applicable	N/A	This data flow applies to all EIONET countries.

Source: European Environment Information and Observation Network (EIONET)

Figure 16: Detailed Data Flow Analysis for Malta—2004

Data flow name	Status	Progress 2003	Progress 2004	Remark
EWN-3: Groundwater quality	2005/07/07			Data provided on time and in the requested format. General description and selected quality data available. Saltwater intrusion and GIS data provided.

Source: European Environment Information and Observation Network (EIONET)

provided information on the programme and application pack for the current call for proposals. The second part consisted of four workshops, each dealing with a measure of the programme. This forum served as an excellent opportunity to make contacts with Sicilian organisations in order to develop potential partnerships for projects.

EUROWATERNET - ANNUAL REPORTING

The European Environment Agency (EEA) is the agency officially appointed by the Commission to collate the necessary data on groundwater quality and general characteristics of water bodies from EU Member States. Data collated includes details on the hydrology, geology, hydrogeology of water bodies and pressures on them. EUROWATERNET holds all the data of the Member States in a harmonised manner thus facilitating European-wide interpretation and cross-referencing. EEA has also established a core set of indicators and information submitted to EUROWATERNET is required to update the data flows and fact sheets associated with the EEA's core set of indicators.

Data on the two major groundwater bodies in the Maltese Islands; the Malta Main and the Gozo Main Sea Level Groundwater Bodies has been submitted to the EEA. The information provided included data on the quantitative and qualitative status of these groundwater bodies, GIS layouts of the two groundwater bodies and well as details on the risks for saline intrusion.

The submission, for the first time, of saline-intrusion data enabled Malta to obtain the highest score in this exercise as indicated in the table above. This data is publicly available on the EEA Data Service's website.

ENERGY MODELS

The Authority also started on the process of establishing an energy balance for Malta for internal use as a basis for managing energy flow, using standard methodologies and definitions. The first step was to establish contact with the National Statistics Office to identify methodologies and terminology used, particularly in reporting to the European statistics office the Eurostat.

Three software packages also were analysed.

The International Atomic Energy Agency donated ENPEP for Windows is a windows version of the Energy and Power program, developed by Argonne National Laboratory under the auspices of the U.S Department of Energy. This program uses a non-linear, market based equilibrium approach to determine the energy supply for the entire energy system and the response of various segments of the energy system to changes in energy price and demand levels.

The Long-range Energy Alternatives Planning system, is a software tool developed by the Stockholm Environment Institute-Boston for energy and environmental scenario analysis. LEAP is a forecasting program that can be used to build sophisticated simulations and data structures. LEAP can be used to project the energy supply and demand situation in order to glimpse future patterns, identify potential problems and assess the likely impacts of different user specified scenarios. However, its process capabilities are limited since its main job is that of forecasting future trends based on the input and therefore does not automatically generate optimum or market-equilibrium scenario. Nonetheless based on user-defined data LEAP can be programmed to opt for a least cost proposal based on present and future fuel costs.

The MARKAL model, developed by the International Energy Agency (IEA), is an integrated energy system least cost optimisation model that determines the least cost means of satisfying the demand for energy services. It uses linear programming to model a generalised energy system. The analysis is “demand driven” in that feasible solutions are obtained only if all the specified end-use demands for energy services are satisfied for every time period.

Further analysis of these packages, particularly considering the differences in cost and the facilities offered, is being undertaken.

APPENDIX 1 - TECHNICAL PAPERS

An Overview of the Initial Characterisation of Groundwater Bodies in Malta

Abstract

Article 5 of the Water Framework Directive requires that an analysis of the characteristics of the Maltese Water Catchment District is carried out. During 2004, the Malta Resources Authority prepared four reports outlining the studies performed in this 'initial characterisation' phase of the implementation of the Directive. These studies show that the state of Malta's groundwater resources is generally poor.

Introduction

The Water Policy Framework Regulations require the Malta Resources Authority as the designated Competent Authority in Malta in so far as 'inland waters' are concerned, to carry out an 'initial characterisation' of the groundwater bodies within the Maltese Water Catchment District in accordance with the provisions laid out in Regulation 5, in order to identify those bodies which are at risk of failing to achieve the Environmental Objectives of the Regulations by 2015.

The Regulations outline that for each water catchment district, three main studies are undertaken according to the technical specifications outlined in Annexes II and III to the same regulations. These studies are:

- an analysis of groundwater body characteristics,
- a review of the impact of human activities on the status of groundwater, and
- an economic analysis of water use.

Another reporting requirement of the Regulations, is the establishment of a register of areas requiring special protection, where the MRA was the designated competent authority responsible for the formulation of Drinking Water Protected Areas.

The first part of this overview outlines the contents of the four main reports produced by the MRA which provide an in-depth analysis of the main characteristics of the groundwater bodies in the Maltese Water Catchment District; whilst the second part outlines the principal conclusions of these studies which were carried out by the MRA and reported to the European Commission in March 2005.

These documents may be downloaded from the Authority's web-site: http://www.mra.org.mt/wfd_introduction.shtml.

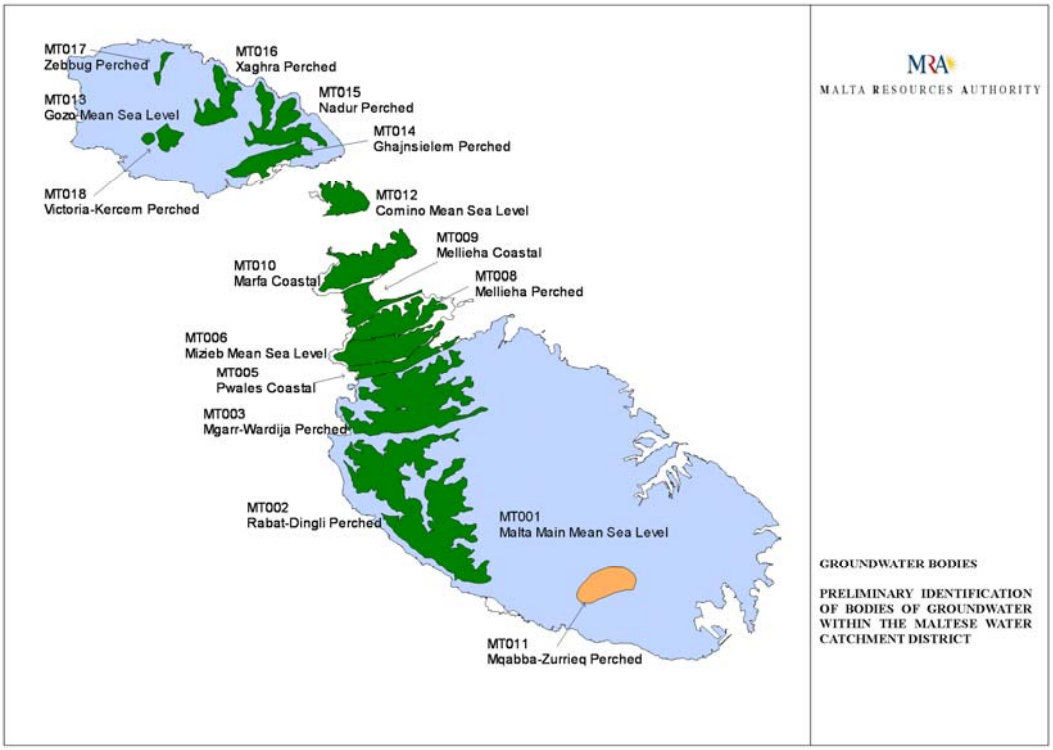
Initial Characterisation of the Groundwater Bodies in the Maltese Water Catchment District

Introductory Document to Article 5 Report under the Water Policy Framework Regulations, 2004

The 'Introductory Document to Article 5 Report under the Water Policy Framework Regulations, 2004' supports the initial delineation of 'bodies of groundwater' in the Maltese Water Catchment District which has been strictly based on geological boundaries and has resulted in the identification of sixteen groundwater bodies. Basic details supporting this subdivision are presented in Figure A1.1.

From a structural point of view, the island of Malta can be divided into two parts: the northern and the central/southern regions; the limit being marked by the sealing Pwales fault. In the major part of the island, south of the Pwales fault, the Upper Coralline

Figure A1.1: Preliminary identification of bodies of groundwater within the Maltese Water Catchment District



Limestone and the Lower/Globigerina Limestone aquifers are stacked vertically. The Lower Coralline Limestone aquifer is in direct contact with sea-water and due to the density contrast of fresh-water and salt-water a 'Ghyben-Herzberg' system is developed: - a freshwater lens floating on saltwater with a thickness approximately 36 times below sea level than the height of the freshwater surface above sea-level. The Upper Coralline Limestone aquifer in these regions is perched above the Blue Clay aquiclude formation and is divided into two hydrologically separate blocks due to faulting; namely the Rabat-Dingli and the Mgarr-Wardija Plateaux. The northern part of the island is divided by a NE-SW fault system into a succession of horst and graben-like structures; the graben being occupied by rather flat valleys separated by ridges. This structure with parallel compartments separated by faults leads to the point that the resulting aquifer blocks are considered as independent from one another from a hydrogeological point of view. Distinct 'bodies of groundwater' are thus developed in the hydrologically separate aquifer blocks at Pwales Valley, Mizieb, Mellieha Ridge, Mellieha Bay and Marfa Ridge regions.

The island of Comino supports a distinct 'Ghyben-Herzberg' groundwater body within the Upper Coralline Limestone.

In the island of Gozo, the Lower Coralline Limestone aquifer sustains another 'Ghyben-Herzberg' system displaced over the whole island except for a small region around the harbour of Mgarr in the south-eastern part of the island, where the Blue Clay formation occurs at sea-level due to faulting. The Upper Coralline Limestone outcrops in geographically separate areas, namely at Ghajnsielem, Nadur, Xaghra, Zebbug and Victoria/Kercem giving rise to separate aquifer blocks sustaining distinct bodies of groundwater.

Initial Characterisation of the Groundwater Bodies within the Maltese Water Catchment District under the Water Policy Framework Regulations, 2004

The 'Initial Characterisation' report describes the basic characteristics of the bodies of groundwater in the Maltese Water Catchment District and estimates the

risks each groundwater body has of failing to achieve the objectives set by the Water Policy Framework Regulations. The report therefore provides an analysis of the following characteristics for each groundwater body:

i Location and Importance,
ii Pressures on the Quantitative Status,
iii Pressures on the Qualitative Status,
iv Presence of terrestrial eco-systems,
v Geological Characteristics.

On the basis of this information a preliminary risk assessment for each groundwater body was performed, in which the risks of achievement of the Directive's various objectives was analysed. These partial risk assessments were finally combined, with each groundwater body being classified according to the status of highest risk determined for any of the categories considered. The final assessment resulting from the characterisation study is shown in Table A1.1.

According to the provisions of the Regulations, therefore, 'further characterisation' will be undertaken in order for the 'risk' determined during the initial characterisation to be accurately quantified. This is because none of the groundwater bodies were conclusively determined not to be 'at risk' of failing to achieve the environmental objectives set by the Directive. The process of 'further characterisation' has been already initialised by the Directorate and is expected to be concluded by end-2007. This investigation will be based on the information collected during the initial phases of the characterisation process and will combine pressure (human activities), hydro-geological (aquifer system) and monitoring data in order to model the IMPACTS of these pressures and quantify the RISK to the achievement of 'good' status.

Review of the Impacts of Human Activities on Groundwater Bodies within the Maltese Water Catchment District

The 'Review of Human Impacts' comprises a review of the impact of human activity on the status of groundwater. The report is essentially a register of anthropogenic pressures for each groundwater body which has been identified following the investigations in the 'Initial Characterization' phase as being at risk of failing to meet the objectives set in Article 4.

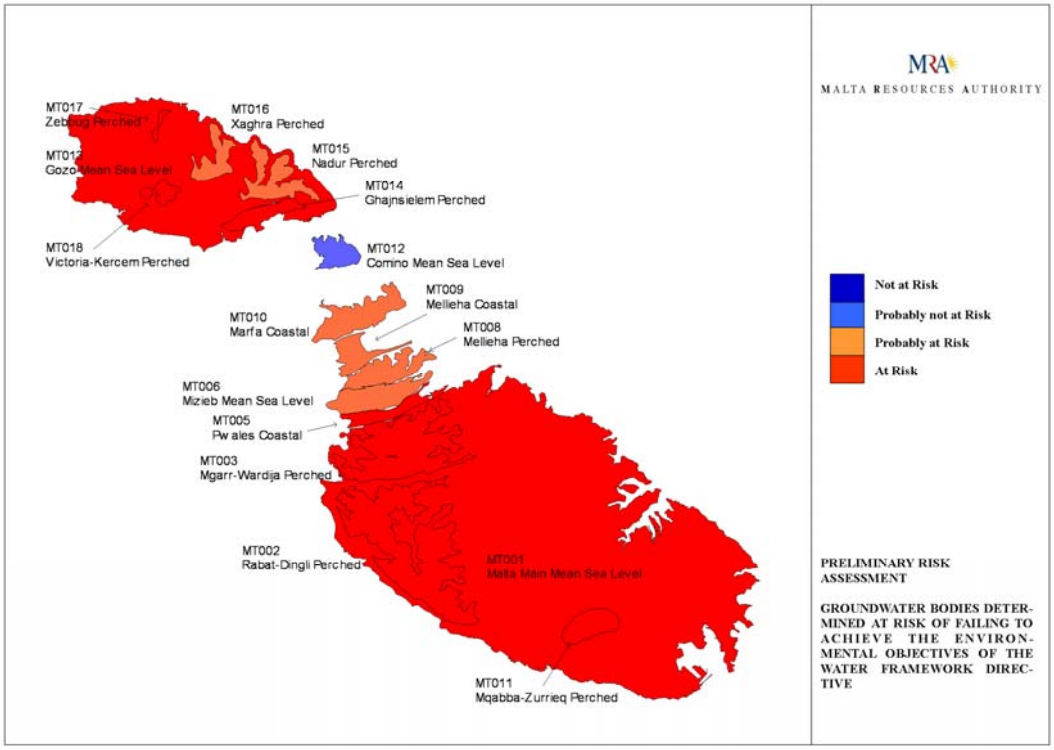
Annex II to the Directive outlines a set of data requirements as:

- the location of points in the groundwater body used for the abstraction of water with the exception of:
  - points for the abstraction of water

Table A1.1: Risk Assessment for Bodies of Groundwater in the Maltese WCD

Groundwater Body Code	Groundwater Body Name	Risk Assessment
MT001	Malta Main Mean Seal Level	At Risk
MT002	Rabat-Dingli Perched	At Risk
MT003	Mgarr-Wardija Perched	At Risk
MT005	Pwales Coastal	At Risk
MT006	Mizieb Mean Sea Level	Probably at Risk
MT008	Mellieha Perched	Probably at Risk
MT009	Mellieha Coastal	Probably at Risk
MT010	Marfa Coastal	Probably at Risk
MT011	Mqabba-Kirkop Perched	At Risk
MT012	Comino Mean Sea Level	Probably not at Risk
MT013	Gozo Mean Sea Level	At Risk
MT014	Ghansielem Perched	At Risk
MT015	Nadur Perched	Probably at Risk
MT016	Xaghra Perched	Probably at Risk
MR017	Zebbug Perched	At Risk
MT018	Victoria-Kercem Perched	At Risk

Figure A1.2: Preliminary Risk Assessment - Groundwater Bodies Determined at Risk of Failing to Achieve the Environmental Objectives of the WFD



providing less than an average of 10m^3 per day, or

- points for the abstraction of water intended for human consumption providing less than an average of 10m^3 per day and serving less than 50 persons.

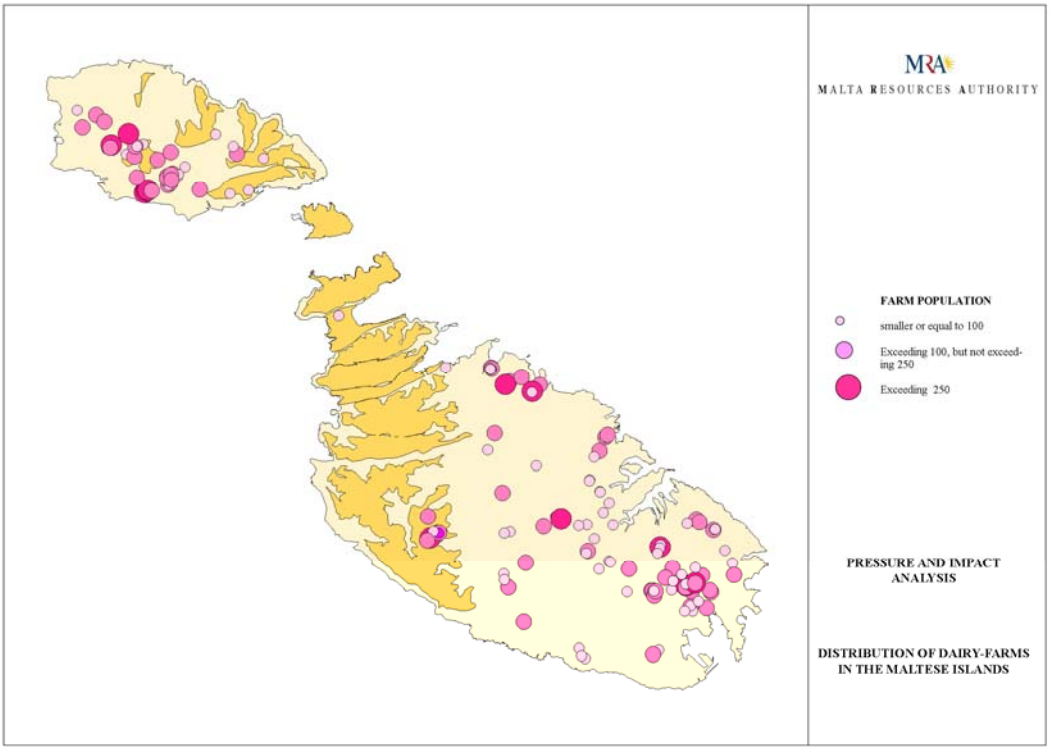
- the annual average rates of abstraction from such points;
- the chemical composition of water abstracted from the groundwater body;
- the location of points in the groundwater body into which water is directly discharged;
- the rates of discharge at such points;
- the chemical composition of discharges to the groundwater body, and
- land use in the catchment or catchments from which the groundwater body receives its recharge, including pollutant inputs and anthropogenic alterations to the recharge characteristics such as rainwater and run-off diversion through land sealing, artificial recharge, damming or drainage.

The report thus discusses the main anthropogenic pressures in the Maltese islands and their potential influence on each groundwater body. The pressures discussed include diffuse sources of pollution such as agricultural and urban activities; point pollution sources such as fuel storage sites, industrial activities and animal husbandry activities as well as groundwater abstraction sources.

Establishing Drinking Water Protection Areas under the Water Policy Framework Regulations, 2004.

The Water Policy Framework Regulations (L.N. 194 of 2004) under Regulation 6 requires the establishment of a register of all areas lying within each Water Catchment District which have been designated as requiring special protection under specific legislation for the protection of their surface water and

Figure A1.3: Distribution of Dairy Farms in the Maltese Islands



groundwater or for the conservation of habitats and species directly depending on water.

Under the Memorandum of Understanding formulated between the Malta Environment and Planning Authority and the Malta Resources Authority for the co-ordinated implementation of the Water Policy Framework Regulations, 2004; the Malta Resources Authority is responsible to determine the areas to be protected for reasons related to the abstraction of groundwater intended for human consumption. The Authority's proposals are outlined in the document "Establishing Drinking Water Protection Areas under the Water Policy Framework Regulations, 2004" which presents detailed plans of the proposed areas to be designated as drinking water safeguard zones.

Economic Characterisation of the Maltese Water Catchment District

The 'Economic Characterisation of the Maltese Water Catchment District' report describes and evaluates the economic characterisation of the Maltese Water Catchment District. It addresses the issues in the context of the requisites of the Water Framework Directive. Article 9 of the WFD requires Member States to ensure that by 2010 water pricing policies act as an incentive for more efficient water use and thereby contribute to the achievement of the environmental objectives of the Directive. It also requires Member States to secure adequate contributions of different water uses to the recovery of costs of water services.

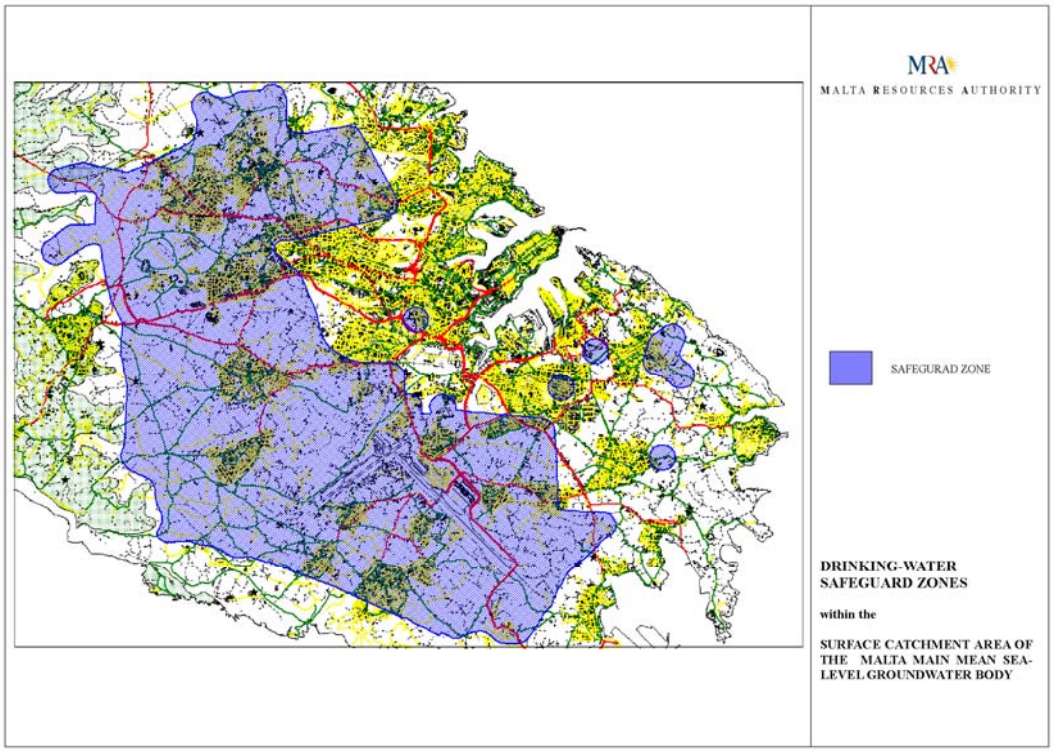
The requirements of the Directive focus on three main elements, which have to be carried out as part in the economic analysis as part of the Initial Characterisation process, namely:

- a description of the socio-economic characterisation of the Water Catchment Basin;
- a definition of the socio-economic and base line scenario.

An assessment of the current level of cost recovery.

This report therefore, initially presents a short outline

Figure A1.4: Proposed Drinking Water Safeguard Zones within the Surface Catchment Area of the Malta Main Mean Sea Level Groundwater Body



of the way water management is organized in the Maltese Water Catchment Basin. This is followed by a discussion on the features of the socio-economic characterisation of the basin. Based on these conclusions, the report then proposes a projected economic baseline scenario for the years ahead. The report is concluded with a discussion addressing the current level of cost recovery as well as with recommendations for ongoing work and possible future research.

Reporting Sheets Submitted to the EU Commission under the Common Implementation Strategy of the Water Framework Directive

The results and conclusions obtained in the studies described in the first section of this paper were summarised in a series of 'reporting sheets' which were subsequently submitted to the EU Commission in March 2005. These reporting requirements were sub-divided into four principal sections:

- Analysis of the characteristics of the river basin district;
- Review of the environmental impact of human activity;
- Economic analysis of water use;
- Register of protected areas.

The sections below present the main statements and results outlined in these reporting sheets.

Analysis of the Characteristics of the River Basin District

The first section, entitled the 'Analysis of the characteristics of the river basin district', included one reporting sheet on groundwater, entitled the "*Identification/delineation of groundwater bodies*". In this reporting sheet the methodology applied in the delineation of bodies of groundwater was described and geographic details on each body of groundwater were given as listed in the Table A1.2.

Table A1.2: Geographic Information on the Bodies of Groundwater within the Maltese Water Catchment District.

GWB-Code	Ground Water Body (GWB) -Name	Mathematical Centre of GW Body (UTM Zone 33)		Size (km^2)	Recharge Potential (hm^3)*
		Eastings	Northings		
MT001	Malta Main Mean Sea Level	450,600	3,971,354	217	34.27
MT002	Rabat-Dingli Perched	443,900	3,970,400	22.6	4.64
MT003	Mgarr-Wardija Perched	443,700	3,976,000	13.7	2.86
MT005	Pwales Coastal	444,000	3,977,900	2.8	0.70
MT006	Mizieb Mean Sea	442,500	3,978,500	5.2	1.11
MT008	Mellieha Perched	442,900	3,979,700	4.5	0.75
MT009	Mellieha Coastal	442,100	3,980,400	2.9	0.69
MT010	Marfa Coastal	441,400	3,982,600	5.5	0.89
MT011	Mqabba-Kirkop Perched	453,200	3,966,500	3.4**	n/a
MT012	Comino Mean Sea Level	440,300	3,985,700	2.7	0.52
MT013	Gozo Mean Sea Level	433,400	3,989,603	65.8	8.66
MT014	Ghajnsielem Perched	436,500	3,978,500	2.7	0.85
MT015	Nadur Perched	437,400	3,989,900	5.0	1.33
MT016	Xaghra Perched	434,500	3,990,800	3.0	0.86
MT017	Zebbug Perched	431,200	3,992,100	0.4	0.16
MT018	Victoria-Kercem Perched	431,600	3,988,700	1.5	0.58

* a mean annual rainfall of 550mm is assumed.
** estimated

Review of the Environmental Impact of Human Activity

The second section concerned the "Review of the environmental impact of human activity" and included eleven reporting sheets. The first reporting sheet requested summary data on "*significant pressures on groundwater in the river basin district*". Subject to the analysis carried out in the 'initial characterisation' process, point source pollution due to leakages from intensive animal husbandry farms, water abstractions for agriculture and public water supply and salt water intrusion were identified as the most significant pressures on Maltese groundwater bodies.

The next reporting sheet, which concerned the "*identification of groundwater bodies at risk*" outlined the methodology developed in the risk assessments carried out during the characterisation of the groundwater bodies. The results of these risk assessments were also presented with the groundwater bodies being classified as either:

- "*Groundwater bodies for which it is already clear that the objectives are at risk of being failed and where further characterisation is required*" or
- "*Groundwater bodies where, due to lack of data a clear assessment of risk cannot be made and therefore more work is required on the initial characterisation*".

For those groundwater bodies which were determined to be at risk of failing the objectives the main reasons for such risk were identified and outlined. These are presented in Table A1.3.

The third reporting sheet analysed the "*significant diffuse source pollution in groundwater*"; with particular reference to arable agricultural areas and urban land areas. Nitrate, phosphorus, pesticides and biological parameters were identified as 'indicative pollutants' and the relative pollution from each

Table A1.3: Main Reasons for Risk of Failing WFD Environmental Objectives

Groundwater Body Code	Diffuse source of pollution	Point source of pollution	Groundwater abstraction*	Artificial Recharge	Saltwater or other intrusion
MT001	X	X	X		X
MT002	X	X	X		
MT003	X	X	X		
MT005	X		X		X
MT011	X				
MT013	X	X	X		X
MT014	X				
MT017	X				
MT018	X				

*It should be pointed out that the analysis of the risk from 'Groundwater Abstraction' takes into account also the natural outflow from the groundwater body

indicator was estimated. "*Significant point source pollution in groundwater*" was considered in the fourth reporting sheet where nitrate pollution from animal husbandry farms and intensive cropping activity were characterised as the major pollution impact from point source pollution. Nitrate, biological parameters, hydrocarbons and heavy metals were identified as the 'indicative pollutants' in this case. This analysis was however constrained with a general lack of monitoring data; particularly in the smaller Upper Coralline Limestone aquifer systems, where the risk analysis was based on estimations and results in comparable situations.

The fifth reporting sheet investigated "*significant groundwater abstractions*". The WFD requires the identification of all groundwater bodies used, or intended to be used, for the abstraction of more than $10m^3$ of drinking water a day as an average; which the Directive considers as 'a significant quantity of groundwater'. Abstraction sources attaining such levels were therefore considered as significant abstractions. The analysis considered abstraction sources by both the public sector and the private sector, where significant data-gaps were identified. The results of this investigation are presented in Table A1.4.

No "*significant artificial groundwater recharge*" was identified within the Maltese Water Catchment District for the reporting requirements of the sixth reporting sheet.

The seventh reporting sheet concerned "*significant saltwater or other intrusion*"; which is a major issue in Malta since the most important groundwater bodies are in direct lateral and vertical contact with sea-water. Today, in the central parts of Malta and Gozo the two major groundwater bodies (the Malta main and the Gozo main mean sea level groundwater bodies) show significant signs of localized seawater intrusion that calls for a series of remedial measures to restore both their qualitative and quantitative status. Significant problems were also identified in the Pwales coastal groundwater body due to saline intrusions through the breaches in the underlying Blue Clay beds in response to seasonal over-abstraction. No 'other intrusions' were identified as affecting groundwater bodies within the Maltese Water Catchment District.

Summary information on the "*Further Characterisation*" process were requested in the eight and ninth reporting sheets. The data submitted included initial information on the geological and hydrogeological characteristics of the groundwater

Table A1.4: Significant Groundwater Abstractions within the Maltese Water Catchment District.

GWB_Code	GWB_Name	Number of significant groundwater abstractions*	Total annual volume abstracted from significant abstractions** (hm^3)	Proportion of average GWB inflow abstracted from significant abstractions (%)
MT001	Malta Main Mean Sea Level	72	12.8	37
MT002	Rabat-Dingli Perched	1	0.2	4
MT003	Mgarr-Wardija Perched	3	0.5	17
MT005	Pwales Coastal	0	0	0
MT006	Mizieb Mean Sea Level	1	0.4	40
MT008	Mellieha Perched	0	0	0
MT009	Mellieha Coastal	0	0	0
MT010	Marfa Coastal	0	0	0
MT011	Mqabba-Kirkop Perched	0	0	0
MT012	Comino Mean Sea Level	0	0	0
MT013	Gozo Mean Sea Level	36	2.2	25
MT014	Ghajnsielem Perched	1	0.04	5
MT015	Nadur Perched	0	0	0
MT016	Xaghra Perched	0	0	0
MT017	Zebbug Perched	0	0	0
MT018	Victoria-Kercem Perched	0	0	0

* Includes only groundwater abstraction sources operated by the Water Services Corporation and in use in the period January – December 2003.

** for the period January – December 2003.

bodies and the aquifer systems which support them, the characteristics of the overlying superficial deposits and soils, the presence of any associated surface water systems and a basic characterisation of the baseline chemical composition of the groundwater.

The tenth reporting sheet concerned "uncertainties and data gaps" where the uncertainties and data-gaps identified during the characterisation process were outlined. These mainly concerned the groundwater abstraction by the private sector, the estimations involved in the natural water balance calculations, groundwater monitoring data, aquifer inhomogeneity, water consumption and demand by the private sector and micro-area studies on population changes. Current planning recommendations for the setting up of a groundwater "*monitoring network*" were outlined in the eleventh reporting sheet. It is expected that these monitoring plans will be finalized and issued for public consultation by end-2005.

Register of Protected Areas

The fourth section concerned the "Register of protected areas"; where the MRA is required to report on "*areas designated for the abstraction of water intended for human consumption providing more than 10m^3a day as an average or serving more than 50*

persons and those bodies of water intended for future such use". In the Maltese Water Catchment District groundwater protected areas have long been established and are commonly known as the 'Groundwater Protected Zone'. This zone was established on the basis of the location of the public groundwater abstraction sources - both those in use and those intended for such use. Relevant details on these protection areas were submitted as outlined below.

Table A1.5 : Geographical Information on Groundwater Protected Areas in the Maltese Water Catchment

Code	Type of Protected Area	Surface Area of Protected Area (km^2)	Code of the Groundwater Bodies encompassed by the protected area*	Mathematical Centre of Protected Area (UTM Zone 33)	
				Eastings	Northings
DRW001	DRW	78.7	MT001/MT011	451,436	3,970,432
DRW002	DRW	10.9	MT002	442,686	3,971,092
DRW003	DRW	5.3	MT003	442,945	3,975,291
DRW004	DRW	3.3	MT006/MT008	442,285	3,978,983
DRW005	DRW	15.9	MT013	433,789	3,988,926

* Groundwater Bodies which encompass the protected areas

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MALTA WATER RESOURCES REVIEW

Introduction

The Maltese islands are densely populated but scarcely endowed with freshwater resources. Since the 1980s, drinking water supply is heavily dependent on saltwater desalination. The population and the tourist sector are served with good quality drinking water, but certain trends give raise to concern: depletion of groundwater in quantity, quality; and growing dependence on oil imports for water desalinisation. The public is poorly educated about national water questions and ill-prepared to assimilate information and contribute to shape the required action. These and other associated trends raise concern about Malta's long-term water sustainability and security.

Sustainable water resources are vital to Malta's long-term prosperity. Water is necessary for drinking and supports everyday life at work, at home or at leisure. Water is essential to agriculture and to the health of the natural environment that supports all human activities. Every sector of the economy depends on secure and sustainable access to water. Despite the islands' very limited resources and the importance of water to a healthy future, water has not been valued so far as the precious resource it is. There are no easy solutions to Malta's water shortage yet the nation requires water security into the future. Legal and administrative measures need to be taken according to a plan emerging from a strategy, which in turn is the expression of a national water policy.

The review of Malta's water resources is meant to provide a strong and objective factual knowledge base on the status of the islands' water resources and the trends in water use. It is hoped that it will be widely used as a platform for discussion among stakeholders and serve for the development of Malta's water policy and of its groundwater management strategy

Review of Malta's Water Resources

The state of Malta's water resources is poor. With the support of FAO, the Malta Resources Authority has been undertaking studies and consultations to articulate a national water policy and formulate a set of workable regulations. The rationale behind this process is that involving stakeholders will lead to a policy that is socially and politically acceptable and geared to tackling the complex water-related challenges facing the country. In addition, it is intended that the water policy will ensure that Malta is in compliance with the European Union Water Framework Directive. This directive requires Malta to achieve the good status for its groundwater bodies by 2015.

As part of the policy formulation process, a water resources review was conducted to:

(i) assess the current status of water resources;
(ii) evaluate the demand trends of different sectors;
(iii) provide information; and
(iv) identify opportunities for improving the sustainability, efficiency and equity of water resource management.

This review has shown that, although the demand for groundwater is outstripping supply, there is scope to reverse current trends through demand management, supply augmentation and strategic protection of groundwater resources. Groundwater quality can be

protected and the mean sea-level aquifer stabilized. Policies and practices to do this need to be based on accurate information and acceptance that solutions must be applicable in the long-term.

Malta's core water challenge is one of water governance. Tough decisions will have to be made immediately if the environmental sustainability of Malta's aquifer systems is to be achieved. However, decision-making is currently fragmented, policies are poorly aligned, and awareness of the consequences of continued mismanagement of the sea-level aquifers is poor. Nonetheless, there is much scope for improving Malta's system of water governance.

Malta faces many infrastructural challenges both in terms of engineering hardware and the institutions that are responsible for service delivery. Considerable investment has been made in desalination plants and further investment has been committed for the construction of sewage treatment plants. However, additional investment will be required if a much higher proportion of Malta's freshwater needs are to be met with desalinated water and if the treated sewage effluent is to be treated further than the statutory requirements of European conventions and conveyed to potential users and/or to locations where it can be used safely to recharge groundwater (using the precautionary principle as a guide).

Considerable private investment has been made in water-related infrastructure (e.g. boreholes and small desalination plants). Private investors are likely to resist a water policy that makes it difficult for them to capitalize on their investments or that necessitates further private investment.

There is scope for augmenting water resources by improving the capture of runoff particularly in urban areas. A 25-m^3 cistern or equivalent in every household is estimated to create a storage capacity of about 4.5 hm^3 (about 25 percent of annual domestic demand). However, logistical constraints hamper the practicability of attaining such levels of storage and self-supply.

Studies undertaken as part of the water resources review indicate that an effective water policy will require:

- improved governance;
- improved awareness;
- staged and adaptive implementation;
- demand management;
- supply augmentation;
- the ensuring of equity and justice;
- targeted interventions.

It is suggested that a water policy should aim to achieve the following vision by 2015:

- levels of water use regulated according to sustainable abstraction levels;
- aquifers restored to a status that represents a strategic reserve;
- water quality of all aquifers restored to within permissible limits;
- widespread use of local and decentralized solutions (e.g. rainwater cisterns, grey-water recycling, and pollution control);
- high levels of collective responsibility for managing and protecting Malta's water resources.

The report sets out and analyses four demand scenarios (based on current levels of demand and the subsequent projections that have emerged from discussions with various stakeholders). It also discusses different strategies for meeting future demand and achieving the vision.

The report also identifies a set of risks and assumptions that will apply if a proposed water policy is implemented. These are:

- Reversibility of aquifer degradation: It is assumed that a reduction in groundwater abstraction will lead to an improvement in water quality to acceptable levels. The risk is that in some areas this may take many years.
- Climate change: Climate change may become a serious issue in the future.
- Equity: Implementation of the water policy will almost certainly lead to changes in patterns of water availability and use that may result in distinct winners and losers and reduced equity. Provision should be made for compensation schemes that would ensure socially acceptable outcomes.
- Impact on livelihoods: To be effective, the water policy must have an impact on water demand of the water-using sectors and individual water users. There is a risk of negative impacts on some commercial

operations and the livelihoods of some users. Attempts should be made to minimize impacts on poorer social groups.

- Non-compliance: There is a history of poor compliance with water-related regulations. Enforcing the water policy effectively will require both resources and political will.

Economic Evaluation of Water Use

Several policy considerations emerged from this study as it revealed a set of anomalies in official water consumption data. It was seen that official figures underestimate by a wide margin, the true volume of water consumed annually. Billed data gives total consumption in the region of 18million m^3, while an estimate of 'comprehensive consumption', a statistic which includes non-conventional sources, give 38 million m^3.

Agriculture has been identified as the prime source of demand with an aggregate of 34%, i.e. 30.5% for irrigation and 3.5% for farms. Domestic consumers come second with 33%. This classification is in line with the distribution of water consumption in many countries. However, the study showed incongruence with official data that rates domestic consumers as the main component for water consumption billed by the Water Services Corporation.

As the large volume of water consumed in Agriculture is not subject to any charge, the real cost composition of water to Agriculture is not published in official data. The report recommends that this situation has to be rectified if robust policies on efficient water usage are to be devised and linked to the true market value of the commodity.

Policies on water management and agricultural productivity need to be integrated, so as to promote those practices that are conducive towards market profitability and in terms of the input of water costs One critical policy consideration refers to the fact that up to now, the prices fetched for agricultural products arose in a sheltered environment. As these protective tariffs are being removed the inclusion of proper water charges for agricultural produce will affect directly the price competitiveness of such produce.

Estimates of price elasticity of demand for water suggest that, in general, the response by Maltese households to the price changes that prevailed in the past seems to respond after some time. Hence, although overall price elasticity is relatively inelastic, yet there are indications that households do respond to price changes once they are given time to adapt.

A customer survey was undertaken in the course of this study to reveal customers' perception on water pricing and perceptions regarding quality of service and supply. Results show that:

(a) Households

Results on households' consumption of water, their reactions to the quality of tap water they consume, and preferences regarding their willingness to pay are itemised below:

- Tap water is used by 68% of households for cooking and drinking, but almost all households (91%) use it for bathrooms and laundry. It is used by a third of households to water plants and trees.
- One half of households use bottled water for drinking/cooking. Water cisterns, the traditional 'providers' of rainwater in homes, account for 6% of water used for cooking and drinking. But they are used by 17% of households for laundry and by 28% for gardening.
- Households supplement tap water by bottled water because they consider tap water to be inferior in quality. Fifty six percent of households regard tap water quality to be poor or inferior. Only 12% of households consider tap water as 'excellent' for drinking purpose.
- Sixty percent of households surveyed are not prepared to pay more for tap water. They consider the existing tariffs to be fair in relation to the quality of water they receive in the home. At present, households consume on average 18 litres of bottled water per week.
- Maltese households are aware of the possibility of using recycled water. A small number of households already generate their own recycled water for bathroom use. However, 54% replied that they are not prepared to consider use of recycled water. The other 46% will consider using recycled water for domestic use or gardening as long as it is 'guaranteed'

safe for health purposes. Recycled water will be reconsidered if no extra charges than at present are included.

(b) Industry

Another survey was carried out among industrialists to assess the use of water, its quality and relative costs. Though the response was weak a pattern emerged from the limited number of returns confirming:

- water to be an intermediate input varying between 0.1% to 0.45% for most industries, according to official input-output data that relies on billed consumption data, i.e. out of every Lm100 worth of output, the outlay on water varies between 10c and 45c. On the other hand it is considered to represent a considerable input by suppliers of bottled water and soft-drink manufacturers.
- Industries that rely on tap water are not satisfied with its quality. Tap water is classified as 'hard' and in some cases it is high in salinity and dissolved solids, obliging some of the industries to resort to polishing.
- Present tariffs are considered to be too high.

The exact value of water in use is however, not known. Industrial units in manufacturing and the leisure sector are known to utilise additional sources of water e.g. water is abstracted from boreholes or privately treated to attain the required chemical quality. Research is being carried out to establish the volume and value of such water.

(c) Tourism

Response to the questionnaire was very poor from the tourism sector. Tourism consumes relatively large quantities of water. This is especially so in the accommodation sub-sector. However, because of the proximity of many of the hotels to the coastline, the units can rely on seawater as a secondary source of water and on desalinated water from small customised plant for their water supply.

Data from input-output configurations referring to the nineties suggest that the relative expenditure share of Tourism on billed water consumption amounted to 1.5% of output. Recent data on the production account of industry in Malta under development yield a relative share of 1.8% in terms of total intermediate consumption and 0.9% of total output at basic prices.

More intensive work on this subject is required to identify the integrated water resource network operated by hoteliers and leisure sites. Costs for this network and the disposal of water used will bear an impact on the net contribution to Malta's value added by the million plus visitors that represent the equivalent of 30,000 permanent residents.

The economic study succeeded in establishing important facts necessary for the formulation of an effective water policy and strategy in the Maltese Islands.

The primary contribution refers to the derivation of a wider consensus on the actual water consumption among interested stakeholders, namely the Malta Resources Authority, the Department of Agriculture, the National Statistics Office and the Water Services Corporation. This result is the outcome of inter-agency collaboration that materialised during the course of this study, auguring well for the future.

Such a result brings a series of adjustments to existing databases in its wake. This mainly affects the costs per unit of water from different water sources and the resultant distortion in the price matrix that condition decision making in the various sectors of the economy. The main effects are surely observed in the sector of agriculture where the wrong water price configuration is leading to an expanding area of irrigated land but based on misleading cost consideration. There cannot be a resilient agricultural policy in the absence of good quality sustainable water supply at a competitive price.

Similar remarks apply to certain units in the manufacturing sector that may be tapping water sources illegally by abstraction of water from underground sources, either directly or indirectly through supply by water bowsers. This phenomenon may be happening to a lesser extent, perhaps, in the sector of tourism. Attempts to build up a data set on water sources and cost relationships in these two sectors did not produce the desired results as the degree of response from operators in these two important sectors was very poor. Industrialists feel that they are overburdened with surveys since the National Statistics Office adopted an approach that relies on surveys to collate data. Industrialists maintain that some data are already available in one format or another and therefore the data gathering process needs to be evaluated.

At the same time, operators in the leisure industry were taken up with debate on smokeless environment and a trade flow that was less attractive than expected. They focused on these issues and did not find time to concentrate on water use.

Therefore, these data gaps will have to be filled in future. The collaboration of the representative bodies was never in doubt. So, a longer time frame for conducting research on these issues will benefit all and will draw a higher degree of collaboration as happened in the case of agriculture and water use.

The distribution of visitors throughout the year and throughout the Islands will bear on water consumption and its disposal. So there has to be the same synergy between the respective objectives and strategies for manufacturing industry, tourism and water that has been noted for agriculture and water. In the end it is this integrated, holistic national plan that brings together the respective policies. They have a common element apart from the consumption of water. That is price. 'Water consumption' has to be turned into 'water consumption at a competitive price' in a national strategy for profitable trade.

More research has to be carried out to focus on several important issues.

1. Micro area studies to assess the changes in population density and the related needs for public utility services.
2. The correct amount of water used by industry in the manufacturing sector and the relative share of piped water in such an amount. It is important to establish whether water is being obtained through abstraction of underground water. Besides, industrialists have to make their views known regarding the efficient way of recycling water and, also, regarding the volumes of water they are prepared to re-use and at what price.
3. The water supply and water recycling network that prevail in the accommodation sub-sector in tourism and their related costs. The information available is not enough to construct an informed policy.
4. The quality of water in use in agriculture and the optimal use of such water in relation to the net benefit per crop as explained above.
5. Demand for recycled water and the optimal way to dispose of sludge.

This new information will support the policy makers with a wider data base on which to draw up different scenarios and adopt the right strategies to meet MRA's corporate function.

Critical Assessment of the Legal Framework for Groundwater

This study was conducted to assess the legal instruments and the administrative practices, which may support a future water administration system. The exercise was necessary in order to assess whether the existing institutional capacity is adequate to implement a registration system under legal instruments and administrative systems which are already in place, and to make the necessary proposals as to a rational way for implementation.

The report identifies the registration of boreholes and wells for water abstraction as the first step to establish a water rights registration system. Through the system all users of groundwater will be subject to a licensing system, obliging the user to adhere to a set of conditions meant to ensure a good qualitative and quantitative groundwater status.

It is also recommended that a future registration of groundwater sources is linked with land registration as provided by the Land Registration Act (Chapter 296 of the Laws of Malta), and the registration system for agricultural land, conducted by the Ministry for Rural Affairs and the Environment. This system of Agricultural Land Registration provides invaluable information, which may be utilized by MRA in the compilation of its inventory of wells and boreholes that would enable the initiation of a water rights registration system and consequently the licensing system to regulate groundwater abstraction. It should avoid duplication of tasks whilst pegging the existing LRCS with the registration of boreholes, in anticipation of a fully fledged water rights administration system.

The legal study concluded that MRA needs to issue subsidiary legislation in the short term to provide for the legal backing for the setting up of a Licensing Abstraction System that would be linked to the registration of water rights attached to the land.

Finally, the issue of ownership of boreholes and wells must be addressed. Any subsidiary legislation to be drafted must clearly establish whether it is the owner or the occupier who is obliged to register the existence of a borehole or well used for groundwater abstraction, who is liable at law in the case of non conformity the owner or the other person who occupies the tenement under any other title or should both be jointly liable. This report suggests that since the ownership of a borehole relates to rights over the land it would make more sense to oblige the owner to register the borehole and to render both the owner and the occupier as jointly and severally liable for non-compliance.

The Assessment of Irrigation Water Use

Despite agriculture contributes only 2.5% of the GDP, it is considered to be a major consumer of fresh water resources. The assessment of water demand by agriculture has been based, so far, on empirical estimates based mostly on the crop water requirements in Mediterranean countries. The scope of the new assessment was therefore to:

- Review current data and estimates on water use in agriculture
- Compile information on land use in agriculture and irrigation
- Cross-check with available LANDSAT images
- Prepare a typical cropping pattern for irrigated agriculture
- Compute more accurate irrigation water requirements
- Validate with existing information on crop water use in agriculture in Malta

Table A2.1 - Water Requirements for Crops Under Irrigation in 2001

Irrigated crop:	Water requirements (mm)	Water requirements (10^3 m^3)
Vineyard	550	2695
Orchards	580	2477
Vegetables (half March – half June)	340	2149
Vegetables (beginning July – beginning October)	470	2970
Total		**10291**

Table A2.2 - Agricultural Land Use in 2001 and 2003

Agricultural land use:	Area 2001 (ha)	Area 2003 (ha)	Increase
Vegetables	1854	2190	18%
Potatoes	1153	1207	5%
Fodder	4464	5197	16%
Vineyards	490	615	26%
Orchards	427	466	9%
Fallow	1268	696	-45%
Total	**9656**	**10371**	**7%**

FAO has developed a method to assess of irrigation water use and the application of such method could be of great use to the project in providing more reliable assessment of water use.

Crop water requirements can easily be calculated with CROPWAT, a programme developed by FAO that utilises climatic data and standard crop data for the computation of crop water demand.

The crop water requirements for the main crop-types cultivated under irrigation in the Maltese Islands are as shown in Table A2.1.

The National Statistics Office carried out an agricultural survey in 2003. For this survey 1,502 out of a total of 10,989 holdings were visited. The result of this survey was compared to the census of 2001 and results are shown in Table A2.2.

It results that agricultural land area in Malta grew by 7% in two years between 2001 -2003. Assuming that the cropping pattern did not change, the water requirements for irrigated agriculture increased even with 18 % to gross irrigation water requirements of 13.5 – 15.2 million m^3.

The expansion of agricultural land is probably due to the granting of EU subsidies on agricultural investment in 2003. To qualify for subsidies, farmers needed to register their cultivated land on which subsidy is granted in relation to the crop produce in a particular season.

Sources of Water for Agriculture

The total net amount of water used for the irrigation of crops in 2003 has been estimated to be around 13760 x 10^3 m^3. Assuming an irrigation field efficiency of about 85% gives gross irrigation water requirements of about 16200 x 10^3 m^3.

Most of this water originates from natural sources. It is estimated that the Sant Antnin sewage treatment plant supplies about 1500 x 10^3 m^3 of treated waste water to the agricultural sector in the South Eastern part of Malta, the rest originates from surface and ground water. During the Agricultural Census of 2001, 9069 rain-water reservoirs were registered. The average capacity of these reservoirs is estimated to be about 175 m^3. The total amount of water used for irrigation from these reservoirs is estimated at about 1500 x 10^3 m^3.

Table A2.3 : Comparison of Net Water Requirements for Irrigation in 2001 and 2003

Irrigated crop:	Net Water requirements in 2001 (10^3 m^3)	Net Water requirements in 2003 (10^3 m^3)	Increase
Vineyards	2695	3383	26%
Orchards	2477	2703	9%
Vegetables (half March – half June)	2149	2538	18%
Vegetables (beginning July – beginning October)	2970	3509	18%
Total	**10291**	**12132**	**18%**

The total annual demand from agriculture on groundwater is therefore estimated to be 13200 x 10^3 m^3 of which 15% (about 2000 x 10^3 m^3) flows back to the hydrological cycle, so the net annual demand of agriculture on the groundwater resource is about 11.2 x 10^6 m^3.

Spatial Distribution of Irrigated Areas

The Global Land Cover Facility (http://glcf.umiacs.umd.edu/index.shtml) of the University of Maryland distributes remotely sensed satellite data from different sources. These data include LANDSAT ETM+ imagery. One of the LANDSAT ETM+ products are referred to as the Landsat Mosaics. Figure A2.1 shows such a Mosaic for the Maltese Islands taken on 26 September 1999.

One way to distinguish irrigated areas in semi-arid areas through satellite remote sensing is by using a vegetation index. The method is known as the NDVI technique, by means of which an image (Figure A2.2) is produced showing the presence of chlorophyll in vegetation. The greener an area (pixel) the more chlorophyll present. As the image was taken on 26 September 1999, the more likely it is that the pixel is irrigated. The image is not suitable to assess the total extent of the irrigated areas since it is difficult to establish a reliable threshold for the NDVI to indicate which pixels are irrigated and which are not.

In Table A2.4 the area distribution over different NDVI classes with a value higher than 0.05 is presented.

It was concluded that an NDVI-value of 0.1 is probably a good threshold to indicate whether a pixel is irrigated or not. The total area with an NDVI-value above this threshold (1621 ha) corresponds closely with the irrigated area reported by the census in 2001 (1509 ha) noting that the difference possibly is the result of the inclusion of landscaped areas and gardens in the remotely sensed image.

The satellite image with NDVI-index is very useful to assess the location of the irrigated areas and as such to identify from which aquifer the irrigation water is withdrawn. Results are shown on Tables A2.5 and A2.6.

The assessment confirmed that almost half of the renewable groundwater is used for agricultural purposes. The mean sea-level aquifer in Malta is exposed to the heaviest pressure from agriculture being that 62% of the irrigated areas lie over this aquifer followed by the perched aquifer. The study showed that the estimated irrigation demand compares well with that computed by the MRA. Also, the estimated crop water requirements, of 12319 m^3/annum based on a cropping intensity of 300%, calculated by Mitschoff, is considered to be high. It was seen through this study that a cropping pattern for vegetables of 1.45 is more realistic while the crop water requirements for the different crops under irrigation range between 1027 m^3/ha for spring potatoes, 4700m^3/ha for summer vegetables and 5800m^3/ha for fruit tree orchards.

Table A2.4 : Area Distribution over Different NDVI Classes

NDVI-class:	0.05 - 0.06	0.06 - 0.07	0.07 - 0.08	0.08 - 0.09	0.09 - 0.10	0.10 - 0.12	0.12 - 0.15	0.15 - 0.20	0.20 - 1.00
Area per NDVI-class (ha)	436	367	328	276	239	396	404	390	431
Cumulative area (ha)	3266	2830	2463	2136	1860	1621	1225	821	431

Figure A2.1 : NDVI Image of the Maltese Islands

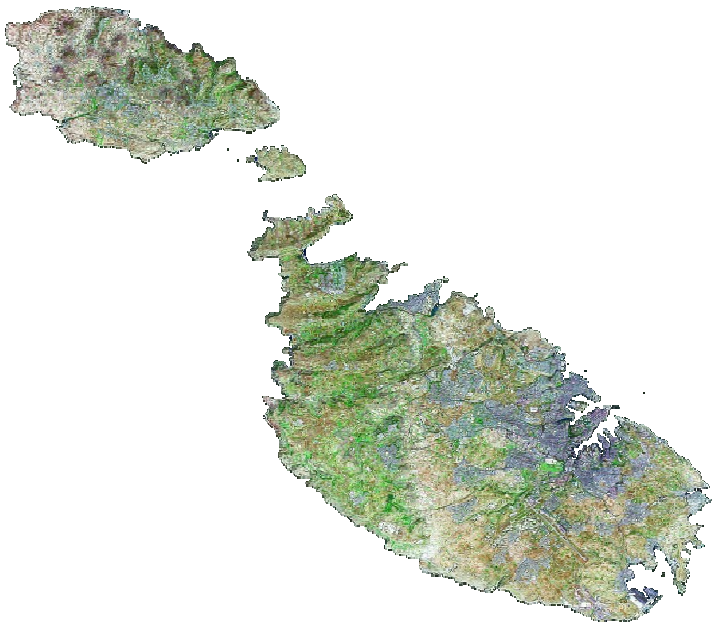

Figure A2.2 NDVI Indexed Image of Malta Showing the Presence of Chlorpyll in Vegetation

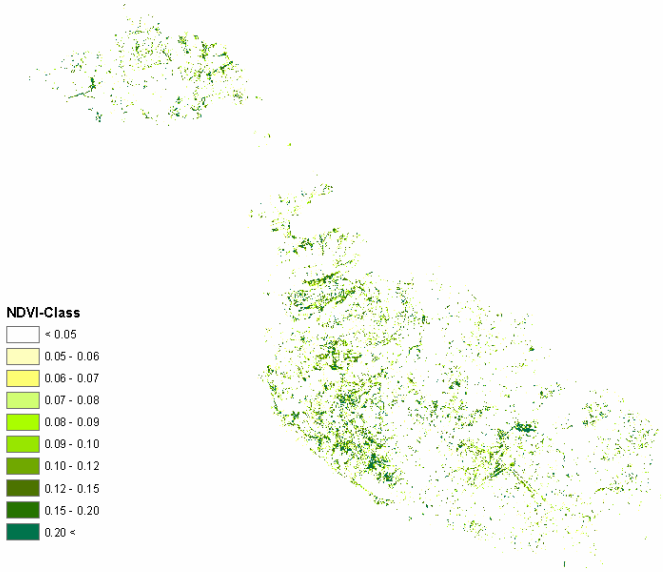

Table A2.5: Irrigated Area per Aquifer System in Percentage of Total Irrigated Area

	Irrigated area per island/aquifer as percentage of total	
Malta	86%	
Perched aquifer		*37.5%*
MSL aquifer		*62.5%*
Gozo	13%	
Comino	0.1%	

Table A2.6: Annual Demand for Water from Agriculture by Aquifer System

	Groundwater demand (in $10^3 m^3$)	
	Net	**Gross**
Mean Sea Level Aquifer	5400	6400
Perched Aquifer	4000	4700
Gozo	1800	2100
Total	**11200**	**13200**

Water Rights Administration Study

The scope of the study was to recommend the administration structure for the setting up of an abstraction/permitting licensing system, a key process in the regulation of groundwater resources. Current abstraction processes by water service providers were first assessed, a series of hypothetical permitting strategies analysed and the necessary administrative capacity identified in order to implement a regulated abstraction system in the light of new EU legislation.

It is proposed to stagger the implementation of a water-rights administration system in a logical sequence over a period of six years:

- Regulation of existing boreholes, and the drilling trade.
- Regulating the sale of groundwater: Metering abstraction for commercial purposes and imposing a charge for tankers who sell water.
- Launching of the water catchment management plan.

The water catchment management plan provides a basis for developing longer term responses on water allocation. A draft plan could be released for public consultation around 2007 and will be used as a vehicle for a more comprehensive assessment and consultation process with users about how best to share and regulate Malta's groundwater reserves in the long term.

The report proposes the registration of all boreholes in Malta and Gozo and considers this as an essential task to enable the authority to take stock of the current rate of abstraction by identifying all existing abstraction points, in its drive to improve the management of groundwater. Ways of implementing this exercise were thoroughly examined as the experience of previous registrations showed that the gathering of reliable data is a main point of concern. Emphasis was made on the rationale behind *registration*, as a first step towards regulation and better management of the aquifers. While serving as a means of assessing the current status of the aquifers "on the ground", it will be useful to determine the territorial distribution of abstraction points thus allowing a more accurate hydrogeological analysis resulting from abstraction. Registration will be anticipated by a public awareness campaign to emphasise with the public the relevance of this

measure in the allocation of groundwater resources. The campaign will draw on the results of the "Characterisation" report undertaken by the authority as a statutory requirement of the Water Framework Directive. These results justify the urgent need for remediation of groundwater.

The report recommends the integration of the *Registration* process with:

- administrative measures (short and long term) for the establishment and allocation of specific water quotas.
- an overarching water rights administration system whereby all operators will be made subject to the regulatory framework of Legal Notice 525/2004 *Water Supply and Sewerage Services Regulations 2004*.
- the water catchment management plan, earmarked for publishing by 2008 as a requirement by the Water Framework Directive (WFD).
- technical measures to ensure good practice, both with the drilling and the operation of boreholes.
- legal measures to enforce corrective action in cases of malpractice with detrimental effect to groundwater or other public sources.

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