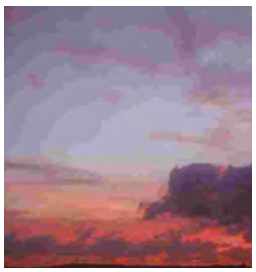
STATE OF THE ENVIRONMENT REPORT

2005







MEPA

Malta Environment & Planning Authority

January 2006
ISBN 99932-83-21-5

This report has been compiled by MEPA in partnership with the National Statistics Office.

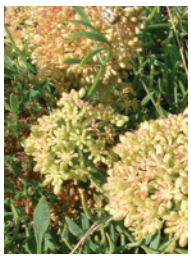
NATIONAL STATISTICS OFFICE • MALTA

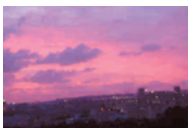
STATE OF THE ENVIRONMENT REPORT

2005

CONTENTS

FOREWORD



The State of the Environment report is our crystal ball into the future. In it we have a photograph of the present. As the Nobel literature Laureate Gunther Grass said "The future is already in place".

This ministry was entrusted to me with the specific aims of making the environment a priority target. It is encouraging to read in this report that we have made positive strides in reducing pollution, as the results regarding air pollution show. Following the introduction of clean fuels in the form of unleaded petrol and low-sulphur fuel for the power stations, concentrations of benzene and sulphur dioxide have fallen remarkably. It is also encouraging to note that bathing water quality meets all the criteria related to the EU Bathing Water Directive. This report is also an example of Government's commitment towards transparency and access to information in this most sensitive area - the environment.

This does not mean we should be complacent. We must continue to improve environmental quality in these areas, as we must also do in the areas where the challenges are greater, as for example, for waste management and nature protection. As this Report indicates, many steps have already been taken to increase the resources available for environmental protection. However for us to meet our environmental challenges, we will need to continue building up the capacity of our institutions for environmental management, both in terms of expertise and resources.

European Union membership has proven to be an ideal benchmark, by setting standards and policies for environmental protection and awareness. EU membership has brought about the enactment and transposition of legislation that will act as a safeguard for our environment.

Compiling this document is no easy task and it is encouraging to see that the format this time round is much more user-friendly than previous versions. Undoubtedly, this will help greatly in disseminating the information and enhancing appreciation of what state the environment is in. Raising awareness about the environment is a central commitment for this administration and for this publication, and the media mix related to this publication should help bring in a new generation of environmental communications. Information is power - in this case the power to change the environment, each in our little ways.

Finally I would like to congratulate MEPA whose responsibility it is to produce this information on the diligence with which it worked, together with stakeholders, to compile the information. I also augur that this publication will generate a healthy debate within our society, one that will help us strengthen the environmental awareness. A better environment is the ultimate gift which we should aim to give to present, and more especially, future generations.

George Pullicino
Minister for Rural Affairs and Environment

INTRODUCTION

The objective of the 2005 State of the Environment Report (SOER) is to support progress towards sustainable development by providing credible environmental information to policy makers, organisations and the general public. It should also provide guidance for the development of new policy directions and identify investment requirements in environmental protection and improvement.

There have been major new developments in the environmental policy field since the previous SOER, namely the formation of MEPA and other agencies (for example the Malta Resources Authority [MRA] and the Malta Transport Authority) with significant environmental remits. Accession to the European Union (EU), the challenge of transposing and implementing the *acquis*, and significant investments in capacity building in the environment and other sectors have also shaped the first half of the 2010s.

The situation regarding environmental information has also undergone key changes. The EU environmental policy process has compelled us to take our environmental policy making to a new tier of complexity, with much more monitoring, reporting and review of policy, as well as, of course, adopting many more policy instruments related to the transposing of the numerous EU directives into national legislation. Environmental data is more widely available, particularly on the websites of the responsible agencies, but it often remains in a complex and fragmented form; the problem for lay people wishing to understand environmental processes is now often one of information overload.

That is why a new approach has been taken for this SOER. This new approach focuses on providing timely and policy-relevant information to show what is changing and (where possible) why in the environment, and how this relates to the policy framework. It aims to draw a broad rather than a detailed picture of key changes and challenges. The 2005 SOER has been compiled by MEPA in partnership with National Statistics Office (NSO), and draws upon detailed information sources related to environmental monitoring programmes carried out by MEPA, NSO, MRA, Ministry of Health, the Elderly and Community Care, etc., and is supported by a set of sub-reports and data sheets are available on the MEPA website (at www.mepa.org.mt). Different SOER products are aimed at different target audiences, so while this current report is aimed particularly at those who may not have the time to digest a lengthier report, sub-reports and data sheets are available for others who may require more detailed information. For any more detailed information, please contact MEPA.

An effective, target-oriented environmental policy process needs to have information to monitor progress. This Report seeks to indicate progress on targets; however data gaps in certain key policy areas (such as biodiversity and waste) sometimes do not allow this. In this regard, there is a tension between the objective of using new data and the need to substantiate key messages. In some cases it was necessary to revert to older data rather than leave out an important environmental issue. In other cases, were detailed studies have not been carried out, it has also been necessary to rely on expert judgement. In terms of geographical coverage, the Report uses the scale relevant to the issue under discussion. For example for groundwater quality, pumping station data was used, on air pollutant concentrations data gathered at the locations of the diffusion tube network was used, and on bathing water quality, data samples from the set of bathing areas defined by the Public Health Department were used. Where possible comparisons were given in the sub-reports to EU figures, but sometimes different parameters were used at EU level.

Due to the complex inter-relationships between environmental factors, it is often difficult, if not impossible, to isolate individual processes as the cause of an exact problem. For example, it is not simple to attribute levels of heavy metals in Maltese soils to any specific source, or the dust particulates in Malta's air to specific activities or processes. It is also not straightforward to indicate the precise effects of the presence of certain substances on human health and ecosystems. The approach taken in this document has been to indicate where there is evidence of the cause of a problem in Malta, but also to indicate, in those cases where this is not available, the identified source of the problem in other countries. This is important if Malta's environmental policy is to be based on the precautionary principle. In some cases the causes have not been identified at all, and where this is the case this is indicated in the text.

This Report follows the structure of the OECD Pressure-State-Response model,[1] and first outlines the principal pressures on the Maltese environment, then the state of the environment in terms of key trends and challenges, followed by a chapter on policy responses. Each chapter begins with a list of key messages. The Report closes with a chapter summarising the key messages and recommending a set of over-riding priorities for the future. This report has been compiled by Marguerite Camilleri and Roberta Galea with the help of numerous contributors (see acknowledgments), to whom I would like to extend my sincere thanks.

Godwin Cassar
Director General

1. DRIVING FORCES FOR ENVIRONMENTAL CHANGE

Key Messages

- Malta's population has largely met its basic material needs, and it is demand for additional consumption that is now placing significant strain on natural processes.
- The rising number of motor vehicles has serious implications for the environment, human health and the economy, in terms of air pollution, land take-up, biodiversity loss, noise, fuel consumption, road accidents, waste generation and congestion costs.
- Only by decoupling Malta's accelerating energy demand from economic growth can environmental targets and objectives related to air pollution and climate change be met. While using a cleaner fuel mix has had positive effects on air quality, there is still significant potential for further shifts. Malta is still far from reaching EU renewable energy targets, which the national energy plan that will soon be published will address.
- Malta will need to map out a sustainable development path for the energy generation, transport and tourism sectors, as well as develop a basket of measures to address the nexus of social, environmental and economic issues surrounding house building and housing quality, availability and affordability.

The production and consumption patterns of the Maltese population are the principal cause of environmental change related to habitat loss, pollution and landscape degradation. This first chapter of the 2005 SOER reviews the principal demographic and economic drivers of environmental change in the Islands.

Malta's population density is one of the highest in the world, at over 1,274 persons per km^2.[2] **However, the population has largely met its basic material needs,**[3] **and it is demand for additional consumption that is now placing significant strain on natural processes.** These additional demands relate mainly to sectors such as transport, energy, water and land use. Malta's population is projected to increase between 1995 and 2010, then to begin to decrease between 2015 and 2025 due to decreasing birth rates and stabilising death rates (see Chart 1.1). The expected downturn in population may have a positive effect on the environment if accompanied by changes to consumption patterns.

Malta's economic structure is a key determinant of environmental impacts: consumption of natural resources, use of energy, the types and volumes of pollutants and waste produced are all dependent on the share of the various sectors (as well as, of course, their environmental performance). Malta's economy continued to shift gradually from an emphasis on direct production to one of market services between 2000 and 2004 (see Chart 1.2) with market services contributing 71 percent of GDP in 2004 compared with 65 percent in 2000. This is in line with the general trend identifiable between 1975 and 2000,[4] however the shift towards services may not always indicate less environmental impact. This depends on the environmental performance of each sector. For example, both transport and tourism can have significant environmental impacts. With a share of almost 20 percent of GDP in March 2005,[5] manufacturing activities still involve substantial environmental impacts in terms of industrial waste generation and energy consumption. The contribution of the construction and quarrying sector, which has an overall negative environmental impact, grew slightly from 4.5 percent of GDP to 5.3 percent during this period.

Four economic sectors are considered to have the most significant impacts on the environment: housing, transport, energy generation and tourism. Agriculture, which also generates significant impacts, is reviewed under the land chapter.

Residential areas constitute Malta's principal urban use of land, and an indication of pressure on land resources from the construction sector is provided by dwelling permission trends (see Chart 1.3), which indicate rising pressures on land and energy resources, as well as waste generation (construction and

demolition waste[6] reached 88 percent of total waste in 2004), despite the high cost of housing.[7] Nevertheless the rising percentage of apartments being permitted (79 percent of total in 2004, compared with 52 percent in 1994) indicates more efficient use of land resources, provided that these dwellings are actually inhabited and, for the longer term, that quality and urban character are respected. These trends raise complex questions regarding the nexus of social, environmental and economic issues surrounding house building and housing quality, availability and affordability. House sizes, environmental efficiency, making better use of Malta's 35,000 vacant dwellings (23 percent of total),[8] and the overall direction of Malta's construction sector will need to be addressed.

Chart 1.1 Population change (Maltese population only)
Source: NSO

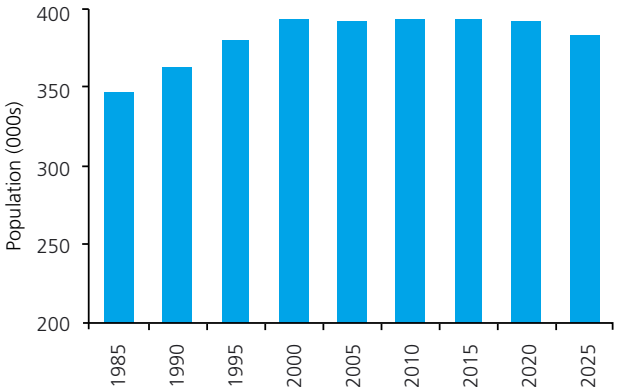
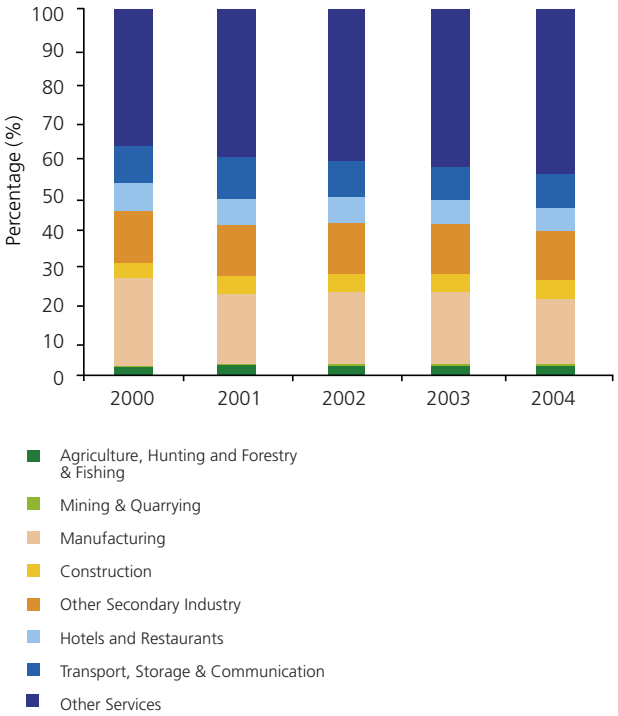
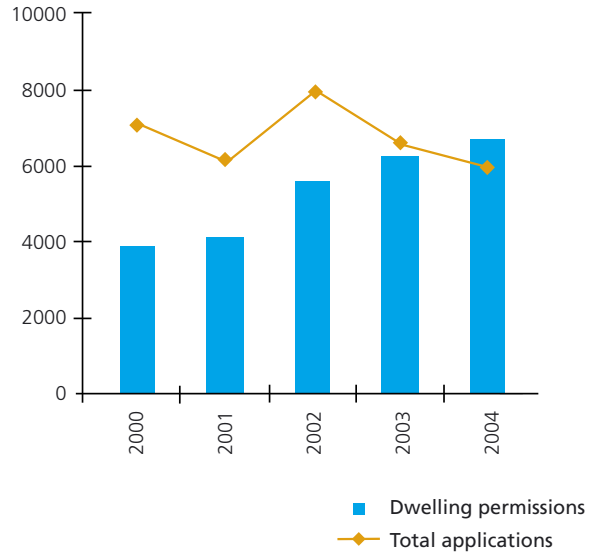


Chart 1.2 Percentage sectoral contributions to GDP[10]
Source: NSO 2005a



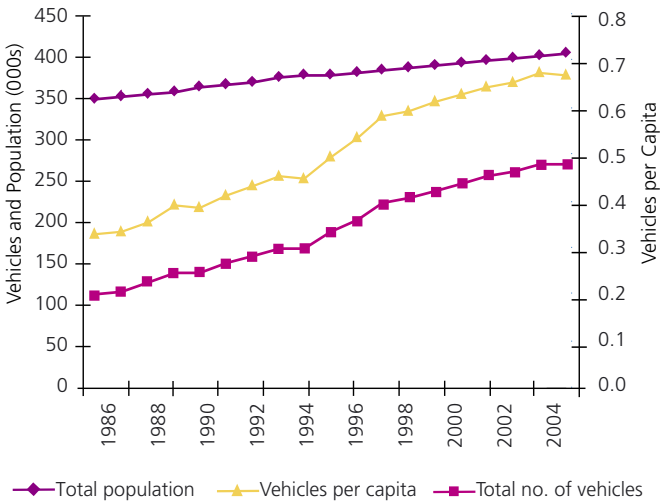
Demand for road transport is growing rapidly (see Chart 1.4). Motor vehicle ownership is on the increase; it more than doubled since 1986, rising to 271,100 vehicles in 2004.[9] In years such as 1994 and 1997 vehicle numbers increased by approximately 10 percent over the previous year, and in 2003 over 40 percent of the vehicles imported were second hand.[11] The number of vehicles per capita has also increased from 0.33 in 1986 to 0.7 in 2004 and is significantly higher than the EU average, and close to those of Italy and the USA.[12] **The rising number of motor vehicles has serious implications for the environment, human health and the economy, in terms of air pollution, land take-up, biodiversity loss, noise, fuel consumption, road accidents, waste generation and congestion costs.**

Chart 1.3 Dwelling permissions and applications
Source: MEPA dwellings database



Note: Dwelling permissions exceed total applications in 2004 due to the increasing trend for development applications to involve multiple dwelling units.

Chart 1.4 Size of licensed vehicle fleet per capita
Source: NSO



Energy generation is another key driver of environmental change - power plants are responsible for over 63 percent of Malta's greenhouse gas emissions,[13] as well as other gaseous pollutants that have a negative impact on human health, ecosystems and cultural heritage.[14] Between 1990 and 2004 Malta's gross energy consumption increased by 73 percent (see Chart 1.5). The rise in 2003 is principally attributable to the installation of additional air conditioning units after a lengthy heat wave.[15] **Only by decoupling Malta's accelerating energy demand from economic growth can environmental targets and objectives related to air pollution and climate change be met.**

Malta's fuel mix is becoming cleaner following measures such as the abolition of leaded petrol use in 2003 and the supply of higher standard diesel,[16] with corresponding improvements in air quality.[17] However there is significant potential for further shifts, particularly towards increased use of natural gas. Despite the Islands' abundant potential for solar energy generation and their relative windiness,[18] there is no significant infrastructure in place to exploit renewable sources, barring a small but growing sector of domestic solar water heaters. **Malta is still far from reaching EU renewable energy targets, which the national energy plan that will soon be published will address.**

Tourism is a high-profile foreign exchange earner, which nevertheless places significant pressure on the environment. It increases demand for development of coastal and other scenic land, places pressure on sensitive ecological or cultural sites such as garigue areas, beaches and archaeological sites, and increases traffic congestion, noise pollution, and waste production. Tourist numbers have fluctuated considerably since 1975, although the overall trend is one of growth; while 5 million tourist days were registered 1975, there were 10.9 million in 2004. The number of incoming tourists in 2004 was 2.7 times the population. Given that in general tourists use 1.5 times more resources[19] in terms of land, water and energy, and produce more waste than locals,[20] this represents significant additional pressure on the environment. The local tourism industry is characterised by significant seasonality patterns, with the summer months, particularly August, undergoing the highest pressure. However as Chart 1.6 indicates, despite the cyclical trend, average number of tourists in August is consistently significantly higher than the annual average.

These growth patterns suggest that **Malta will need to map out a sustainable development path for the energy generation and transport sectors, which are approaching thresholds in terms of pollution concentrations and congestion, as well as a sustainable tourism strategy and a basket of measures to address the nexus of social, environmental and economic issues surrounding housing availability and affordability.**

Chart 1.5 Sectoral electricity consumption
Source: NSO

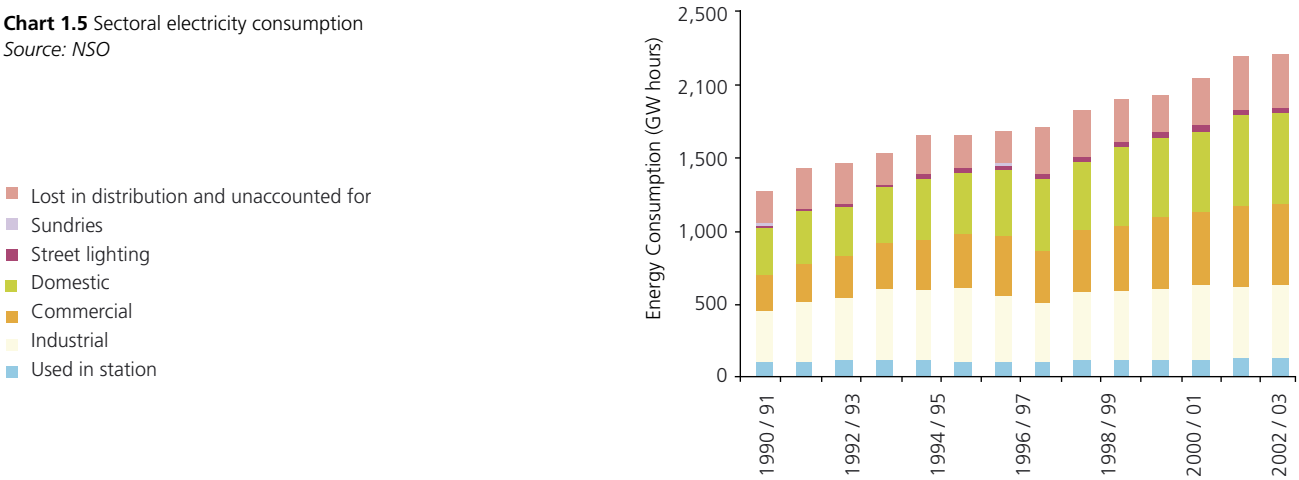
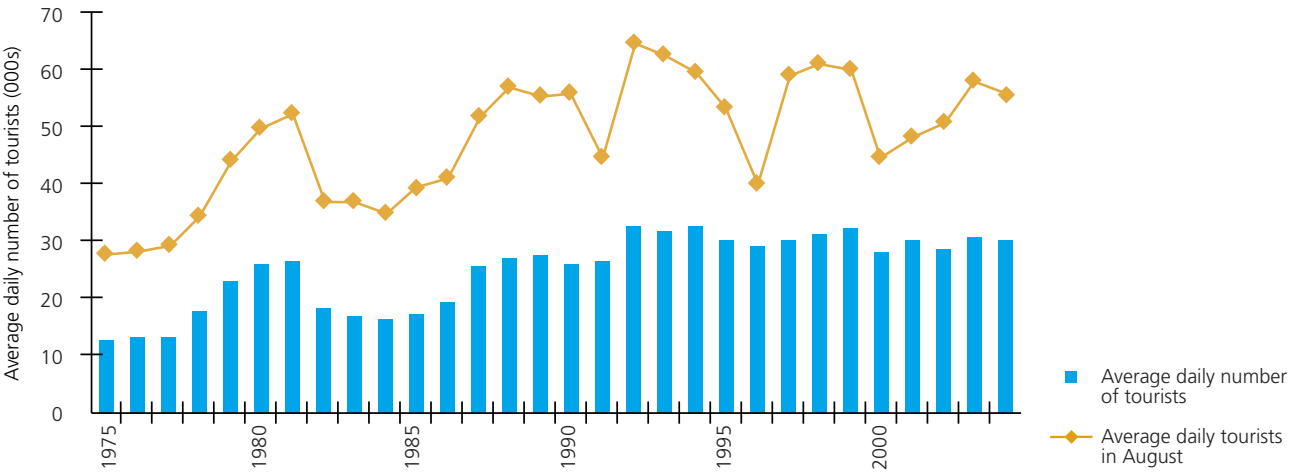


Chart 1.6 Average daily number of tourists (annually in August)
Source: NSO, MTA



2. AIR

Key Messages

- Nitrogen oxides pollution remains high in certain urban areas. Concentrations can only be significantly reduced through shifting to more sustainable patterns of mobility and energy consumption.
- Initial results indicate high levels of particulates in Malta and more studies are needed to identify sources.
- Transboundary air pollution in the form of ozone and sulphur dioxide is of concern given the Islands' geographical situation and weather patterns. Long-term effects of ozone on human health and especially on agriculture are of concern.
- There have been significant decreases in the levels of sulphur dioxide and benzene in the air, due to switches to cleaner fuels.
- Air quality in heavily-trafficked and enclosed streets can be many times worse than that a few streets away.
- Air quality at the real-time monitoring station at Floriana is on average good to moderate, with particulates and sulphur dioxide levels of more concern.

Human health and ecosystems can be negatively affected by poor air quality. In Malta air pollution is heavily influenced by factors such as morning rush hour traffic and daily electricity generation surges, as Chart 2.1 illustrates. This chapter is based on 2003 and 2004 data from MEPA's diffusion tube network and fixed station in Floriana, as reported in Nolle *et al.* (2005).[21]

Ozone (O_3) is a naturally occurring gas found both at ground level and in the high atmosphere, where it protects the Earth from harmful ultraviolet rays.[22] Ground level ozone causes respiratory symptoms in humans, such as coughs and chest pain, and impairs photosynthesis (feeding) in plants.[23] Malta is strongly influenced by ozone, the majority of which is of transboundary origin, with some local production under windless weather conditions. This gas is found mostly in areas less affected by traffic such as the south and west of Malta and Gozo, since it reacts with nitrogen oxide, which emerges from car exhaust. Indeed, EU air quality standards[24] with respect to human health were exceeded in 2004 at the Gozo Gordan lighthouse on 36 percent of days but on only 14 percent at the Floriana site. These levels of ozone are expected to impair photosynthesis in plants but not to cause visible injury. **Ozone concentrations in Malta are strongly influenced by transboundary sources.**

Nitrogen oxides (NO and NO_2) (NO_x) are produced through combustion of the nitrogen in air, and road traffic is their primary human-induced source. The principal health effects of NO_2 are linked to respiratory system change, although effects are largely indirect (such as seeming to promote bacterial infections in children and intensification of asthma symptoms). Plants and limestone are also damaged by NO_2.

Localities experiencing heavy traffic, in particular Floriana, Hamrun and Sliema, are the most affected by NO_2. The annual averages in Floriana were always above the 40 $\mu g/m^3$ annual limit value for human health protection.[25] Regarding individual sites, St. Anne Street is by far the most severely affected by NO_2, with annual averages of 71 $\mu g/m^3$ in 2003 and 82 $\mu g/m^3$ in 2004. However, the analysis of the real time measurements made at Floriana station revealed that the 200 $\mu g/m^3$ hourly limit value for humans was never exceeded. In line with international trends,[26] there was an eight percent nationwide reduction in NO_X between 2003 and 2004, however concentrations rose in localities such as Floriana (15 percent). **Nitrogen oxides pollution remains high in certain urban areas, and concentrations can only be significantly reduced through more sustainable patterns of mobility and energy consumption.**

Most global sulphur content is of anthropogenic origin,[27] arising from the combustion of sulphur-containing fossil fuels. Sulphur dioxide (SO_2) is highly water soluble, eventually becoming sulphuric acid in air, which affects the respiratory tract. Its effects are exacerbated in the presence of other pollutants such as particulates. This colourless

gas also affects plant health and causes erosion of limestone buildings. Drastic reductions in SO_2 levels in line with international trends[28] were observed between 2000[29] and 2004, with a 36 percent drop between 2003 and 2004 alone, due to switching to low sulphur fuels. Reductions were observed in particular downwind of the Marsa power plant at Luqa, Fgura, Zejtun, Gudja, and Birzebbuga (of 51, 48, 44, 40, and 40 percent respectively). In 2004, no local council area averages exceeded the WHO annual limit value for human protection of 50 μg/m³. Although the overall SO_2 burden has decreased substantially over the last few years, concentrations in particular sites such as Fgura/Hompesch Road are above both hourly and annual EU standards.[30] **Part of SO_2 (like O_3) being measured in Malta may also originate from transboundary sources, arising out of the Islands' geographical situation and weather patterns.**

Benzene is a volatile organic compound (VOC) produced in urban areas from evaporation or incomplete combustion of benzene-containing fuel. Benzene is carcinogenic and mutagenic (permanently alters the cell DNA[31]) and any dose is considered harmful.[32] Cigarette smoke is also a source of benzene. **Benzene concentrations in air have declined significantly since 2001, due to the introduction of lead-replacement petrol in January 2003** (see Map 2.1). While benzene content in leaded petrol was between six and eight percent[33], it is less than one percent in unleaded petrol. Between 2003 and 2004, the most significant decrease in benzene concentrations occurred at Fgura locality (42 percent).

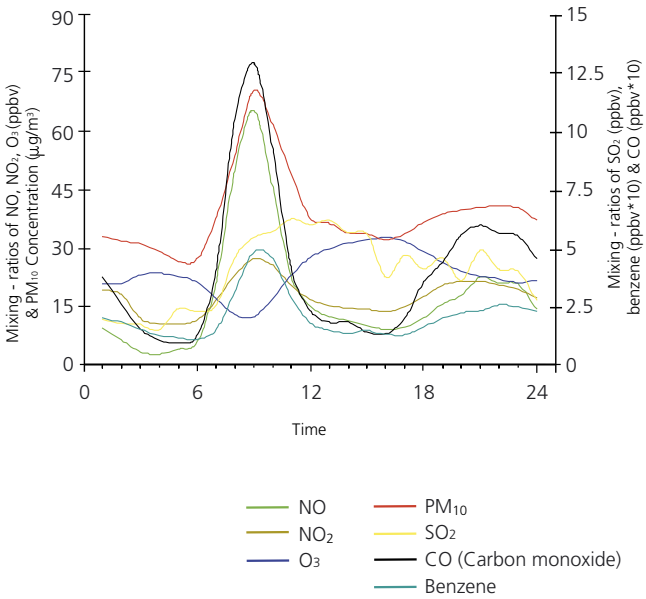
In 2004, only Hamrun had an annual average of more than the 2010 EU limit, at just beyond the 5 μg/m³ limit.[34] However in terms of particular sites, Floriana/St. Anne Street recorded the highest benzene concentration at 7 μg/m³, a considerable improvement on the worst 2003 benzene recording at Fgura/Hompesch Road (14.7 μg/m³). The differences between measurements on main roads and a few streets behind as in Floriana indicate that **air quality in heavily-trafficked and enclosed streets can be much worse than a few streets away.**

Particulate matter[35] (PM) in air originates from the dispersal of solid material from the Earth's surface, or through chemical reactions and condensation. PM_{10} refers to particulate matter that is smaller than 10 μm, and which enters the respiratory tract since the body cannot filter it out.[36] In Malta, important sources of particulates include atmospheric sea salt, dust (local and imported from the Sahara), tyre and brake abrasion and emissions. Exposure to particulate matter may be the most significant potential European health problem from air pollution.[37]

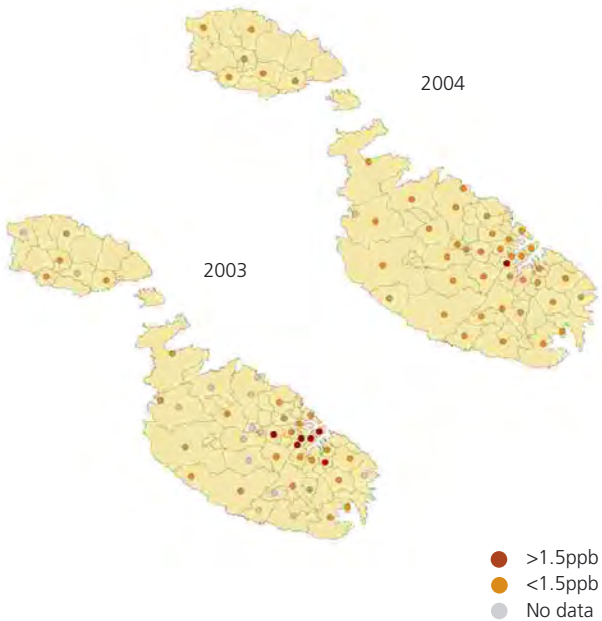
Particulate levels have only been measured at the Floriana fixed station, where EU thresholds[38] were exceeded in 37 out of 99 days measured. Peak concentrations of up to 300 μg/m³ were recorded, mostly during morning rush-hour periods, when concentrations doubled. These aerosols probably include nitric acid and sulphuric acid droplets, ammonium sulphates and ammonium nitrate, as well as diesel soot. **These initial results indicate high levels of particulates in Malta and more studies are needed to identify their sources.** The results of a 2005 study[39] on particulates indicate that sodium concentrations (due to sea salt) were found to be high, as was the amount of sulphate particles.

The Pollutant Standards Index (PSI)[40] summarises the harmfulness of concentrations of the five classic air pollutants (SO_2, NO_2, CO, O_3 and PM_{10}), based on hourly limit values. Average hourly air quality in Floriana is mostly good regarding short-term effects on human health (72 percent of the time), while only for a few hours (2.3 percent of the time) is air quality such that susceptible people such as children, elderly and asthmatics could experience symptoms. However this considers hourly averages for the period investigated. Significant effects on health and quality of life can still be expected following high pollution levels occurring for short periods.

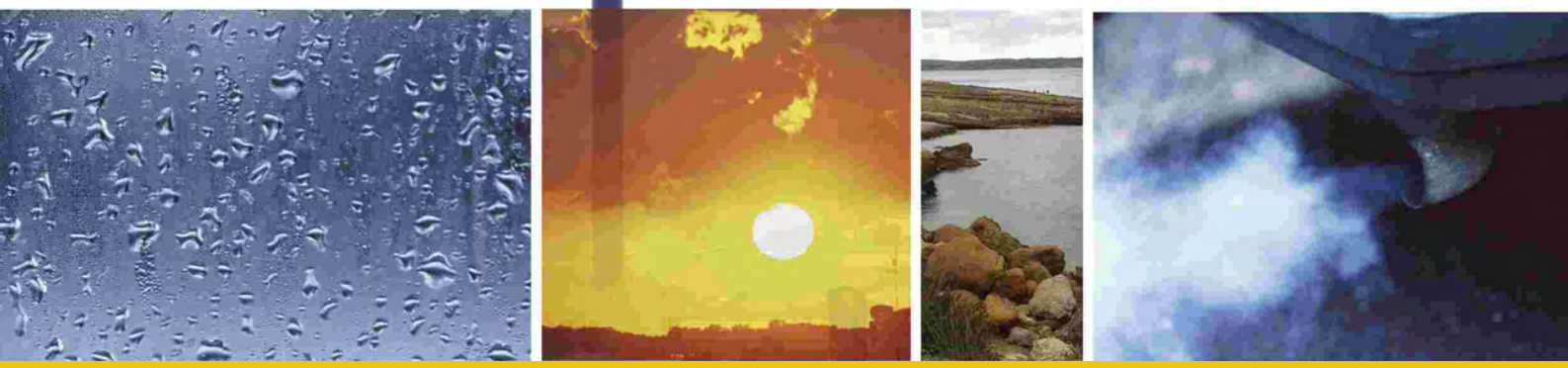
Chart 2.1 Daily variation in levels of key pollutants at Floriana (Sept - Dec 04)
Source: Nolle et al. *2005*



Map 2.1 Annual average benzene concentrations by locality
Source: Nolle et al. *2005*



3. CLIMATE CHANGE



Key Messages

- Malta's greenhouse gas emissions increased by 44 percent between 1990 and 2003, and derive largely from the energy and transport sectors.
- There is an urgent need to decouple economic growth from energy consumption.
- The Maltese climate has changed slightly over the last 50 years, and is slowly becoming warmer and dryer, consistent with international climate change predictions.
- Malta is expected to suffer moderate impacts from climate change, mainly related to deterioration of water supplies and quality, and more frequent extreme weather events. Yet due its dependence on coastal activities its economic vulnerability is expected to be moderate to moderately high.
- Even if global society gradually reduces its greenhouse gas emissions over the coming decades, climate change is likely to continue over the next centuries; mitigation and adaptation strategies are therefore necessary.

Climate change is one of the most serious environmental threats facing the world today, and is a key priority of the EU 6th Environmental Action Programme, the EU Sustainable Development Strategy and the Lisbon Strategy. Due to Malta's current formal position as a 'developing country' within the context of the United Nations Framework Convention on Climate Change (UNFCCC) it does not have quantified greenhouse gas (GHG) emission reduction targets. Malta ratified the Kyoto Protocol in 2001 and its limited obligations include periodic reporting. The EU ratified the Kyoto Protocol as an Annex I signatory, and is thus committed to reducing its emissions to eight percent less than 1990 levels by the period 2008 to 2012.

Malta's GHG emissions increased by 44 percent between 1990 and 2000, and derive largely from the energy and transport sectors.[41] Despite its rising emissions (see Chart 3.1), Malta had one of the lowest GHG emission rates per capita in the EU, seven tonnes compared to the EU average of 11 tonnes in 2000. Nevertheless it had a relatively high rate of GHG emissions per unit GDP at 910 tonnes of CO2 equivalent per million Euro as against the EU average of 605 tonnes,[42] possibly due to inefficient energy production and consumption. EU-15 GHG emissions fell by 1.4 percent between 1990 and 2003, while EU-25 emissions were 5.5 percent below the 1990 level.[43] In 2003 Malta's emissions accounted for 0.055 percent of EU GHG emissions.[44]

The energy sector contributes approximately 63 percent of Malta's GHG emissions, and was largely responsible for the steep rise in emissions in 2002. As indicated in Chapter 1, energy consumption continues to rise, with a growth of 61 percent between 1990 and 2002, and this trend is expected to continue. Malta's GDP also continues to rise, albeit slowly, and the total energy generated per unit GDP has begun to rise again after falling during the 1990s (see Chart 3.2). This trend is a matter of concern since it indicates that Malta is moving away from 'cleaner' economic growth. **There is an urgent need to decouple economic growth from energy consumption** and limit CO_2 emissions from power plants to levels stipulated in Malta's National Allocation Plan.[45] In the short- to medium-term, Malta will need to map out, based on coordination between the principal sectors involved, a sustainable development path for the energy sector in line with EU energy scenarios, the EU post-Kyoto climate regime, and EU renewable energy targets.

GHG emissions from transport increased steadily between 1990 and 2000, in step with rising vehicle numbers[46] (see Chapter 1). This sector has increased its share of emissions by 45 percent over 10 years and now accounts for 20 percent of total emissions.[47] The risk here is that any increases in fuel efficiency in the transport sector are outweighed by rising transport volumes; in the EU, GHG emissions from transport are increasing along with growth in transport volumes

that outweigh increases in efficiency.[48] In 2002 the transport sector's emissions in EU-15 were 22 percent higher than 1990 levels.[49]

The Maltese climate has changed slightly over the last 50 years, and is slowly becoming warmer and dryer, consistent with international climate change predictions. Rainfall and temperature are key indicators of climatic conditions, and their distribution in space and time vitally affects social and economic practices, including agriculture. In Malta rainfall is the only direct natural source of water and is in scarce supply due to the dry climate. Despite year-to-year fluctuations, there has been a small upward trend in temperature and a slight downward trend in rainfall between 1950 and 2004 (see Chart 3.3). Statistical analysis of meteorological data indicates a 0.5°C increase in mean annual air temperature over the past 77 years.[50] This mean annual temperature in Malta is predicted to increase by a further 3°C by 2100.[51] Despite a fluctuating trend, rainfall over the past 50 years has tended to decrease - average rainfall for the intervals 1950-75 and 1975-00 decreased by 17 percent. Extrapolation of this trend leads to a 50 percent probability of a 17 percent decrease in total annual rainfall by 2100.[52]

Over the past 100 years, mean temperature has increased by 0.7°C globally, and by 0.95°C in Europe,[53] consistent with the expected rise estimated from increased levels of atmospheric GHG. The Intergovernmental Panel on Climate Change (IPCC) predicts an increase in global mean temperature of 1.4° to 5.8°C by 2100,[54] and European temperatures are projected to rise by a further 2°C to 6.3°C by 2100.[55] European sea levels are also on the rise, having risen by 0.1m to 0.2m over the past century, and projections indicate further increases.[56]

Evidence is now growing of the impacts of climate change on ecosystems, human health and economic activity. Malta's First National Communication to UNFCCC[57] indicates that from a global perspective, **Malta is expected to suffer moderate impacts from climate change. Yet its economic vulnerability to climate change is expected to be moderate to moderately high, due its small island geography and its dependence on tourism and other coastal activities.**

The Communication predicts significant impacts related to deterioration of water quality and supply, and more frequent extreme weather events (including heavy rainfall, severe heat waves and long spells of drought). This is likely to be accompanied by an increase in soil erosion, and threats to public health, particularly for vulnerable groups such as the aged and the infirm. The estimated[57] sea level rise of 0.5m by 2050 and of 1m by 2100 would affect seawater characteristics and fish stocks, and give rise to coastal erosion and inundation, which would affect coastal development and infrastructure. It would also lead to reduced biodiversity as coastal habitats change, the climate becomes drier and water availability decreases. **Even if society gradually reduces its greenhouse gas emissions over the coming decades, climate change is likely to continue over the next centuries; mitigation and adaptation strategies [59] at various scales are therefore necessary.[60]**

Chart 3.1 GHG emissions by sector
Source: MEPA 2005a

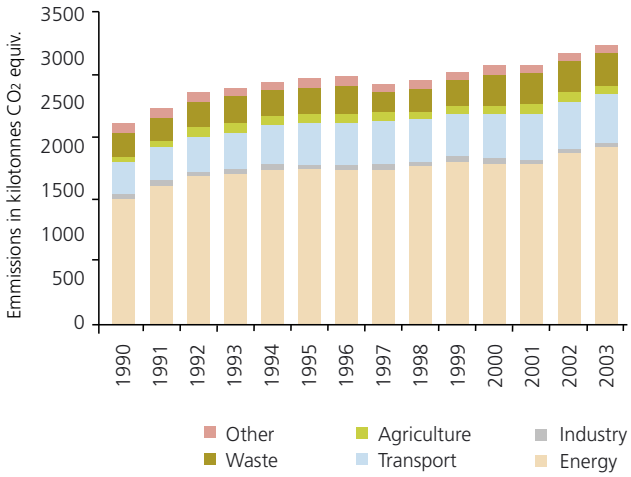


Chart 3.2 Energy intensity of growth
Source: NSO; MRAE 2004

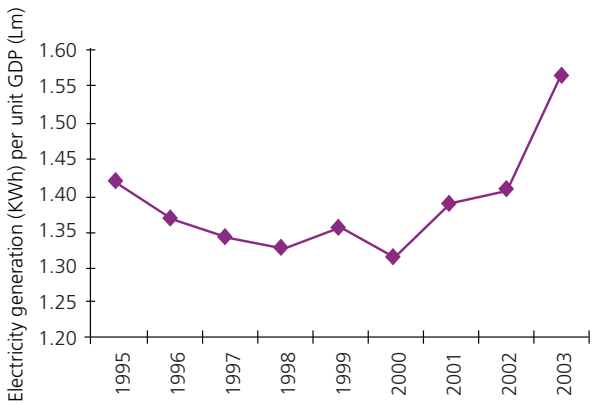
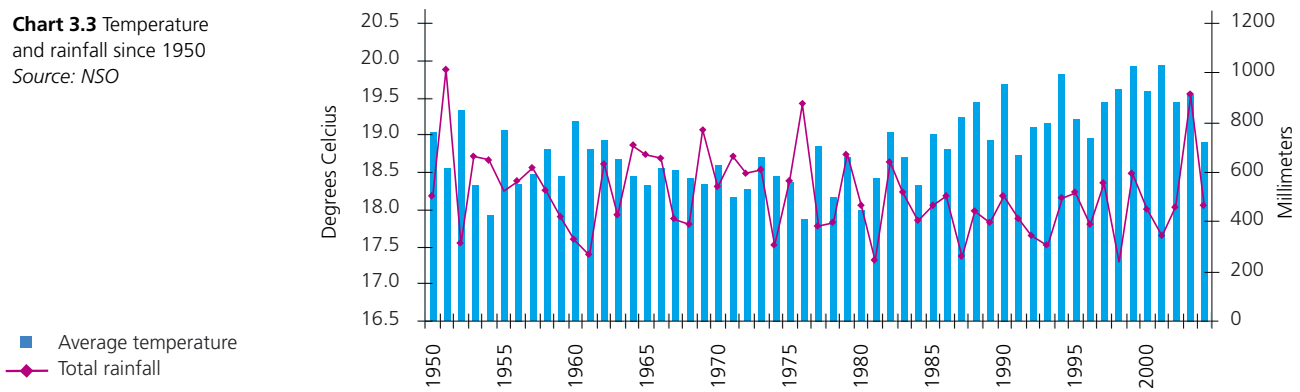


Chart 3.3 Temperature and rainfall since 1950
Source: NSO



4. LAND



Key Messages

- The key target of the Structure Plan to contain urban sprawl within the development boundary defined by the 1988 Temporary Provision Schemes has largely been achieved.
- There is significant potential for improving the overall efficiency of land use. An in-depth investigation into the social and economic dynamics underpinning the apparent contradiction between high house prices and high rates of residential vacancy, including how this affects conservation goals, is urgently needed.
- Although many historical buildings and areas have been given statutory protection, and there is a planning policy presumption against demolition of buildings within UCAs (Stucture Plan Policy UCO 9), there is increasing tension between these protective mechanisms and the desire of owners to redevelop their properties. This is resulting in loss of historic fabric, inappropriate design of new and restored buildings, and illegal excavations. Vehicle emissions and underlying factors such as residential vacancy also have a negative impact on cultural heritage.
- Countryside quality is still threatened by localised intensification of urban development, dominating settlement edges, quarrying and certain agricultural and recreational practices. The rising public interest in the countryside, including access, is an opportunity to upgrade and improve its protection and management.
- Agricultural land abandonment, farm intensification, improper farm management practices and fragmentation of ownership have negative impacts on the environment. Rural Development Plans represent important opportunities to address the viability of the agricultural sector in the context of environmental stewardship.
- Approximately five percent of Malta's 1km coastal buffer area was developed between 1990 and 2004, indicating significant development pressures coming mainly from tourism and recreation.

Land is Malta's primary non-renewable natural resource, but given Malta's small size and high population density it is in very short supply. Land provides a life support system for Malta's residents and tourists and many other living creatures. It is also the locus of the history and identity of the Maltese people. Human influence is the principal factor driving land-use change, and the magnitude and direction of that change is reviewed here by focusing on trends related to urban areas and cultural heritage, the countryside and the coast.

The CORINE 2000 land cover map[61] indicates that predominantly agricultural land accounts for almost half of Malta's land area (49 percent) while forests make up only 0.9 percent (see Map 4.1). Natural vegetation accounts for 22 percent of land, most of which is in coastal areas, while urban fabric covers 23 percent, mainly in the form of a conurbation around the harbours. The major land cover change over the past few decades has been the conversion from arable land to urban areas, although with the coming into force of the Structure Plan, the rate of loss of arable land has decreased significantly (see Soil Chapter).

On the basis of MEPA's 1988 GIS base maps and data from granted applications, it is possible to estimate recent land use change within the approved TPS development boundary as defined by parliament in 1988 in order to contain urban sprawl.[62] It results that Malta's built-up land area within the 1988 development boundary increased from 15.4 percent of the Islands' land area in 1988 to 16.9 percent in 2004. The 2000 figure was 16.5 percent. The estimate does not take into account development outside the development zone, such as in rural settlements. Malta's population density, limited land area, increasing land values,[63] and pressure for denser development patterns,[64] indicate that competition over the use of land is significant. Yet the high (and apparently paradoxical) rate of residential vacancy (23 percent of homes in 1995[65]) suggests that **there is significant potential for improving the overall efficiency of land use. An in-depth investigation into the social and economic reasons underpinning these contradictory dynamics, including how they affect conservation goals, is urgently required.** This situation is exacerbated by the high investment potential of land and property.

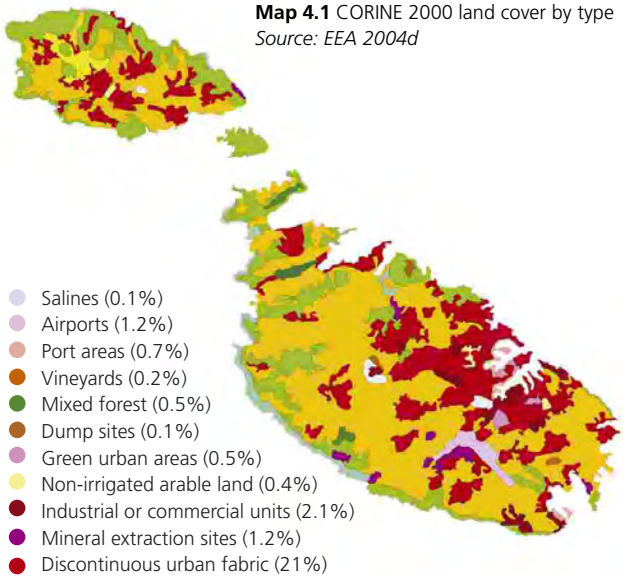
Malta's urban areas are not only the places where most Maltese live and work, but also showcases of history, identity and culture. These areas have been subject to intense pressures arising from the high population density, development patterns and the by-products of waste-intensive and car dependent consumption patterns. These pressures involved more pollution, noise, congestion, dust, increasing residential densities and loss of amenity in urban areas. However they also gave rise to the following threats to urban cultural heritage: loss of historic fabric from demolition and redevelopment of historic buildings; damage or loss of archaeological remains during excavation of basements, degradation of visual quality due to poor design, breaking up of streetscapes by incongruent set backs, reduced light penetration due to height extensions; and, vehicle emissions.[66] Structural factors were also important: substantial proportions of vacant buildings in historic areas,[67] coupled with significant amounts of low-cost rental accommodation contributed to dilapidation.[68]

During the period under review, historic buildings and areas continued to be given legal protection. Between 2002 and August 2005 89 sites were scheduled for protection under the Development Planning Act,[69] covering 167 ha of fortifications in the Grand Harbour and Mellieha areas and at Fort Chambray in Gozo. An important priority in this period was to inform known owners of scheduling made in these and previous years by means of almost 850 scheduling notifications. Monitoring of the status of scheduled sites was also undertaken. The National Protective Inventory[70] now includes 64 telephone booths and 158 post boxes from the British period and also includes 971 archaeological sites. Protection of urban conservation areas (UCAs) continued with four areas being designated, while another three are currently awaiting formal designation in parallel with the local plan process.[71] Work started in 2002 on a Street Categorisation process in UCAs, to allow a more fine-tuned approach. The scheduling process nevertheless faces a number of challenges related to demolition,[72] requests for re-consideration, appeals from scheduling and re-definition of the scheduling level of buildings and monuments, significant monuments still unprotected,[73] need for more procedural clarification and transparency; shortage of trained staff; lack of enforcement capacity; and, lenient court sentences. **Although many historical buildings and areas have been given statutory protection, and there is a planning policy presumption against demolition of buildings within UCAs (Stucture Plan Policy UCO 9), there is increasing tension between these protective mechanisms and the desire of owners to redevelop their properties. This is resulting in loss of historic fabric, inappropriate design of new and restored buildings, and illegal excavations[74]. Vehicle emissions and underlying factors such as residential vacancy also have a negative impact on cultural heritage.** On a wider level, however, the conservation of historic urban areas depends on an integrated approach that considers socio-economic issues in tandem with cultural and environmental ones. A critical assessment of current practice in this regard is required. Better-managed urban areas with more public open space would reduce demand for suburban development.

Key strategic factors affecting land use change in the countryside are urbanisation, quarrying, agriculture and recreation.[75] Between 1994 and 2000, 97 percent of dwellings approved were located within the development boundary,[76] indicating that **the key Structure Plan goal to contain urban sprawl within the development boundary has largely been achieved**. Nevertheless urban sprawl, which is largely irreversible, continues to exert significant pressure on the countryside. The main development-related losses of arable land between 1994 and 2000 were to minerals extraction (19 ha), hotels, hospitals, schools and animal farms.[77] Urban areas are now visible from 90 percent of the Maltese territory.[78] The impact of these trends on the openness and rural feeling of the countryside is becoming significant.[79]

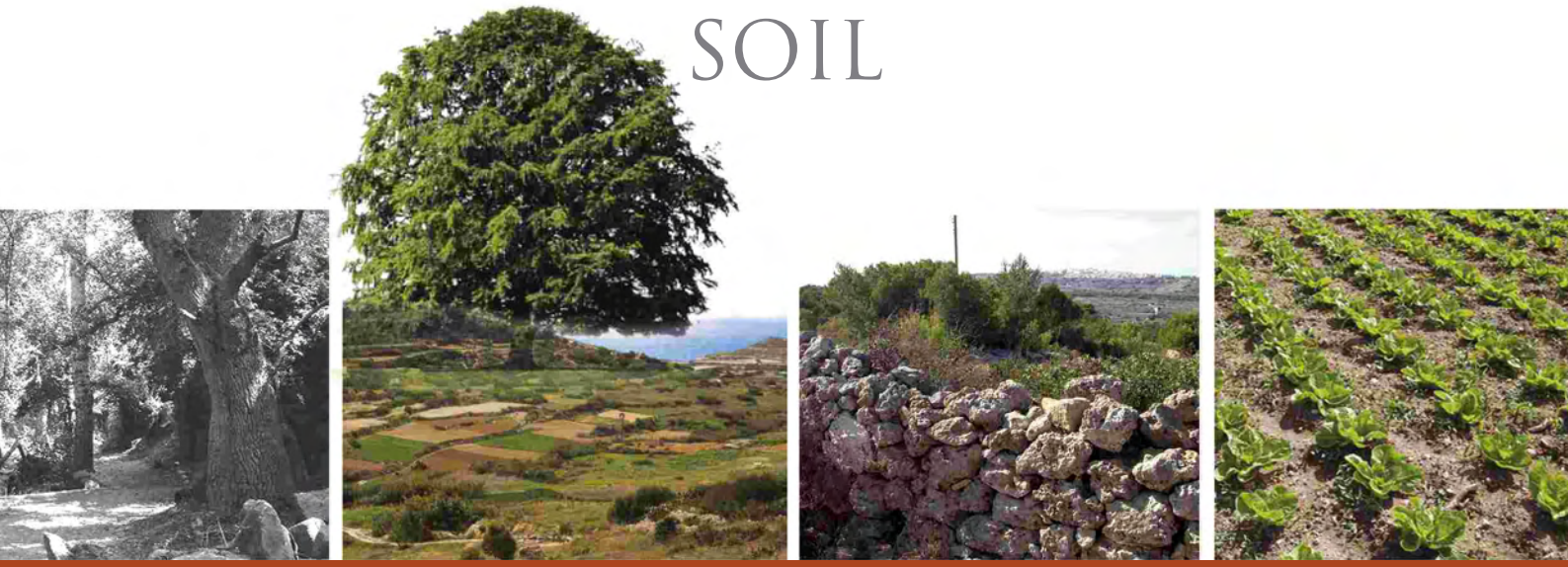
Agriculture has long been Malta's predominant land use, with multifunctional roles including maintaining rural landscapes and biodiversity as well as providing food and rural livelihoods. However, certain forms of agriculture also have environmental impacts related to pollution of soil, water and air, fragmentation of natural habitats and loss of wildlife, land abandonment and soil erosion, land use intensification and improper use of agricultural chemicals.[80] The most critical land-related agro-environment issues are land abandonment, farm intensification, poor farming practices and fragmentation of ownership. **The Rural Development Plan[81] and its associated Code of Good Agricultural Practice represent important opportunities to address the viability of the agricultural sector in the context of countryside stewardship.** Organic farming is increasing in Malta and by mid-2005 14 ha worked by 20 farmers had been registered, of which 79 percent had obtained certification. However this still represents only 0.09 percent of total agricultural land[82] as compared to the EC average of four percent in 2002.[83] **The increasing public interest in countryside issues represents a growing awareness of the relationship between quality of life and the environment, which is a key strategic opportunity to upgrade and improve its protection and management.** Local councils could play a key role here.

Malta's small island character dictates that a large percentage of its land falls within its coastal zone, where natural processes related to terrestrial and marine environments interact to create a unique and dynamic system. It is estimated that between 1990 and 2004 approximately five percent of Malta's 1km coastal buffer area was developed,[84] indicating significant development pressures coming mainly from the tourism and recreation sectors.[85] These pressures have an impact on sensitive coastal habitats, limiting public access and use and undermining landscape quality. They are also leading to the displacement of traditional coastal uses (such as fishing) and to user conflicts. MEPA statistics indicate that 21 percent of the coastline no longer retains its natural form.



Map 4.1 CORINE 2000 land cover by type
Source: EEA 2004d

5. SOIL



Key Messages

- Maltese soils can be significantly fertile and productive despite limiting natural geographical and climatic factors such as shallow depth and low levels of organic matter.
- Society underestimates the value of Maltese soil resources, in particular their ability to perform a multitude of vital functions, including food production, storage and filtering of water, and supporting human activity and biological diversity.
- Malta's principal soil contamination sources include point sources such as quarries, industrial facilities, and waste dumps, and diffuse pollution from aerial deposition of dust or combustion products, exhaust emissions, lead shot, agricultural chemicals and application of manure and compost.
- As a result of pressures from high population density and certain agricultural practices, Maltese soils' vulnerability to erosion by water, salt and nutrient loading and localised contamination have been intensified. This increases the threat of long-term land degradation.
- A wide variety of organisms live in the soil and the reduction of soil biodiversity makes it more susceptible to other degradation processes.

Soil[86] is one of the basic components of life on earth, supporting agriculture, maintaining the countryside, vegetation and fauna, supporting organisims that break down plant debris, managing water resources, preserving archaeological heritage, and managing potential pollutants. **Maltese society underestimates the value of its soil resources, in particular their ability to perform these vital life-support functions.** Although easily destroyed if misused, soil can continue to serve the needs of humans and other organisms be a renewable resource for the foreseeable future if properly managed.

The spatial distribution of the various types of Maltese soil is very intricate, both in semi-natural and agricultural areas. Three human factors have contributed to this complexity: the movement of excavated soil from construction sites,[87] the creation of 'made ground' or replenishment of eroded or shallow soils, and the impacts of urbanisation. Nevertheless, a soil classification has been developed on the basis of a 2004 national soil inventory and other sources.[88] Different soils form on different types of landscapes. Malta's semi-natural landscapes include bare sea cliffs, garigue, marshland, woodland, Blue Clay slopes, Blue Clay spring line, and blown sand. In rural landscapes of greater human influence there is widespread terracing of sloping land and more 'made ground'. Malta's major soil types [89] are illustrated in Map 5.1.

Maltese soils range from slightly to moderaltely alkaline.[90] Due to their clay content of higher than 48 percent, two thirds of Maltese soils may be considered difficult to work. However these soils have higher nutrient retention and water filtration capacities. In general, the soils are non-saline, however, irrigation with poor quality water, especially saline treated sewage effluent, is increasing soil salinity. Soil organic matter is a key determinant of the soil's productivity, and 46 percent of Maltese soils have a soil organic carbon content of below two percent, at which point it is estimated that potentially serious decline in quality occurs[91] (see Map 5.2). During the past 30 years, 4,500 ha of agricultural land has been lost to development, although the average annual rate of loss of land has decreased from approximately 200 ha per annum for the period 1971-1986, to approximately 80 ha per annum for 1986-2001.[92]

Soil contamination leads to loss in the soil's ability to support plant life. Heavy metal concentrations provide important insights into contamination levels. In 25 percent of Maltese soils, lead concentrations exceed the limit (100 mg/kg) for the application of sewage sludge.[93] Moreover, seven percent of soils exceed the 200 mg/kg limit established for zinc, and in three percent of the soils, the 100 mg/kg threshold for copper is exceeded. **Point source contamination is generally associated with minerals extraction, industrial facilities, waste dumps and other facilities, both in operation and after closure. Diffuse contamination by heavy metals arises from aerial deposition of dust or combustion products, exhaust emissions, lead shot, the application of livestock manures, compost from mixed municipal waste, agricultural chemicals and treated sewage effluent.**

The soils' suitability for agriculture is limited by a number of factors, including unfavourable degrees of alkalinity, shallow depths (approximately 60 percent of soils), low soil organic matter, high soil stoniness, the dry climate and low water absorption rates due to soil surface crusts. **Despite their limitations due to natural geographical and climatic factors, national agricultural statistics[94] indicate that Maltese soils can be significantly fertile and productive.**

Soil flora and fauna have a fundamental role in cycles that enable the soil to support natural and semi-natural vegetation.[95] **A wide variety of organisms live in the soil and the reduction of soil biodiversity makes it more susceptible to other degradation processes.** It is estimated that 1g of healthy soil may contain as many as 600 million bacteria belonging to up to 20,000 species.[96] Larger organisms such as rabbits, reptiles, and birds also depend on the soil for food and shelter. Data on soil macro and micro fauna and flora in Malta is incomplete, and limited to selected groups of insects, molluscs, fungi (mostly mushrooms and some plant pathogens) and some invertebrate species associated with leaf-litter, particularly in wooded areas.[97] Important habitat types in terms of soil biodiversity include woodlands, clay slopes, karst soil pockets in garigue, rocky steppes and cliff edges (*rdum*). Specialised habitats including saline marshlands, freshwater wetlands and other humid areas also house important species. A number of soil-inhabiting species have been found in soil at 10-30 cm depth, often under trees, many of which have been recently described as new species to science, and are endemic to the Maltese Islands. Two examples include the endemic weevil and a deep-burrowing slug.[98]

Soil is under increasing threat from a range of human activities, particularly urbanisation and development, and intensification of agricultural systems, which undermine its long-term availability and viability. Maltese soils are threatened by many of the threats that have been identified internationally,[99] and, despite limited knowledge of their extent and implications, the five major threats for Maltese soils are discussed in Table 5.1. **As a result of these pressures, Maltese soils' vulnerability to erosion by water, salt and nutrient loading and localised contamination have been intensified. This increases the threat of long-term land degradation.**

Table 5.1 Principal threats to Malta's soils
Source: MRAE

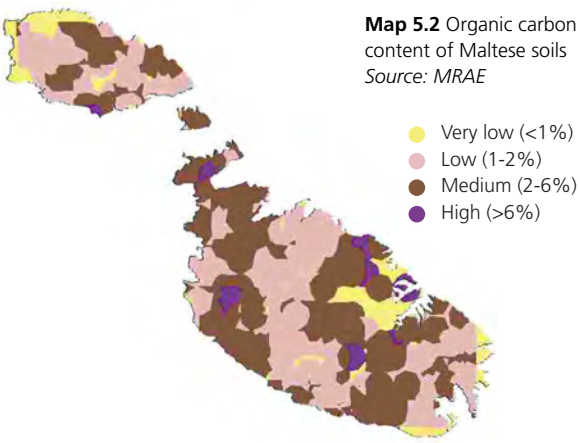
Erosion: Soil is eroded by wind and water, while human activities such as land development, quarrying, waste disposal, overexploitation of freshwater resources, deforestation, overgrazing, down slope ploughing, land abandonment and increased use of pesticides and fertilisers directly remove soil or degrade the soil leading to erosion.[100] Rural development policies[101] have been directed to reducing soil erosion processes and mitigating damage by conserving retaining rubble walls. Land tenure also plays a part in rubble walls maintenance. The Agricultural Leases (Reletting) Act, 1967 (Cap 199) sought to address this but has not managed to stem the damage. The rubble walling is protected under the Rubble Walls and Rural Structures (Conservation and Maintenance) Regulations, but most of the arable land in the Maltese Islands remains severely to moderately eroded due poor wall maintenance. The Building Industry Consultative Council organises training courses in rubble wall construction.

Soil Sealing: This is the irreversible covering of soil for housing, roads, or other land development. Although the covering of fertile soil with any layer of concrete, stones or stone slabs, is legally prohibited, this legislation[102] is difficult to enforce and has contributed to considerable soil mixing due to soil stripping and deposition in alternative sites.

Decline in organic matter: A result of intensive cultivation, this decline has become a major driver of land degradation.

Soil contamination: High levels of contaminants in soils have multiple negative consequences for the food chain, and thus for human and ecosystem health (see earlier discussion).

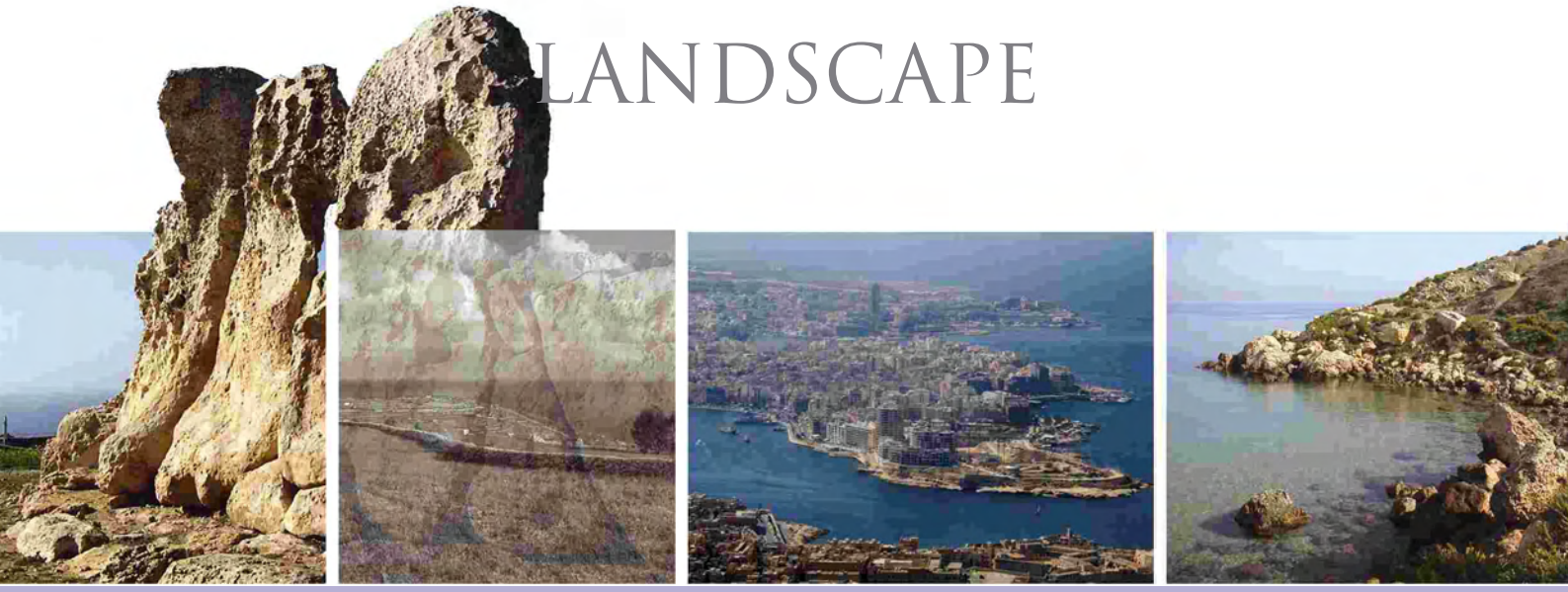
Salinisation: The accumulation of soluble salts in soils to the extent that soil fertility is reduced. In irrigated areas soil electrical conductivity (total soluble salts) is up to twice that in non-irrigated regions, and losses in yields are often reported.



Map 5.2 Organic carbon content of Maltese soils
Source: MRAE

Map 5.1 Soil landscapes and soil types of the Maltese Islands
Source: MRAE

6. LANDSCAPE



Key Messages

- The Maltese landscape may be characterised as a cultural landscape with a combination of elements that give it a distinct character that is unique in the world.
- Since 1990 there has been a limited but noticeable improvement in townscapes in terms of architectural quality and public amenities, with more attention to landscaping, treatment of facades and public open space. Overall, however, landscape is threatened by the increasing built up area, industrial and coastal development, taller buildings on urban fringes obstructing views of historical centres, modern agricultural practices, increasing vehicular access, littering, poor standards of design and work, and lack of maintenance.
- The Landscape Assessment Study has provided a firm foundation for better landscape protection in strategic and subsidiary land-use plans.
- Some important areas of high quality landscape character, particularly in Gozo and Comino and inland Malta, have not yet been given statutory protection.

While Malta's landscape is physically determined by its limestone geomorphology and dry climate, it has also been heavily influenced by over 7,000 years of human presence, particularly during the last few decades. Malta's natural landscape is characterised by karstic rock and relatively inconspicuous Mediterranean biodiversity in terms of vegetation and fauna. **The Maltese landscape may be characterised as a cultural landscape with a combination of elements that give it a distinct character that is unique in the world** (see Box 6.1).

Malta's draft Landscape Assessment Study[103] provides a summary of the principal changes to the Maltese landscape in the period between 1990 and 2000. **It concludes that there has been a limited but noticeable improvement in townscapes in terms of architectural quality and public amenities, with more attention to landscaping, treatment of facades and public open space. Overall, however, landscape is threatened by increasing built up area, industrial and coastal development, taller buildings on urban fringes obstructing views of historical centres, modern agricultural practices, increasing vehicular access, littering, poor standards of design and work, and lack of maintenance.** Key landscape changes[104] between 1990 and 2000 are discussed in Table 6.1.

Public perceptions of landscape value favour hilly coastal areas with lush vegetation, including fortifications, churches and traditional buildings, and view industrial areas, quarries and landfills negatively.

Box 6.1 Key elements of Malta's landscape[105]

- Landscape characterised by coastal views;
- Shallow coastal waters and presence of offshore islands;
- Lack of significant inland water bodies;
- Relative absence of forests;
- Terraced fields;
- Panoramic spots accessible from road network;
- Cultural and natural heritage strongly intertwined;
- Fortified structures dominate the Inner Harbour area, and other ex-military structures in the countryside;
- Characteristic churches dominate traditional urban skylines along with newer large buildings;
- Cubic settlement massing with flat roofs;
- Dominance of *franka* (soft) stone in architecture;
- Most urban areas concentrated within a radius of 5 km from the Inner Harbour;
- Most bays along eastern and northern coasts of Malta and some bays in Gozo dominated by modern development;
- Sensitivity to detail: relatively small features can have a disproportionate influence on long distance views.

A recent study[106] indicates that landscapes with varied rural topography and steeper slopes were more appreciated than plains. Settlements were generally perceived to be of neutral value, scoring very highly

when churches were in the centre, and lower when modern buildings on settlement edges dominated skylines. Industrial areas, quarries and landfills were judged to detract significantly from scenic value. The least favoured landscape was that containing the Maghtab dump site, despite the sea and fields surrounding the feature. This illustrates the importance of prior knowledge in public perceptions of landscape quality[107] (see Plates 6.1 and 6.2).

Malta signed (but has not yet ratified) the European Landscape Convention in 2000 and its provisions relating to legal recognition, participatory procedures, protective policies, and integrating landscape into land-use planning are already implemented. In line with provisions regarding landscape characterisation and monitoring, MEPA has carried out a national landscape assessment, which mapped out landscape sensitivity areas, of which Very High and High Landscape Sensitivity areas (see Map 6.1) cover 51 percent of the Islands.[108] **The Landscape Assessment Study has provided a firm foundation for better landscape protection in strategic and subsidiary land-use plans.**

The planning system's principal tool for landscape protection is statutory designation. Areas of High Landscape Value (AHLVs) were designated in 1996 and 2000, and cover 12 percent of the territory.[109] There is a certain level of convergence between the findings of the Landscape Assessment Study and AHLVs (see Map 6.1), however **some important areas of landscape quality, particularly in Gozo and inland Malta, have not yet been afforded statutory protection.** The emergent land-use policy on tall buildings has also taken landscape sensitivity on board. Other protective designations such as the Special Areas of Conservation that protect biodiversity (see Chapter 9) also help to protect the Maltese landscape. On the scale of individual projects, the land-use planning system imposes landscaping conditions on permissions for major development projects. For smaller developments in urban areas, small plot sizes and parking conditions often do not allow for much landscaping. In rural areas landscaping aims to screen development from long- and medium-distance views.

The Environmental Landscapes Consortium, a public-private partnership launched in 2001, has improved the appearance of many of Malta's public areas and gardens. In addition, MRAE's Tree for You (34U) afforestation campaign will create woodland recreational areas integrated with national and regional parks at Delimara, Xrobb il-Ghagin, Ta' Qali, Salina and Mellieha, although some public woodlands that are not being actively managed, such as the Tas-Silg area, are seriously degraded and suffering from vandalism. The Rural Development Plan is another key tool for landscape protection;[110] one of its medium-term objectives is to maintain cultural landscapes to generate positive externalities. Its agri-environment measure provides financial incentives for rubble wall repair on the basis of which, together with Pre-accession project, 0.26km^2 rubble walls were subject to application for restoration.

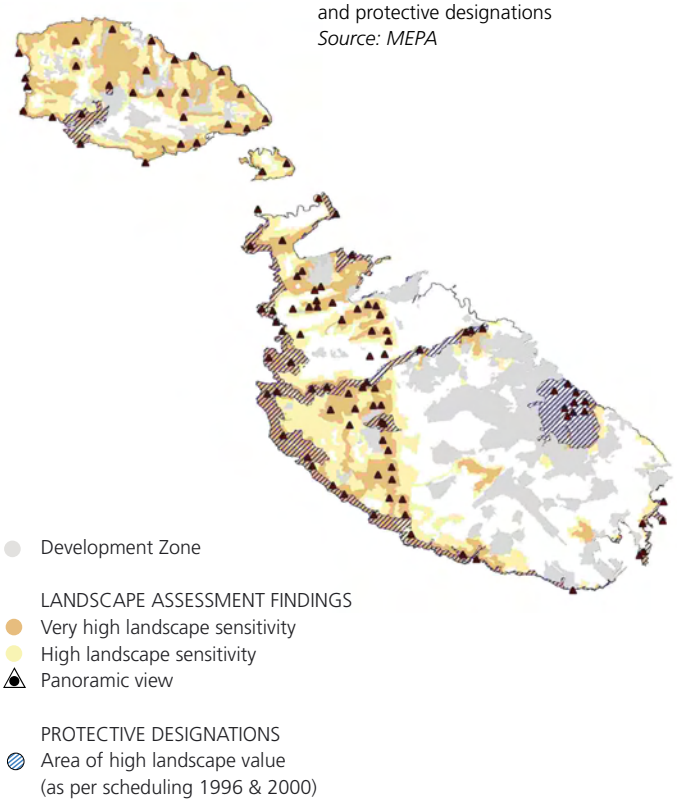
Plate 6.1 Most favoured landscape image for public
Source: MEPA

Plate 6.2 Least favoured landscape image for public
Source: MEPA

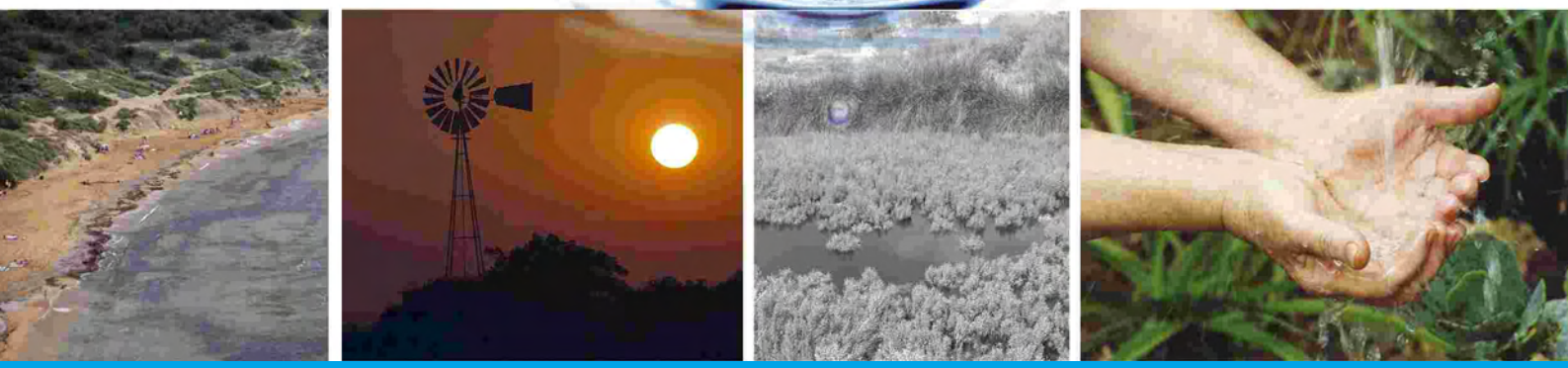
Table 6.1 Major features of landscape change 1990 - 2000[111]

Issue	Change 1990 -2000
Urban sprawl	Urban sprawl of the 1980s significantly contained, however, some settlements continued to merge, undermining distinctiveness of settlements.
Project landscaping	Localized improvements in treatment of facades and open spaces in historic urban and coastal areas, particularly promenades. However urban skylines continued to deteriorate, especially close to urban fringes and roof clutter continued to degrade skylines. Landscaping being given more attention, particularly around major projects and public amenities.
Agricultural practices	Rate of loss of agricultural land decreased, but higher level of visual influence resulting from agricultural changes (e.g. animal husbandry units and greenhouses). Greater accessibility brought remoter areas under greater human pressure.
Industry and waste	Industrial development had negative impacts in some areas (e.g. Freeport area). Waste disposal and dilapidation continued as major drivers of rural degradation.
Coastal quality	Fish farms introduced unsightly offshore features, although visual footprint is fairly limited. Mooring of oilrigs has had limited adverse impact on the seascape.
Architecture and public amenities	Limited but noticeable improvement in architectural quality and public amenities, although to variable standards. Poor workmanship, lack of attention to detail, inappropriate design sometimes leading to pastiche, and lack of a maintenance culture continue to contribute to degradation. Additional degradation arose from the presence of large numbers of vehicles in rural areas.

Map 6.1 Landscape sensitivity areas and protective designations
Source: MEPA



7. WATERS



Key Messages

- Malta's groundwaters are seriously at risk from over-exploitation and pollution, risking the loss of Malta's only renewable freshwater resource. In 2004, nitrate levels at two thirds of WSC abstraction boreholes exceeded the Nitrate Directive trigger-value, while chloride levels in the sea level aquifer system indicate that abstraction boreholes are highly threatened by localised seawater intrusion.
- The large share of private water abstraction, estimated at 30 percent of total water production in 2003, highlights the vulnerability of groundwaters to multiple private users. So far, no private suppliers of water for human consumption have registered with the Health Department, which would ensure their compliance with Drinking Water Directive standards.
- All Malta's inland surface and transitional (between sea and land) waters are highly restricted habitats and the various animals and plants found there are in danger of extinction. Malta is legally bound to ensure the long-term protection of these habitats.
- Most of Malta's coastal waters were of acceptable status in 2004, except for inside harbours and near sewage outfalls, power station thermal discharge points, and to a lesser extent, in the vicinity of fish farms and Maghtab. Sewage overflows in St. Paul's Bay and Birzebbugia remain a matter of concern. Malta's bathing waters meet Bathing Water Directive quality standards and mostly meet those of the Barcelona Convention.
- It is likely that only two of the three sewage treatment plants planned to treat all Malta's sewage by 2007 will be on board by the target date. These two plants are in the initial stages of construction in Gozo and the North of Malta.
- Overall, there is potential to improve national coastal and marine policy by integrating sectoral policy such as that on tourism and recreation, maritime activities, aquaculture and fisheries, and the environment.

Water remains a scarce resource and is under intense pressures from competing users. While immediate supply constraints have been addressed, principally through desalination (reverse osmosis), this has been achieved at a high cost in financial[112] and environmental terms due to fossil fuel use and related emissions. The domestic sector accounted for 39 percent of total estimated water consumption in 2003, followed by arable agriculture at 37 percent (see Chart 7.1). There was a 4 percent decrease in billed consumption[113] between 1995 and 2004, likely to be related to the 1998 water tariff increases, when this consumption fell by almost 20 percent.[114] Consumption rose by eight percent between 1998 and 2004.

Groundwater remains Malta's single most important freshwater source, estimated at 56 percent of total production, over half of which is estimated to occur through (largely unauthorised) private groundwater abstraction. **This highlights the vulnerability of Malta's groundwaters to decisions by multiple private users, in which context abstraction rates cannot be easily regulated to ensure groundwater protection. Although private suppliers of water for human consumption must now also conform with EU Drinking Water Directive standards,[116] and thus should be registered with the Health Department, none had yet done so as of October 2005** although a small number have applied for registration and one bottling company had been registered since February 2005. Water theft, illegal abstraction from unregistered boreholes, particularly for agriculture, and the use of privately-supplied water of unknown quality by domestic users, remain matters of concern.[116] Losses to leakages of water produced by the Water Services Corporation (WSC) fell by 53 percent between 1995 and 2003.[117]

Malta's key instrument for ensuring the quantitative and qualitative status of water is the Water Policy Framework Regulations,[118] which involves a target to achieve good status of water by 2015.[119] The Water Framework Directive (WFD) identifies four categories of waters that are found in the natural environment: groundwaters, inland surface waters, transitional waters, and coastal waters.

An initial characterisation of Malta's waters confirms that the major groundwater bodies are now in jeopardy due to over-exploitation (see Map 7.1) [120] and pollution. This increases the risk of losing Malta's only renewable freshwater resource. In the case of the Malta mean sea level aquifer, which provides 66 percent of total groundwater extracted, and which is seriously threatened by localised seawater intrusion (see below) it would mean losing a resource that under optimum conditions could store up to 1.5 billion m^3 of water,[121] and which once lost would be difficult to restore. In addition, the increasing urbanisation of Malta reduces the natural replenishment of groundwater from rainfall since more water runs off into the sea.

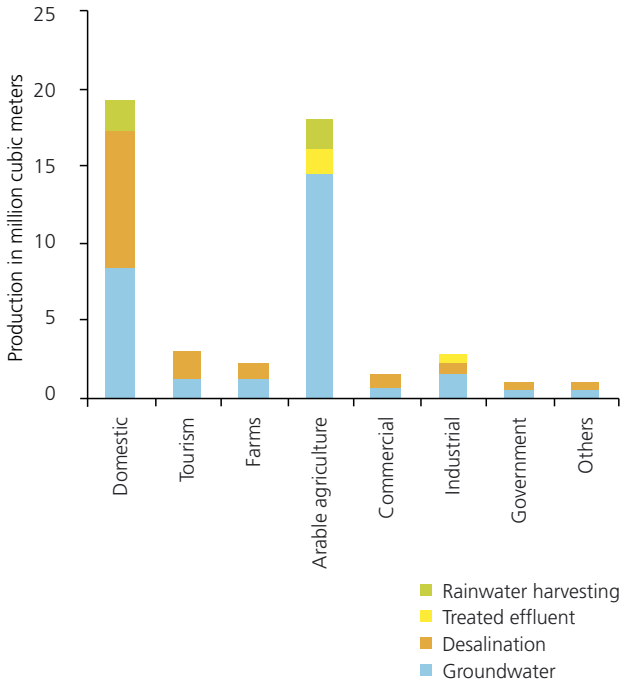
In terms of qualitative status, in 2004 nitrate levels in Malta's groundwaters exceeded the Nitrate Directive trigger-value (after which certain actions apply) of 50 NO_3 mg/l at two thirds of the WSC abstraction boreholes. Exceedences were most notable in the perched aquifer system, where the highest value was 132 mg/l at Mgarr. The highest nitrate level found in the sea level aquifer system was 85 mg/l at the Speranza borehole. The fresh water lens that makes up **Malta's mean sea level aquifer system is particularly vulnerable to localised seawater intrusion. Chloride concentrations, indicating saltiness, in this groundwater body all exceeded the WHO drinking water standard of 250 Cl mg/l,** which may be used as a benchmark for groundwater but remains a very high standard in this context. Concentrations range from 1,736 mg/l at Ta' Kandja to 354 mg/l at Xewkija, Gozo. The perched aquifer system is also slightly at risk from salinity, with values ranging from 209 mg/l at Bingemma to 163 mg/l at Falka near Rabat. Since 2001 there has been an overall reduction in the levels of nitrates and chlorides measured at WSC abstraction boreholes on the island of Malta.[122] The main threats to groundwater quality are: unlawful discharges, nitrate contamination particularly from agricultural fertilizers, human and animal wastes, and localised sea-water intrusion. Malta is working to achieve good groundwater status by its 2015 WFD target.

Pesticide residues in groundwater are also of concern due to effects on human health and ecosystems.[123] A once-off test in 1999 indicates that pesticide levels in both water abstracted from boreholes and tap water were well below detection limits.[124] However the 24 percent increase in pesticide sales[126] between 2000 and 2003 point to the need for a structured process of data gathering on pesticides in water.[127] Tests on Maltese crops indicate that maximum residue levels were exceeded only in 0.02 percent of cases between August 2002 and February 2005.[128]

Malta's inland surface and transitional waters include freshwater and brackish water habitats such as watercourses, springs and freshwater pools. Transitional waters in Malta are saline marshlands or areas at the ends of valleys leading to the sea. **All of these habitats are rare in Malta, and the various animals and plants found within them are in danger of extinction, either in Malta or globally if they are endemic, since they have a considerably restricted geographical range. Malta is legally bound to monitor the quality of these waters and to protect them as habitats, by ensuring long-term sustainable use of water resources.**

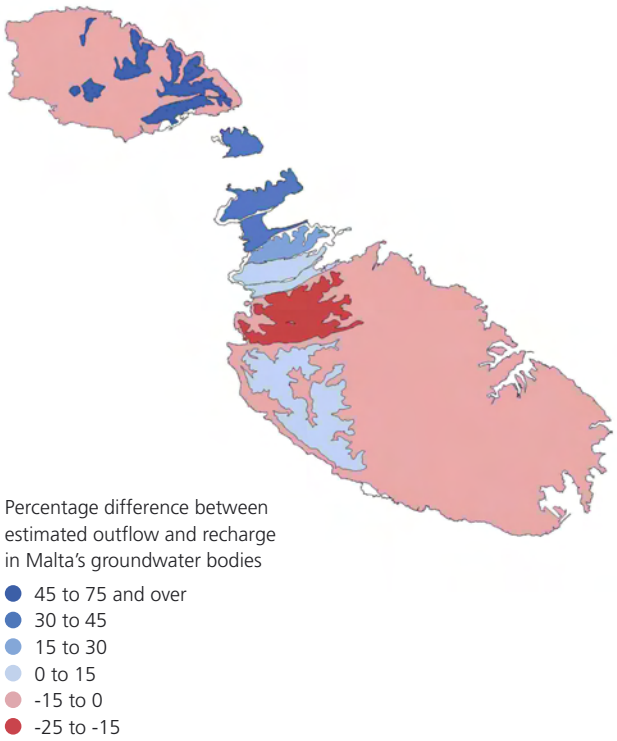
Coastal waters make up the majority of Malta's water resources; their value is economic because of tourism, strategic as an indirect source of drinking water (via desalination), and intrinsic since the waters contain some of Malta's richest ecosystems[129] and are important for recreational and cultural activities. Bathing water quality has a major impact on public health, and both the Barcelona Convention[130] and the WFD set out bathing water quality standards. Malta's bathing waters have improved in terms of microbiological

Chart 7.1 Estimates for sectoral water consumption by source (2003)[125]
Source: MRA 2005 data



Note: This chart does not take in to account public distribution losses.

Map 7.1 Quantitative status of Malta's groundwater bodies[132]
Source: MRA

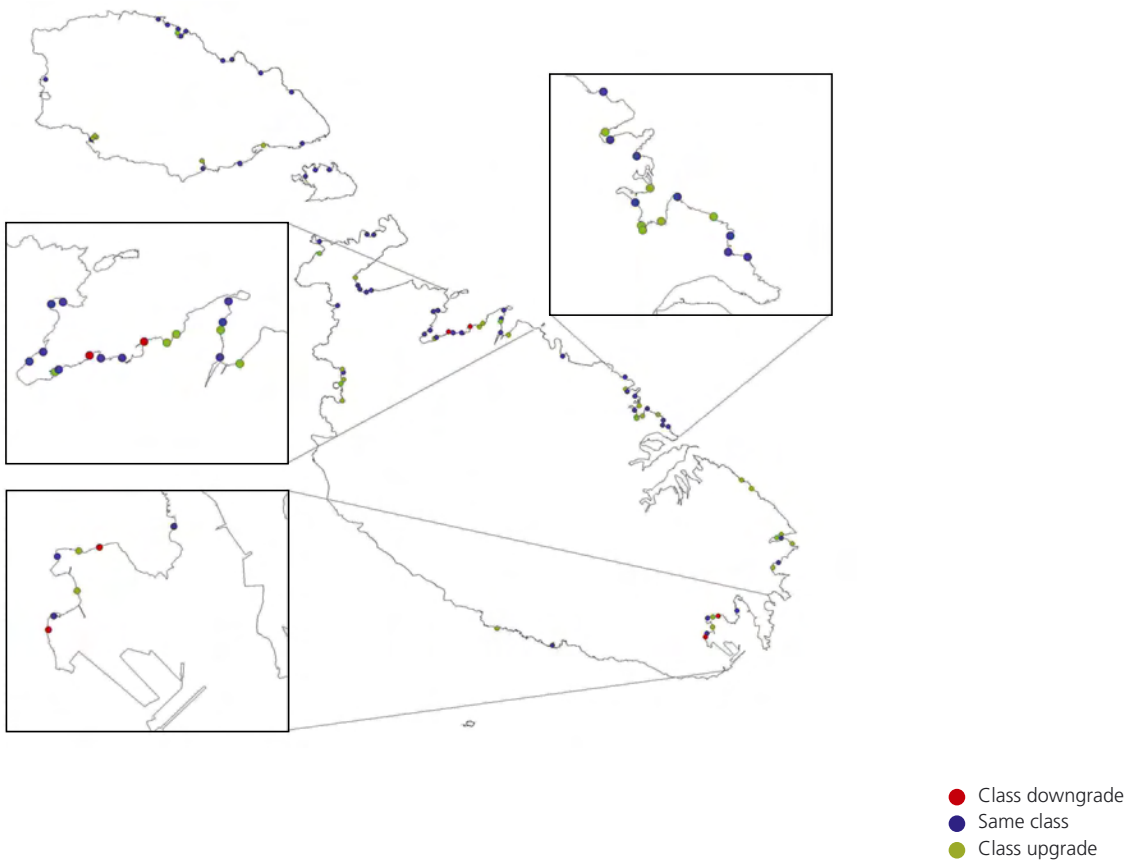


parameters; the number of sites classified as First Class under the Barcelona Convention rose from 55 percent of sites in 1996 to 83 percent in 2004. Between 2001 and 2004, all bathing sites complied with Bathing Water Quality Directive criteria.[131] Only four sites, at Birzebbugia and St. Paul's Bay, registered class downgrades since 2001 (see Map 7.2). **Malta meets the Bathing Water Directive standards, and to a large extent also those laid out under the more stringent Barcelona Convention.** The 2004 physio-chemical monitoring of bathing water reports significant pressures on bathing areas during summer, since increased activity generates more sewage disposal and marine-leisure related impacts.[133] Values for most parameters were below detection limit throughout the 2004 season, though minor quantities of heavy metals, detergents, phosphates and nitrates were detected in certain areas. Dissolved oxygen levels achieved guideline standards in only 40 percent of cases, indicating biological overproductivity.

Since 2002, ongoing monitoring under the Barcelona Convention indicates that overall coastal water quality has improved.[134] The 2004 monitoring report indicates that **most of Malta's coastal waters are of acceptable status, except for inside harbours and near sewage outfalls, power station thermal discharge points, and to a lesser extent, in the vicinity of fish farms and Maghtab. However sewage overflows in St. Paul's Bay and Birzebbugia remain a matter of concern. There is potential to improve national coastal and marine policy by better integrating sectoral policies such as that on tourism and recreation, maritime activities, aquaculture and fisheries, and the environment.** The upcoming EU Marine Thematic Strategy[135] and Maritime Policy[136] should provide the right context for this.

Only approximately 6.4 percent of sewage discharged at sea was treated in 2004,[137] and flow is regulated by demand from industry and agriculture. Both these sectors have noted that the treated sewage effluent is of a poor standard due to its salinity, which originates in seawater infiltration into the sewerage system, and dumping of brine from desalination and toilet flushing.[138] **It is likely that only two of the three wastewater treatment plants planned to treat all Malta's sewage by 2007 will be completed by the target date. These two plants are in the initial stages of construction in Gozo and the North of Malta.**

Map 7.2 Changing trends in microbiological status of bathing water between 2001 and 2004
Source: Department of Public Health



8. WASTE

Key Messages

- Waste generation is still increasing rapidly, particularly in the construction and demolition and municipal waste fractions.
- Progress has been achieved in setting-up waste management systems such as permitting, improved landfill management, and better enforcement. These are contributing to changing practices and attitudes with regard to waste in industry and households, however not enough resources are in place to fully implement and enforce these systems on a recurrent basis.
- The review of the Solid Waste Management Strategy offers an important opportunity for Malta to map out how it plans to achieve its waste management targets in terms of key actions, actors and resources.

Waste arises as a result of household, industrial and commercial practices and reflects loss of natural resources. The collection, treatment and disposal of waste also involve considerable economic and environmental costs. Generating less waste would therefore be better both for the economy and for the environment.

While a figure for the amount of waste generated is not yet available,[139] total waste arriving at Malta's principal waste management facilities[140] is a useful approximation. This data must be viewed in the context of increasingly exact measurements over the years, particularly since 1997 when weighbridges were installed at Maghtab and Sant' Antnin. **There was an increase of approximately 50 percent in total waste arriving at the facilities between 1996 and 2004, principally due to increases in construction and demolition waste and municipal waste** (see Chart 8.1). However these figures do not include illegal dumping. The Cleaning Services Department[141] indicates that 20,000 tonnes of material illegally dumped across the Maltese Islands was cleared during 2004, and 10,000 tonnes between January and August 2005.

Malta's major waste fractions are construction and demolition waste (88 percent in 2004) and municipal waste (8 percent). The trend in construction and demolition waste collected is one of marked growth (112 percent since 1996). Municipal solid waste[142] and mixed trade and municipal waste[143] have also increased substantially since 1996, albeit at a slower rate (57 percent). In the period from 1997 to 2004 the increase was 37 percent. This is most likely due to increased use of packaging (see Chart 8.2), which represented approximately 37 percent of municipal solid waste and 3 percent[144] of total waste generated in 2004. The amount of hazardous waste going to landfill has declined substantially since 1999, and since 2003 this type of waste has been retained on site at the waste generator or exported through private initiative, pending the establishment of hazardous waste management facilities. Commercial and industrial waste decreased, possibly due to resource efficiency gains in industry and improved recycling practices.

In line with the Solid Waste Management Strategy (currently under review) and the Waste Management Subject Plan, and following the transposition of the EU *acquis* into national legislation, Malta now has a raft of waste management policies and targets to implement. With this in view, new permitting systems are gradually being introduced to control the management (including the movement) of wastes within and beyond the Islands' shores, thereby ensuring environmental safeguards on waste-related activities.[145] These systems also provide information to feed into a planned National Waste Register. Permitting has initially targeted infilling of disused quarries with construction and demolition waste, landfilling of non-hazardous waste, waste transfers (particularly hazardous waste) and waste shipments.

In order to encourage waste separation at source and the deviation of significant amounts of municipal waste from landfill, Government introduced local 'bring-in sites', in 2003 where the public can dispose of clean, dry, recyclable plastic, metal, glass or paper waste. By June 2005, 75 public bring-in-sites had been set up (see Map 8.1), and this number should rise to 400 by 2006. The use of bring-in sites has almost doubled since mid-2004,[146] while sites are also being

set up within the premises of many organisations. Most separated waste collected is light packaging material, and much of this is exported for recycling following pre-treatment. Civic Amenity Sites, which are supervised facilities where the public may bring bulky household waste, are also being planned. Malta stands to benefit from 4.6 million Euros in Structural Funds to further implement source separation and separate collection programmes by 2006.[147] A pilot project to convert used cooking oil into biodiesel was launched in May 2005. Biodiesel generates lower emissions than petroleum diesel. Intensive public sensitisation and education campaigns accompanied these activities. Economic measures are also being introduced; the eco-contribution on non-biodegradable plastic bags aims at reducing bag use by 20 million (the first quarter of 2005 already witnessed a reduction of 5 million).[148] In a drive to crack down on widespread illegal dumping and littering from 2006, Government has issued new legislation that has significantly raised fines and will enable 'eco-wardens' to enforce this regulation. **Progress has been achieved in setting up waste management systems such as permitting, improved landfill management (see Map 8.1), and better enforcement. These are contributing to changing practices and attitudes with regard to waste in industry and households, however not enough resources are in place to fully implement and enforce these systems on a recurrent basis.**

Malta has a number of targets and obligations related to the EU *acquis*. In line with these and national obligations, the Maghtab and Qortin dumps were closed down in April 2004. The Scott Wilson report[149] on environmental impacts at former waste dumps indicates that the principal hazards presented by the sites are: aerial emissions from combusting or smouldering wastes; the stability of the waste masses; impacts on local groundwater quality from leachate during the rainy season, and landfill gas generation. The Maghtab site represents the greatest potential source of impacts. Immediate and long-term actions for the rehabilitation of the three sites discussed in the Scott Wilson study will be implemented in a number of phases including diversion of construction waste, development of new waste management facilities, recontouring, installation of a gas control system and gradual re-establishment of vegetative cover. Ghallis has been identified as the site for Malta's long-term controlled engineered landfill and hazardous waste management facility. Until this complex is permitted and operational, an interim facility for the disposal of non-hazardous wastes with a projected lifespan of seven years, was brought into operation at Ta' Zwejra near Maghtab. A temporary waste transfer station is also currently being operated at il-Qortin in Gozo, pending the development of a permanent station at Tal-Kus. All wastes received there, except for construction and demolition waste, are transferred daily to Malta. The improvement and upgrading of the Sant' Antnin Waste Treatment Plant will include a materials recovery facility and a digestion plant to recover energy from the biodegradable fraction of separated waste.[151] 16.4 million Euros in Cohesion Funds have been allocated to this project.

Construction and demolition waste is no longer going to landfill, and a five-year contract has been awarded to rehabilitate disused quarries by infilling with this material. Between May 2003 and May 2005, 3.3 million tonnes of this material had been deposited in 14 quarries,[152] and the estimated remaining capacity there is less than five years. One option government is currently considering to address this is using construction and demolition waste for

Chart 8.1 Waste arriving at principal waste management facilities by type[150]
Source: NSO, NSO 2002a, ME 2001, WasteServ Malta Ltd., MHAE 2002, EPD 1999

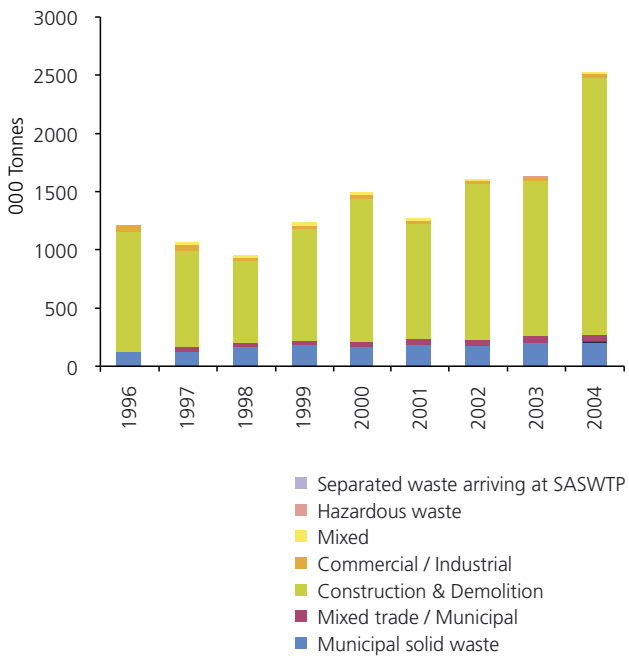
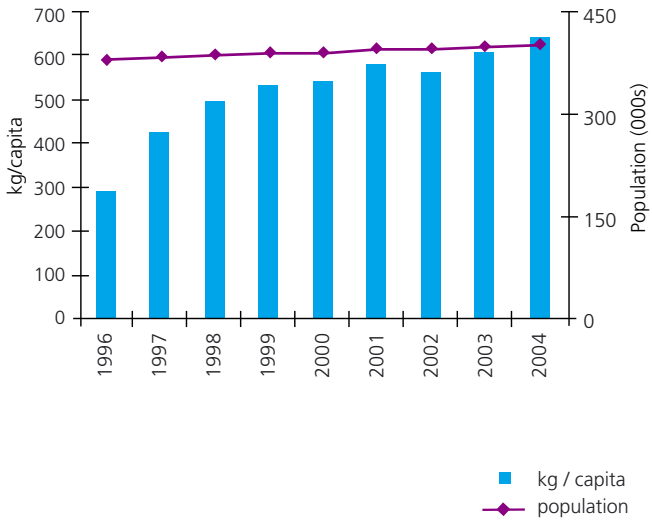


Chart 8.2 Popluation and municipal waste generated per capita
Source: NSO, NSO 2002a, ME 2000, WasteServ Malta Ltd., MHAE 2002, EPD 1999

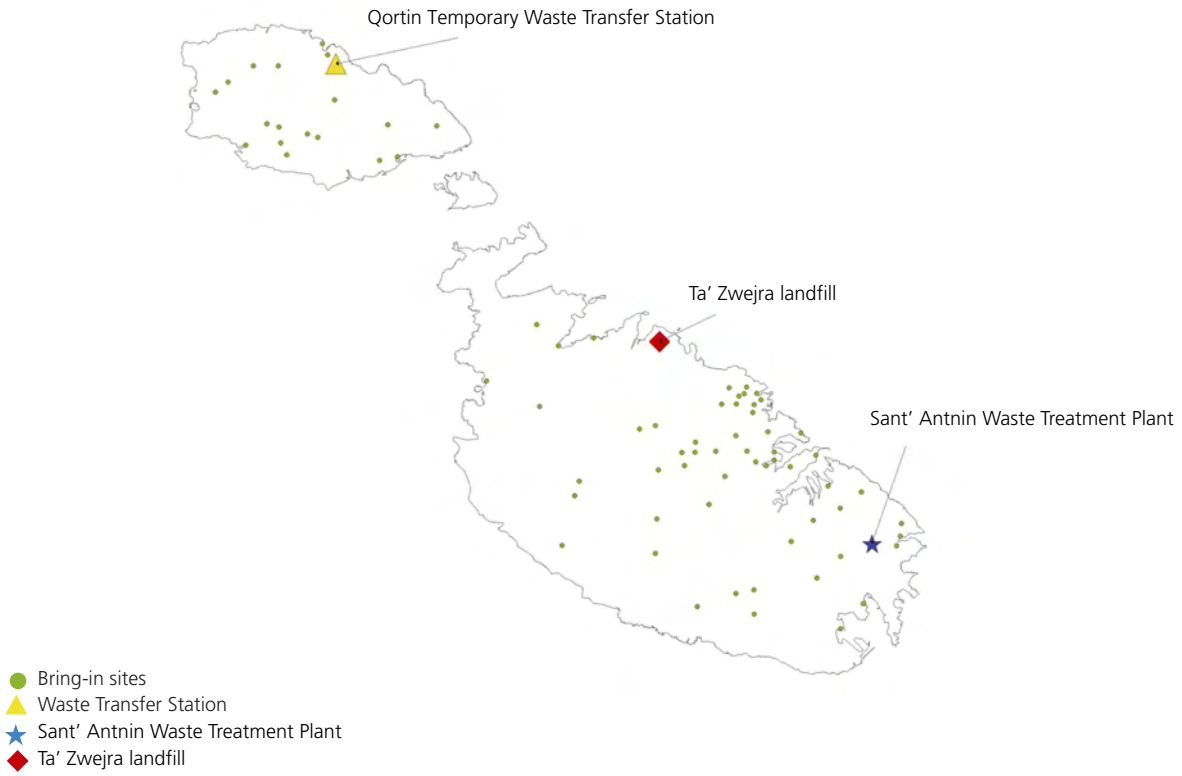


land reclamation.[153] In line with Malta's target to ensure that as from July 2006 shredded used tyres are no longer landfilled, this type of waste is currently being stored for eventual re-use.
National targets related to recycling of packaging are summarised in Table 8.1. It is unlikely that Malta will meet its target to recycle 25 percent of packaging waste by 2005. In addition, Malta did not meet its target to close down all non-conforming incineration plants by 2003, notably in the case of the St. Luke's Hospital incinerator. **The current review of the Solid Waste Management Strategy offers an important opportunity to map out how Malta intends to achieve its waste management targets in terms of key actions, actors (including the private sector) and resources.**

Table 8.1 Malta's targets from the Packaging and Packaging Waste Directive[155]
Source: MEPA

Type of material found in packaging waste that is to be recycled	Minimal percentage to be recycled	Target date
All packaging waste	25 percent	2005
All packaging waste	55 percent	2013
Plastic packaging material	15 percent	2009
Plastic packaging material	22.5 percent	2013
Glass packaging material	60 percent	2013
Metals packaging material	50 percent	2013
Wood packaging material	15 percent	2013
Paper and board packaging material	60 percent	2013

Map 8.1 Bring-in sites and major waste management facilities[154]
Source: WasteServ Malta Ltd.



9. BIODIVERSITY

Key Messages

- Many rare and indigenous species are threatened and continue to decline.
- The main threats to Malta's biodiversity are development in rural and marine areas, the introduction of alien (non-native) species that may compete with native biodiversity, and the exploitation of wildlife.
- An enhanced legal framework has been put in place to ensure the protection of ecologically important sites in the Maltese Islands, including marine protected areas. Maltese candidate sites submitted for the EU Natura 2000 network of protected areas now cover approximately 12.5 percent of Malta's land area.
- Effective management of protected areas has begun, with four management plans approved, covering 1.3 percent of Malta's Special Areas of Conservation. However this process needs to be significantly accelerated in order for Malta to reach its target of halting loss of biodiversity by 2010. There is also need for regular monitoring and enforcement, as well as communication, education and public awareness programmes.

The Maltese people share their Islands and coastal waters with a rich diversity of millions of other living organisms. These play an integral part in providing important ecosystem services such as pollution control, food provision and pleasant recreational areas. Different sets of interrelated species live in dynamic equilibrium within Malta's varied habitats such as cliffs, valleys, garigue and coastal waters. Malta's principal target in the area of biodiversity, for which there is an EU commitment, is to halt loss of biodiversity by 2010. Table 9.1 provides a qualitative review of the status of selected groups of species, indicating that **many rare and indigenous species, including endemic species, are threatened and continue to decline.** The status of Malta's principal ecosystems is varied, with for example, *Posidonia* sea grass meadows' still having overall good and healthy status, despite local regression in some meadows.[156]

The three principal threats to Malta's biodiversity are development in rural and marine areas, introduction of invasive alien species, and exploitation of wildlife. Most development has a direct or indirect effect on biodiversity. Development in rural areas has far greater effect, particularly when it takes place in protected areas such as those related to the rich ecosystems present in garigue scrubland (*xaghri*) or valleys. The introduction of alien species is of considerable potential concern, since once introduced they may escape, become established in natural habitats and actively compete with native species. The rate of entry and spread of alien species is increasing, along with trends in trade, travel and living standards, and possibly climate and land use change. Horticulture (47 percent) and agriculture (23 percent) are the main sources of alien introductions. Of the plant species so far identified 18 percent are alien.[157] When Genetically Modified Organisms (GMOs) are introduced into the environment, the main threat is potential invasive behavior introduced through the inserted gene. Malta regulates GMO releases into the environment and their placing on the market on a case-by-case basis.[158] In the year following EU accession, 19 applications for placing on the EC market were reviewed by Malta. No applications have yet been received for experimental release of GMOs in Malta that have not been first scientifically tested elsewhere in the EU.

The exploitation of wildlife for recreational, economic or other purposes also has significant impact on the viability of wild populations. Collection of species such as sea urchins, snails and tadpoles, or wild plants such as the Mediterranean Thyme and orchids can affect their survival and that of dependent species. Exploited species are under increasing threat due to improved access and capture techniques, with the most vulnerable species being those with slow reproductive rates. Important species threatened by exploitation now have strict legal protection, and sustainable harvesting of less vulnerable species is also provided for in legislation.[159] An indication of the scale of wild bird hunting and trapping may be found in Carnet de Chasse[160] catch declarations which are mandatory for licencees. In 2002,[161] these declarations indicated that 149,066 birds had been hunted or trapped by 15,216 persons (i.e. approximately 10 birds per licensee), principally Turtle Doves (28,519 birds) and Song Thrushes (24,152). These estimates cover only legal hunting and trapping.

The principal tool used to protect biodiversity is statutory protection under the Environment Protection and Development Planning Acts. National designations include bird sanctuaries, nature reserves, special areas of conservation and areas/sites of ecological, scientific and geological importance. Sites across Malta with international designations fall under the EU Habitats[162] and Wild Birds[163] Directives, and the Ramsar,[164] Bern[165] and Barcelona Conventions.[166] These designations cover 18 percent of the Maltese Islands (see Map 9.1).

Since 2002, Malta has declared 38 Special Areas of Conservation (SACs) under the national legislation that transposes the Habitats Directive.[167] Those of International Importance (23 sites as 9 were grouped into one site for all the coastal cliffs of Malta) have been submitted as the first candidate Natura 2000 sites[168] and Emerald Network[169] sites. These represent about 12.5 percent of Malta's land area. Six of these, covering 2.4 percent of land area, have also been declared Special Protection Areas (SPAs) under the Birds Directive. Preparations are also underway to designate further terrestrial, as well as Marine, Protected Areas. A draft management plan and designation for one marine site have already been prepared, and were recently launched for public consultation. In addition, since 2002, 14 sites have been designated under the 1992 Development Planning Act [170] as areas or sites of ecological or scientific importance. Currently these designations total approximately 57 sites and areas extending over approximately 12.5 percent of land area. Through national legislation, the percentage of Maltese species of international importance protected by legislation has also risen, from 61 percent in 2002 to 97 percent in 2005. This indicates that **an enhanced legal framework has been put in place to ensure the protection of ecologically important sites and species in the Maltese Islands, including marine protected areas.** Besides this protective framework, planning applications for development affecting ecologically sensitive areas are subject to compensation and mitigation conditions.

However these legal and planning measures cannot attain conservation goals without parallel efforts towards area management. To this end the process of actively **managing protected areas has begun, with four management plans approved, however so far this only represents 1.3 percent of Malta's SACs and 1.7 percent of its SPAs**, and 0.16 percent of total land area. The Qawra / Dwejra Heritage Park is also covered by a draft action plan. Detemination of land owenership is one of the principal constraints for the finalisation of management plans. **This process needs to be significantly accelerated if Malta is to reach its key conservation target to halt the loss of its biodiversity by 2010. There is also need for more baseline and trend data to ensure wider and continuous monitoring of Malta's natural heritage, more enforcement, as well as communication, education and public awareness actions.** These measures now feature in Malta's National Reform Programme, which addresses Malta's competitiveness in the context of the EU Lisbon Agenda. Work has also commenced on the preparation of a National Biodiversity Strategy and related action plans.

Plate 9.1 The Maltese Everlasting *Sempreviva ta' Ghawdex* *Helichrysum melitense*
Source: S. Brullo

Table 9.1 Qualitative review of status of selected groups of species
Sources: Bertrand et al. *2000, Camilleri 2002, Camilleri 2005, Coleiro 2002, Coleiro 2003, MEPA Nature Protection Unit 2005, MaLiRa Group 2004, Malta Centre for Fisheries Science, M. Gauci / Birdlife Malta, Mosteiro and Camilleri 2005.*

Plants: Significant reduction in species diversity since early 1980s, particularly in sand dunes, freshwater wetlands and saline marshlands. Some species possibly extinct while others vulnerable or endangered, mainly through habitat loss or modification. The endemic[171] Maltese Everlasting (see Plate 9.1) is now found only in Gozo. Increased species diversity is observed in disturbed habitats, possibly due to invasions by alien[172] species that threaten native flora, including endemics.

Fungi: Many species confined to few areas, particularly forest remnants and selected garigue sites, of which a good number are protected. Increased human disturbance in key areas leading to possible decline.

Invertebrates: Studies of a few well-known groups such as insects (e.g. butterflies) indicate general decline. Molluscs also declining in particular habitats, especially water-associated species, and some endemics threatened by human-associated disturbance and development.

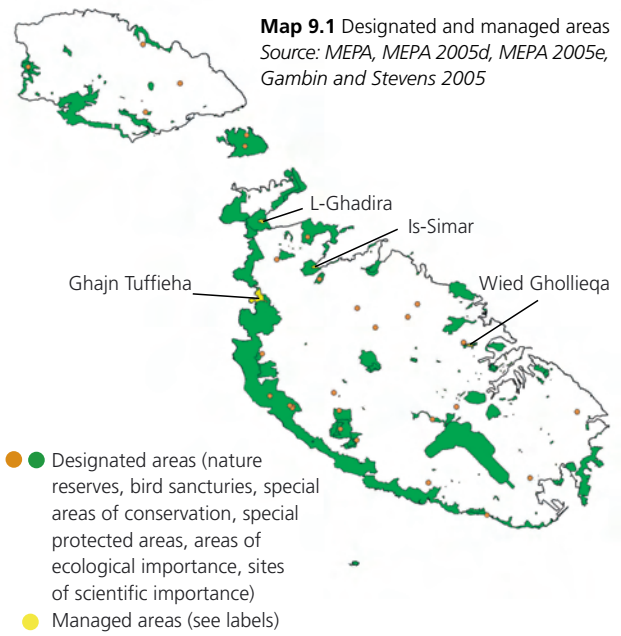
Amphibians and Reptiles: Populations overall appear stable, although many species still vulnerable and/or subject to illegal exploitation. Despite lack of detailed assessment, endemic wall lizard populations appear stable, with the possible exception of those at Selmunett. Some snake populations appear to be increasing. Although marine turtles accidentally captured or injured are now being rehabilitated, their status needs assessment.

Mammals: Variable trends and information available. Bats are generally declining. The Algerian hedgehog seems stable, although the impact of vehicles needs more detailed assessment. Rats are increasing, particularly in urban areas, disturbed habitats and smaller islands, to the detriment of flora and fauna of conservation value. Wild rabbit populations increasing in some areas, particularly Comino, which may negatively affect the regeneration of native plants and animals. Status of marine mammals is unknown.

Fish: Mediterranean dolphin fish stocks appear unaffected by fishing pressure so far. Stocks of tuna and swordfish apparently diminishing. Large pelagic species account for over 60 percent of annual value of landings - these are heavily dependent on international management efforts. Fishing activities or effort distribution in the 25 mile Fisheries Management Zone should not be increased, to ensure their sustainability and safeguard fish "refugia".

Birds: 33 bird species breed in Malta, of which some 20 retain constant numbers. Recent increases in breeding pairs for the Tree Sparrow are noted, while Corn Bunting numbers continue to decrease drastically. Spectacled Warbler still breeding in very low numbers but seems to be spreading slowly in Gozo. Most breeding in protected areas (Buskett and Simar sanctuary), where Moorhens, Little Ringed Plovers and Reed Warblers increased recently. Reed Warbler breeding records increased from 1 (at Salina) in 1995 to 8 (at Simar) in 2004.

Map 9.1 Designated and managed areas
Source: MEPA, MEPA 2005d, MEPA 2005e, Gambin and Stevens 2005



10. CROSS-CUTTING CONCERNS

Key Messages

- A better understanding of the links between environment and health in Malta is required to support effective policymaking.
- The presence of harmful chemicals in the environment arising out of human activities presents human and ecosystem health risks and challenges for management; the integrated approach proposed in REACH should ensure better monitoring and prevention.

Two cross-cutting environmental concerns for Malta deserve mention but do not fit neatly under the thematic headings of this report. These are the related concerns of environmental health and chemicals, both of which are relatively new environmental issues for Malta.

Human health is affected by harmful substances in air, water, soil and food, but also by noise and psychological factors related for example to poor urban environments. However the link between environmental change and health effects is complex, due to the range of (and sometimes synergistic) environmental factors affecting health, the various and often common health effects, and the difficulty in attributing causality to any one factor. Nevertheless in EU-25 environmental factors have been found to be responsible for two to eight percent of the disease burden, mostly arising from transport-related air and noise pollution (see Box 10.1).[173]

Box 10.1 Transport-related health effects

In general, transport-related health effects are found in areas that experience concentrations of pollution sources together with specific climatic and geographical conditions.[174] Airborne pollutants such as ground-level ozone, sulphur dioxide, nitrogen oxides, particulate matter and benzene cause respiratory diseases, asthma and allergies, which constitute a major cause of hospitalisation throughout Europe. Benzene is both carcinogenic (causes cancer) and mutagenic (permanently alters the DNA of a cell[175]) and any dose is considered hazardous.[176] The European Environment and Health Strategy[177] estimates that approximately 60,000 deaths may be caused annually by long-term exposure to urban air pollution. The observed increase in respiratory diseases is considered to be mainly due to degraded air quality and high levels of ozone, and in the EU-25 7.2 percent of children suffer from asthma.[178] In Malta, 7.5 and 11.1 percent of 6-7 and 13-14 year-old children respectively were found to suffer from asthma in 1995.[179] Transport is also the most important source of community noise in Europe, where 10 million people are exposed to levels of environmental noise high enough to cause hearing loss.[180] Additionally, transport affects psychological and social well-being, for example through loss of rural open space to roads, which affects stress levels.

Various pollutants that have a negative impact on human health internationally have been found to be present in Malta, including for example the pollutants in transport emissions, heavy metals in waste and soil, and pesticides and fertiliser residues variously in soil, food and groundwater.[181] So far, research has not directly related environmental change to human health effects in Malta. This is likely to be due to the small size of the Islands and the way it is difficult to isolate populations at risk from any particular point source of pollution, as well as the complicating factor of mobile pollution sources such as motor vehicles, which cannot easily be isolated from other sources. Despite the lack of knowledge, a generalised precautionary framework is in place due to the transposition of the EU *acquis* and other international commitments such as the Barcelona Convention. Nevertheless, more knowledge is required on sources and effects of environmental health issues, in order to be able to address the issues systematically and effectively. In particular, specific studies on the geographical distribution of particulates by type and their effect on respiratory health, especially that of vulnerable groups is a matter of priority.[182] **A better understanding of the links between environment and health in Malta is required to support effective environmental and health policy-making.** In the meantime kerbside testing of vehicles on the basis of VRT standards is currently being carried out by AdT in cooperation with the Police, MEPA and the Department of Health and with the help of the public.

Environment-related health effects are increasingly of concern due to climate change, through which more extreme events and difficult access to clean water are predicted.[183] In June 2003 the European Commission adopted an Environment and Health Strategy,[184] which aims to reduce disease burden and identify and prevent new environmental health threats. Environmental health has been identified as a priority in the EU Sixth Environmental Action Programme and the EU Sustainable Development Strategy.[185] Malta is currently

in the process of revising it's 1997 national Enviornment and Health Action Plan.

The SEVESO II Directive[186] regulates installations with the potential to cause major accidents involving dangerous substances, aiming to limit their consequences for human health and the environment. Establishments that fall under this Directive are divided into two categories depending on the quantities of dangerous substances stored. Lower tier operators must prepare a major accident prevention policy, whilst upper tier operators must meet more onerous requirements including safety reports and emergency plans. There are six upper tier and four lower tier establishments in Malta and the substances stored at these facilities are mainly liquid petroleum gas, diesel, petrol and kerosene (see Map 10.1). Planning guidance[187] was published in 2005 with the aim of reducing the number of people at risk and the likelihood and extent of harm if an accident occurs.

The presence of harmful **chemicals** in the environment is of concern for human health and ecosystems. Various chemicals are imported into Malta for use in agriculture,[188] industry and other activities, only some of which are harmful. In the EU market there are approximately 30,000 chemical substances,[189] and the EU is the largest chemical producing area in the world. It is also the world's leading exporter and importer of chemicals (a share of 65 percent in world exports and of 53 percent in world imports in 2004).[190] The import and export of dangerous chemicals in the European Union is controlled through the Rotterdam Convention[191] on Prior Informed Consent. However none of the chemicals imported into Malta in 2004 and the first quarter of 2005[192] required a Prior Informed Consent.

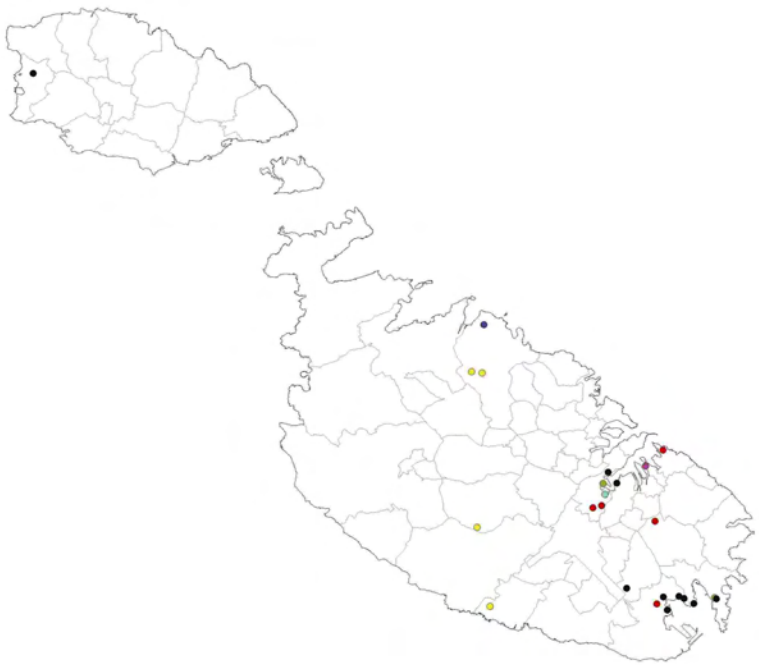
One example of a dangerous family of chemicals is persistent organic pollutants (POPs), which are chemical substances (such as dioxins, PCBs and DDT) that persist in the environment, bio-accumulate in food webs and thus pose a risk to human health and the environment.[193] POPs also require Prior Informed Consent. A 2004 study indicates that Malta's dioxin emissions at 9 g I-TEQs per million inhabitants are below European averages, which range between 10 and 30 g I-TEQs per million inhabitants. In 2004 the Community ratified a UNECE agreement[194] and joined a second global convention[195] to eliminate pollution by POPs by banning the use of twelve harmful chemicals including PCBs.[196]

Another family of chemicals are of concern due to their effect on the stratospheric ozone layer. Since Malta's EU accession, imports and exports of ozone-depleting substances are regulated through the European Commission as part of the EU quota under the Vienna Convention and Montreal Protocol. Since accession, Malta did not 'import' any ozone-depleting substances since they were all shipped to Malta from the EU. Methyl Bromide is an ozone-depleting pesticide, the use of which has been controlled via quotas for some time, and which will be banned in Malta from 2006.

Through the EU *acquis* a number of measures are now in force to control chemical installations and use. The Integrated Pollution Prevention and Control (IPPC) Directive[197] aims to minimise pollution from key point sources.[198] By 2007 all IPPC sites in Malta will need permits based on quality standards and best available techniques. There are currently 15 IPPC sites in Malta, and categories include the chemical and energy industry, certain waste management facilities, and animal breeding units (see Map 10.1).

Since accession, the Malta Standards Authority (MSA) and the European Chemicals Bureau must be notified of all new substances[199] placed on the market. Other Community provisions related to marketing and use of dangerous substances were introduced under the Product Safety Act. In June 2004 the MSA adopted a National Interim Strategy for the implementation of REACH, a draft 2003 European Commission regulation establishing a European Chemicals Agency to control chemicals usage on the basis of a single integrated system for Registration, Evaluation and Authorisation of Chemicals.[200] Through this process up to 1,500 chemicals of very high concern will be subject to authorisation for particular uses.[201] **The presence of harmful chemicals in the environment due to human activities presents human and ecosystem health risks and challenges for management; an integrated approach such as that of REACH should ensure better monitoring and preventative action.**

Map 10.1 Seveso II and Integrated Pollution Prevention and Control sites
Source: MEPA



11. POLICY RESPONSES

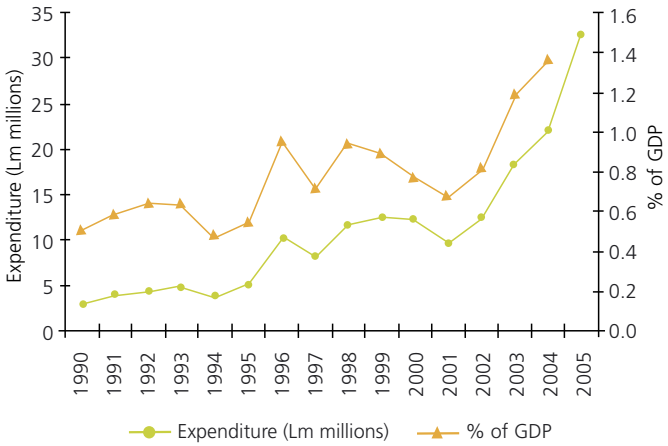
Key Messages

- There has been significant progress in upgrading Malta's environmental legislation, but the challenge will now be to build capacity for implementation. This requires funding to support recurrent expenditure related to administration, compliance, reporting and enforcement as well as private sector investments to upgrade operations.
- Economic instruments have great potential to internalise environmental costs. So far, however, lack of institutional capacity and the absence of a national strategic framework have limited the application of such instruments.
- Public opinion polls continue to indicate high levels of concern about environmental issues, yet this level of concern is not often translated into individual action. Environmental education seeks to address this gap, but Malta lacks a formal environmental education curriculum policy despite examples of good practice in certain areas. Informal education is well addressed by NGOs, but more recognition and support is needed. There is also potential for more work by local councils.
- There is significant potential for use of voluntary schemes by business and public organizations.
- The National Commission for Sustainable Development has the potential to be a powerful tool for pushing for environmental policy integration but needs better resourcing and a permanent secretariat.
- Given the strong presence of the public sector in Malta's small economy, more sustainable patterns of production and consumption could be levered through greening public procurement.
- The environment sector requires a government-led action plan to coordinate the activities of the principal environmental players and identify investment priorities, as well as short and medium term objectives and targets.

Since the early 1990s there have been steady advances in Maltese environmental policy; however the pace of change quickened significantly in the run-up to EU accession since 2000. The key target of transposing the EU environmental *acquis* was achieved on time although some legislation still requires fine-tuning. This transposition also prompted the integration of environmental concerns into other policy areas such as use of water and energy resources. This increased activity translated into increased funding; environmental expenditure[202] increased 87 percent from 0.5 percent of GDP in 1990 to 1.4 percent in 2004,[203] mostly in the areas of waste management and infrastructure[204] (see Chart 11.1). Nevertheless MEPA as the competent authority for environment remains under-resourced, and environmental resposibilities remain fragmented across government agencies. In 2004 it was estimated that in order to implement the *acquis*, new member states will need to spend between two and three percent of GDP on environment.[205]

The EU is partly contributing to covering these costs: it is estimated that in 2005 EU funds, mainly Pre-Accession and Structural Funds, will cover

Chart 11.1 Public environmental expenditure[206]
Source: Financial estimates 1992-2003; NSO



Lm8 million or 23 percent of environmental expenditure. Amongst the new Member States, Malta had the largest percentage share of Structural Funds allocated to environmental projects (41 percent).

Environmental policy responses are generally implemented through four types of instruments, namely legislation, economic instruments, awareness raising and education, and voluntary schemes. Malta's environmental policy has tended to rely on legal and awareness-raising instruments, with economic and voluntary instruments only recently being introduced. **There has been significant progress in upgrading Malta's environmental legislation since 2000.** By 2004, approximately 130 pieces of legislation under the 2001 Environment Protection Act had been published to transpose the EU environmental *acquis*. As part of MEPA's regulatory function in environmental and planning permitting and enforcement, a risk-based approach is being adopted in rolling out a system of environmental permitting. The development control model where the Authority may fine offenders will be extended to increase the effectiveness of environmental enforcement. Despite these efforts, enforcement and the need to instill a culture of compliance remain crucial issues. **The challenges will now be in building capacity for implementation of the *acquis*. This requires funding to support recurrent expenditure related to administration, compliance, reporting and enforcement as well as private sector investments to upgrade operations.**

Economic instruments in the form of environmental taxes or charges are currently used in the policy areas of waste, water, biodiversity, land use, transport and energy. The most developed system of economic measures is that of the waste sector, where an eco-contribution was introduced in 2004, and extended in 2005 to various items including plastic shopping bags.[207] MEPA has recently launched an EU-funded project to build capacity for implementing the Polluter Pays Principle through economic instruments to implement the EU environmental *acquis*. The introduction of economic instruments needs to be accompanied by education and awareness campaigns,[208] and the assessment of social impacts and administrative viability. So far, water price changes during the 1990s indicate the sensitivity of water demand to price signals,[209] however no evaluations of the impacts of fees and charges in reducing environmental damage are available. Nevertheless, **the application of the Polluter Pays principle through economic instruments has strong potential to internalise environmental costs whilst remaining revenue neutral. So far, however, lack of institutional capacity and the absence of a national strategic framework has limited the application of such instruments.** [210]

The environment is an important issue for many Maltese citizens, and a recent Eurobarometer [211] study indicates that 66 percent of Maltese are concerned about air pollution, while concern about waste was twice the EU average at 60 percent. Yet only one percent of citizens associate environment with 'protecting Nature', with Malta ranking lowest in EU in this respect. A 1999 attitude survey[212] revealed particular concern about waste, building activity, conservation of historical and archaeological heritage, improving public open space, and protecting the North West of Malta.[213] **Unfortunately these high levels of concern about environmental issues have not yet resulted in significant environmental shifts in personal consumption patterns,** perhaps due to the need for a more integrated approach within which government sets an example.

Environmental awareness and particularly environmental responsibility can be raised through environmental education, which focuses on community empowerment, reflection and participation in environmental decision-making fora. **However environmental education has not yet become mandatory in the national curriculum and Malta still lacks a formal environmental education curriculum policy**. Nevertheless, increasing numbers of schools are starting to integrate environmental education into their school policies.[214] The popular Xummiemu campaign, aimed at school children, was relaunched in 2004, and suggests ways through which children, as active citizens, can ensure quality of life and high levels of environmental quality. **Non-Governmental Organisations (NGOs) have played an important role in providing informal environmental education.** They also work in schools: BirdLife's *Dinja Wahda*,[215] and *EkoSkola*,[216] co-ordinated by Nature Trust in collaboration with MRAE and the Ministry of Education, Youth and Employment, are two such initiatives. **There is, however, potential to increase the contribution of NGOs through formal recognition and increased support. Local authorities also have a strong potential role to play here.** With a view to addressing some of these gaps, the Centre for Environmental Education and Research (CEER) [217] was set up in 2004 to coordinate and facilitate environmental education activities. The new legal framework concerning access to information and justice, and public participation, in line with the Aarhus Convention[218] should provide new impetus in this area.

Voluntary environmental agreements are designed to achieve more efficient implementation and wider acceptance by industry since they tend to reduce costs.[219] So far three major instruments are in use; ISO 14001,[220] the EU Eco-Management and Audit Scheme (EMAS) and a home-grown Tourism Eco-Certification Scheme. So far four companies are ISO 14001 certified, while the only EMAS-registered site is ST Microelectronics (Malta) Ltd. By May 2005, 21 hotels were eco-certified and the Malta Tourism Authority is now encouraging eco-certified hotels to implement EMAS. **There is significant potential for greater use of voluntary measures,** and given the small number of companies and organisations that have taken up voluntary schemes, government could lead the way by greening public procurement in favour of eco-labelled products or services and encouraging its agencies to opt for environmental management schemes.

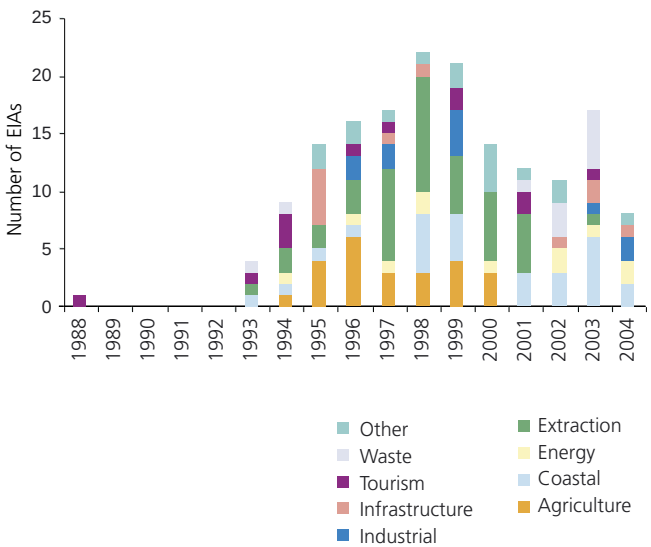
However it is increasingly recognised that the environment sector alone cannot achieve tangible results unless environmental concerns are integrated into other policy areas.[221] Sustainable development, which focuses on integrating environmental, economic and social policy objectives, provides a framework for achieving this. As one of the key tasks of the National Commission for Sustainable Development (NCSD), a draft National Strategy for Sustainable Development was published in 2004, on which there has been extensive public consultation.[222] As an advisory body made up of representatives of government ministries and civil society, **the NCSD has the potential to be a powerful tool for proposing widely-supported sustainable development policy but needs better resourcing and a permanent secretariat. Due to the country's size, the public sector has a relatively strong presence in the economy, pointing to the strong potential of green public procurement to lever more sustainable production and consumption patterns nationwide.** It is also government's policy to lead by example.

Other environmental policy integration processes include the integration of environmental objectives into Malta's Structural Funds programme,[224] environmental assessment, and the appointment of Green Leaders in each Ministry. [225] Environment assessment is a key decision-making tool that systematically assesses and seeks to

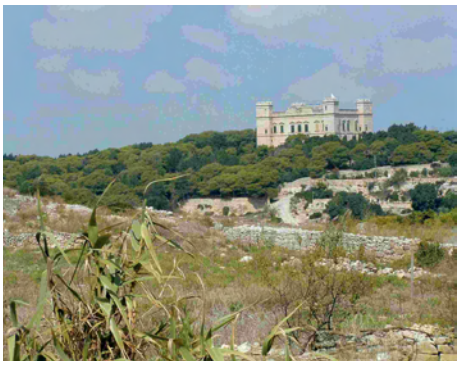
minimise the environmental impacts of projects, plans and programmes. Since 1998, the number of project-based environmental impact assessments (EIAs) (see Chart 11.2) [226] has decreased due to a moratorium on applications for new quarries,[227] and a policy drive favouring upgraded rather than new animal farms.[228] While EIA has been practised for over 15 years,[229] Strategic Environmental Assessment (SEA) is still to take off, although an SEA of the Structure Plan Review is underway.[230] Draft SEA legislation is being discussed at Cabinet level. Also, under the umbrella of the EU's Better Regulation drive,[231] Government is studying the possibility of introducing procedures to consider the wider effects of regulation, including broad environmental issues. Early in 2005 government appointed Green Leaders in each Ministry, with the aim of raising environment awareness while promoting eco-friendly practices. A Green Leader will eventually be appointed in each government department and state agency. This should increase the potential for greening public procurement. A final but important step has been the setting up of a Cabinet Committee on the Environment. This enables government to better discuss environment policy issues, which are often fragmented between the various government actors in the environmental field, as well as the impacts of socio-economic policy on the environment. These initiatives indicate recognition, albeit limited, that there is need for policy integration. However stronger efforts will be required for such a process to bear fruit, such as legal provisions, formal staff training and incorporation of environmental objectives into sectoral plans and strategies.[232]

This review has indicated that while there have been significant increases in public funds allocated to environmental protection, government tends to rely on traditional environment policy instruments - mainly legal measures. Significant potential exists for further use of economic measures, particularly ones implemented in the context of a national policy framework, as well as voluntary measures. The chapter also stresses the importance of community based environmental education that would provide citizens with the knowledge, skills, attitudes and values needed to participate in environmental decision-making. There is also opportunity for further government initiatives towards greater integration of environmental concerns into wider government policy. **The environment sector would therefore benefit from a government-led action plan to coordinate the activities of the main environmental players and identify investment priorities, as well as short and medium term objectives and targets.** A participative approach is recommended to ensure the commitment of all the major public, private and voluntary actors to the process.

Chart 11.2 Applications that required an EIA[223]
Source: MEPA



12. SUMMARY AND PRIORITIES FOR ACTION






The following key messages have emerged from this State of the Environment Report. The **Environmental Pressures** chapter indicates that Malta's population has largely met its basic material needs, and it is demand for additional consumption that is now placing significant strain on natural processes. The rising numbers of motor vehicles have serious implications for the environment, human health and the economy in terms of air pollution, land take-up, noise, fuel consumption, road accidents, waste generation and congestion costs. Only by decoupling Malta's accelerating energy demand from economic growth can environmental targets and objectives related to air pollution and climate change be met. It also reports that while using a cleaner fuel mix has had positive effects on air quality, there is still significant potential for further shifts. Malta is still far from reaching EU renewable energy targets, which the national energy plan that will soon be published will address. Malta will need to map out a sustainable development path for the energy generation, transport and tourism sectors, as well as develop a basket of measures to address the nexus of social, environmental and economic issues surrounding house building and housing quality, availability and affordability.

On the issue of **air pollution**, this report indicates that nitrogen oxides pollution remains high in certain urban areas, and that concentrations will only be significantly reduced through shifting to more sustainable patterns of mobility and energy consumption. Transboundary air pollution in the form of ozone and sulphur dioxide is of concern given the Islands' geographical situation and weather patterns. Long-term effects of ozone on human health and on agriculture are of concern. Initial results indicate high levels of particulates in Malta and more studies are needed to identify their sources. In addition, there have been significant decreases in the levels of sulphur dioxide and benzene in the air, due to switches to cleaner fuels. The report also indicates that air quality in heavily-trafficked and enclosed streets can be many times worse than a few streets away. Nevertheless, air quality at the real-time MEPA monitoring station at Floriana is on average good to moderate, with particulates and sulphur dioxide of more concern.

The **climate change** chapter reports that Malta's greenhouse gas emissions increased by 44 percent between 1990 and 2003, and derive largely from the energy and transport sectors, so that there is urgent need to decouple economic growth from energy consumption. The Maltese climate has changed slightly over the last 50 years, and is slowly becoming warmer and dryer, consistent with international climate change predictions. Yet even if global society gradually reduces its greenhouse gas emissions over the coming decades, climate change is likely to continue over the next centuries; mitigation and adaptation strategies are therefore necessary. Malta is expected to suffer moderate impacts from climate change, mainly related to deterioration of water supplies and quality, and more frequent extreme weather events. Yet due its dependence on coastal activities its economic vulnerability is expected to be moderate to moderately high.

The **land** chapter of this report indicates that the key target of the Structure Plan to contain urban sprawl within the development boundary defined by the 1988 Temporary Provisions Schemes has largely been achieved, but there is significant potential for improving the overall efficiency of land use. An in-depth investigation into the social and economic dynamics underpinning the apparent contradiction between high house prices and high rates of residential vacancy, including how this affects conservation goals, is urgently needed. Although many historical buildings and areas have been given statutory protection, and there is a planning policy presumption against demolition of buildings within UCAs (Stucture Plan Policy UCO 9), there is increasing tension between these protective mechanisms and the desire of owners to redevelop their properties. This is resulting in loss of historic fabric, inappropriate design of new and restored buildings, and illegal excavations. Vehicle emissions and underlying factors such as residential vacancy also have a negative impact on cultural heritage. Countryside quality is still threatened by localised intensification of urban development, dominating settlement edges, quarrying and certain agricultural and recreational practices. The rising interest in countryside issues, including access, is an opportunity to upgrade and improve its protection and management. Agricultural land abandonment, farm, intensification, improper farm management practices and fragmentation of ownership have negative impacts on the environment. Rural Development Plans represent important opportunities to address the viability of the agricultural sector in the context of environmental stewardship. The report also indicates that

approximately five percent of Malta's 1km coastal buffer area was built-up between 1990 and 2004, indicating significant development pressures mostly from tourism and recreation.

The **soil** chapter indicates that Maltese soils can be significantly fertile and productive despite limiting natural geographical and climatic factors such as shallow depth and low levels of organic matter. However, as a result of pressures from high population density and certain agricultural practices, Maltese soils' vulnerability to erosion by water, salt and nutrient loading and localised contamination have been intensified. This increases the threat of long-term land degradation. Malta's principal soil contamination sources include point sources such as quarries, industrial facilities, and waste dumps, and diffuse pollution from aerial deposition of dust or combustion products, exhaust emissions, lead shot, agricultural chemicals and the application of manure and compost. A wide variety of organisms live in the soil and the reduction of soil biodiversity makes it more susceptible to other degradation processes. The chapter concludes that society underestimates the value of Maltese soil resources, in particular their ability to perform a multitude of vital functions, including food production, storage and filtering of water, and supporting human activity and biological diversity.

The **landscape** chapter indicates that the Maltese landscape may be characterised as a cultural landscape with a combination of elements that give it a distinct character that is unique in the world. It reports that since 1990 there has been a limited but noticeable improvement in townscapes in terms of architectural quality and public amenities, with more attention to landscaping, treatment of facades and public open space. Overall, however, landscape is threatened by increasing built up area, industrial and coastal development, taller buildings on urban fringes obstructing views of historical centres, modern agricultural practices, increasing vehicular access, littering, poor standards of design and work, and lack of maintenance. The Landscape Assessment Study has provided a firm foundation for better landscape protection in strategic and subsidiary land-use plans. The chapter also reports that some important areas of high quality landscape character, particularly in Gozo and Comino and inland Malta, have not yet been given statutory protection.

On the issue of **waters**, the Report indicates that Malta's groundwaters are seriously at risk from over-exploitation and pollution. Their loss would mean the loss of Malta's only renewable freshwater resource. Chloride levels in the mean sea level aquifer system indicate that abstraction points are highly threatened by localised seawater intrusion. The large share of private abstraction, estimated at 30 percent of total water production in 2003, highlights the vulnerability of the groundwaters to multiple private users. So far, no private suppliers of water for human consumption have registered with the Health Department, which would ensure their compliance with Drinking Water Directive standards. In 2004, nitrate levels at two thirds of WSC abstraction boreholes exceeded the Nitrate Directive trigger-value, and chloride levels (indicating salinity) in the mean sea level aquifer system all exceeded WHO quality standards. Most of Malta's coastal waters were of acceptable status in 2004, except for inside harbours and near sewage outfalls, power station thermal discharge points, and to a lesser extent, in the vicinity of fish farms and Maghtab. Sewage overflows in St. Paul's Bay and Birzebbugia remain a matter of concern. It is likely that only two of the three sewage treatment plants planned to treat all Malta's sewage by 2007 will be on board by the target date. These two plants are in the initial stages of construction in Gozo and the North of Malta. However Malta's bathing waters meet Bathing Water Directive quality standards and mostly meet those of the Barcelona Convention. Overall, there is potential to improve national coastal and marine policy by integrating sectoral policy such as that on tourism and recreation, maritime activities, aquaculture and fisheries, and the environment. All Malta's inland surface and transition waters are highly restricted and the various animals and plants found within these habitats are in danger of extinction. Malta is legally bound to ensure the long-term protection of these habitats.

In the policy area of **waste**, the report indicates that waste generation is still increasing rapidly, particularly in the construction and demolition and municipal waste fractions. Progress has been achieved in setting up waste management systems such as permitting, improved landfill management, and better enforcement. These are contributing to changing practices and attitudes with regard to waste in industry and households, however not enough resources are in place to fully implement and enforce these systems on a recurrent basis. It concludes that the review of the Solid Waste Management Strategy offers an important opportunity for Malta to map out how it plans to achieve its waste management targets in terms of key actions, actors and resources.

The **biodiversity** chapter indicates that many rare and indigenous species are threatened and continue to decline. It reports that the main threats to Malta's biodiversity are development in rural and marine areas, the introduction of alien (non-native) species that may compete with native biodiversity, and the exploitation of wildlife. However an enhanced legal framework has been put in place to ensure the protection of ecologically important sites in the Maltese Islands, including marine protected areas. Maltese candidate sites submitted for the EU Natura 2000 network of protected areas now cover approximately 12.5 percent of Malta's land area. Moreover, effective management of protected areas has begun, with four management plans covering 1.3 percent of Malta's Special Areas of Conservation, but this process needs to be significantly accelerated for Malta to reach its target of halting loss of biodiversity by 2010. There is also need for regular monitoring and enforcement, and communication, education and public awareness programmes.

Regarding **cross-cutting issues**, the report suggests that a better understanding of the links between environment and health in Malta is required to support effective policymaking. The presence of harmful chemicals in the environment arising out of human activities presents human and ecosystem health risks and challenges for management; the integrated approach proposed in REACH should ensure better monitoring and prevention.

Finally, the **environmental policy responses** chapter reports that there has been significant progress in upgrading Malta's environmental legislation, but the challenge will now be to build capacity for implementation. This requires funding to support recurrent expenditure related to administration, compliance, reporting and enforcement. Economic instruments have great potential to internalise environmental costs. So far, however, lack of institutional capacity and the absence of a national strategic framework have limited the application of such instruments. It also reports that public opinion polls continue to indicate high levels of concern about environmental issues, yet that this level of concern is not often translated into individual action. Environmental education seeks to address this gap, but Malta lacks a formal environmental education curriculum policy despite examples of good practice in certain areas. Informal education is well addressed by NGOs, but more recognition and support is needed. There is also potential for more work by local councils. The chapter also reports that there is significant potential for use of voluntary schemes by business

and public organizations. The National Commission for Sustainable Development has the potential to be a powerful tool for pushing for environmental policy integration, but needs better resourcing and a permanent secretariat. Given the strong presence of the public sector in Malta's small economy, more sustainable patterns of production and consumption could be levered through greening public procurement. Overall, however, the environment sector requires a government-led action plan to coordinate the activities of the principal environmental players and identify investment priorities, as well as short and medium term objectives and targets.

On the basis of these findings, the following priorities for action are identified:

- Focusing on environmental impacts that have a serious effect on human health, such as air pollution from particulates;
- Protecting renewable natural resources such as the water table;
- Promoting eco-efficient economic growth by decoupling growth from material resource use and waste generation, and in particular addressing environmentally-damaging trends in the energy and transport sectors;
- Promoting formal as well as community-based environmental education;
- Drawing on public environmental concern to gain support for public and private initiatives, particularly to address countryside and coastal issues;
- Improving the knowledge base to support the development of environmental policy, particularly in the areas of biodiversity, waste and environmental health, by building up a structured ambient monitoring information system for state of the environment reporting;
- Leveraging finance to fund environmental improvements across government and the private sector;
- Better coordination between government ministries and agencies to improve the coherence and effectiveness of policy, by means of early integration of environmental considerations into all government policies and plans;
- Improving capacity for implementation and enforcement;
- Setting up a multi-actor process to develop a government-led environmental action plan to coordinate the activities of the principal players and identify investment priorities and short and medium term objectives and targets in the environmental field.

REFERENCES




Axiak, V. 2004. Monitoring Programme for Coastal Waters Seventh Report June 2003, March 2004, Environment Protection Directorate PPCU, MEPA, Floriana.

Bertrand, J., Gil de Sola, L., Papaconstantinou, C., Relini, G. and Souplet, A. 2000. "An international bottom trawl survey in the Mediterranean : the MEDITS programme." In Demersal resources in the Mediterranean co-ordinators J.A. Bertrand and G. Relini. IFREMER. Actes de Colloques 26: 76-93.

BICC - MRI (Building Industry Consultative Council – Ministry for Resources and Infrastructure). 2005. State of the Construction Industry Report 2004.

Calleja, E. 2004. State of affairs of organic agriculture in Malta, Organic Farming Unit Agricultural Services and Rural Development Division, MRAE.

Camilleri, M. 2001. Environmental Capacity for Malta: Living within limits in a small island state, Unpublished Ph.D Thesis. Department of Geography, University of Cambridge.

Camilleri, M., 2002. The fishing effort distribution of Demersal gear in Maltese waters and the relative abundance of Demersal resources in the area. International workshop on stock assessment and production of Demersal resources (SAMED); Rome. March 2002.

Camilleri, M., 2005. Maltese fisheries and the sustainability of resources around the Maltese Islands. PhD thesis. University of Plymouth.

Camilleri, R. 2000. Boron: an agro-environmental concern. Thesis (MSc). University of Malta.

Cauchi, G. 1999. A study on the selenium content of local soil and fodder in relation to the selenium content of cow's blood. Thesis (B.Pharm.), University of Malta.

CEC (Commission of the European Communities). 2001. Communication from the Commission to the Council, the European Parliament, the Economic and Social Committee and the Committee of Regions on the sixth environment action programme of the European community 'Environment 2010: Our future, Our choice' COM(2001) 31 final, Commission of the European Communities, Brussels.

CEC (Commission of the European Communities). 2002a. Communication from the Commission to the Council, the European Parliament, the Economic and Social Committee and the Committee of the Regions. Towards a Thematic Strategy for Soil Protection, COM (2002) 179 final, Brussels.

CEC (Commission of the European Communities). 2002b. Communication from the Commission to the Council, the European Parliament and the Economic and Social Committee Towards a Thematic Strategy on the Sustainable Use of Pesticides COM(2002) 349 final, Commission of the European Communities, Brussels.

CEC (Commission of the European Communities). 2003a. Communication from the Commission to the Council, the European Parliament and the Economic and Social Committee A European Environment and Health Strategy COM(2003) 338 final, Commission of the European Communities, Brussels.

CEC (Commission of the European Communities). 2003b. Chemicals: Commission presents proposals to modernise EU legislation. Press Release IP/03/1477, Brussels, 29 October 2003 (http://europa.ue.int).

CEC (Commission of the European Communities). 2003c. Q and A on the new chemicals policy REACH, MEMO 03/213, 29 October 2003. Commission of the European Communities, Brussels.

CEC (Commission of the European Communities). 2004a. Portrait of the European Union, European Communities, Luxembourg.

CEC (Commission of the European Communities). 2004b. Communication from the Commission to the Council and the European Parliament 2003 Environmental Policy Review, COM(2003) 745 final, Commission of the European Communities, Brussels.

CEC (Commission of the European Communities). 2005a. Annual European Community Greenhouse Gas Emissions inventory, 1990-2003 and inventory report 2005, Submission to the UNFCCC Secretariat 27 May 2005.

CEC (Commission of the European Communities). 2005b. Communication from the Commission to the Council and the European Parliament 2004 Environmental Policy Review COM(2005) 17 final, Commission of the European Communities, Brussels.

CEC (Commission of the European Communities). 2005c. Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions, Winning the Battle Against Global Climate Change COM(2005) 35 final, Commission of the European Communities, Brussels.

CEC (Commission of the European Communities). 2005d. Commission Staff Working Paper Annex to the Communication from the Commission to the Council and the European Parliament 2004 Environmental Policy Review, EU

Environmental Policy in 2004: developments, new evidence and outlook for 2005 SEC(2005)97, Commission of the European Communities, Brussels.

CEC (Commission of the European Communities). 2005e. The attitudes of European citizens towards environment. Special Eurobarometer 217/Wave 62.1 – TNS Opinion & Social.

CEFIC (Conseil Européen de l'Industrie Chimique). 2005. Facts and Figures: The European chemical industry in a worldwide perspective. January 2005. European Chemical Industry Council, (http://www.cefic.org/factsandfigures).

Coffey, C., Ladefoged, A., Wilkinson, D and Farmer, A. 2004. Environmental policy integration Paper 1: Looking back, thinking ahead. Revised Draft Final November 2004, EEA, Copenhagen.

Coleiro C. 2002. Breeding Birds Report, Is-Simar Nature Reserve 2002 Report:34

Coleiro C. 2003. Breeding Birds Report, Is-Simar Nature Reserve 2003 Report:29

Colls J. 2002. Air Pollution. Spon Press, London, UK.

COS (Central Office of Statistics). 1997. Census of Population and Housing, Malta 1995, COS, Malta.

Cowiconsult. 1992. Sewerage Master Plan for Malta and Gozo. Ministry for Environment, Works Division, Floriana, Malta.

DPH (Department of Public Health). 2004. Bathing Water Quality Annual Report 2004, DPH.

EEA (European Environment Agency). 2003. Europe's environment: the third assessment. Environmental assessment report No 10, EEA, Copenhagen.

EEA (European Environment Agency). 2004a. Air pollution in Europe 1990-2000, Topic report No 4/2003, EEA, Copenhagen.

EEA (European Environment Agency). 2004b. EEA Signals 2004, EEA, Copenhagen.

EEA (European Environment Agency). 2004c. Impacts of Europe's Changing Climate: An indicator-based assessment. EEA Report No. 2/2004, EEA, Copenhagen.

EEA (European Environment Agency). 2004d. Corine Land Cover 2000 Mapping a decade of change, EEA, Copenhagen.

EEA (European Environment Agency). 2005. Environment policy integration in Europe: State of play and an evaluation framework. Technical Report No 2/2005, EEA, Copenhagen.

Enemalta Corporation. 2003. Enemalta Corporation Annual Report 2003 & Financial Statements 2002, Enemalta Corporation.

EPD (Environment Protection Department). 1999. State of the Environment Report for Malta 1998. Report submitted to the EPD through the Malta Council for Science and Technology by Axiak V., Gauci, V., Mallia A., Mallia E., Schembri P., Vella A.

Farrugia R. N., Fsadni M., Mallia, E. A., and Yousif, C. 2005. "The Renewable Energy Potential of the Maltese Islands." Xjenza (forthcoming).

Gambin, M.T. & Stevens, D.T. 2005. National Report on the Emerald Report Pilot Project in Malta. Council of Europe, Strasbourg. (http://www.coe.int/T/E/Cultural_Co-operation/Environment/Nature_and_biological_diversity/Ecological_networks/Agenda/TpvsEm04e_05.pdf?L=E).

G.A.S. s.r.l. 2002. Baseline survey of the extent and character of posidonia oceanica (l.) delile meadows in the territorial waters of the Maltese Islands.

Haring, A.M., Dabbert, S., Aurbacher, J., Bichler, B., Eichert, C., Gambelli, D., Lampkin, N., Offermann , F., Olmos, S., Tuson, J., Zanoli, R. 2004. Impact of CAP measures on environmentally friendly farming systems: Status quo, analysis and recommendations. The case of organic farming. January 2004. (http://europa.eu.int/comm/environment/agriculture/studies.htm)

Houghton, J. T., Ding, Y., Griggs, D. J., Noguer, M., van der Linden, P. J. and Xiaosu, D. (eds.). 2001. Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, UK.

Lanfranco, E. Forthcoming. Alien Flora of the Maltese Islands. Malta University Services Ltd., Study and associated data cards commissioned by the Nature Protection Unit / MEPA.

MALSIS (Maltese Soil Information System). 2004. Soil geographic database of the Maltese Islands. National Soil Unit, Ministry for Rural Affairs and the Environment, Malta.

MaLiRa Group, 2004. La campagna MEDITS 2004 nello Stretto di Sicilia (Mar Mediterraneo), Sub Area Geografica 15: rapporto finale. MaLiRA Group. IAMC-CNR, Sezione Territoriale di Mazara del Vallo (TP), Italia: 19pp.

MDI (Ministry for Development and Infrastructure). 1990. Structure Plan for the Maltese Islands. Draft Final Written Statement and Key Diagram. December 1990.

ME (Ministry for the Environment). 2001. A Solid Waste Management Plan for the Maltese Islands, Ministry for Environment, Works Division, Floriana, Malta.

MEPA (Malta Environment and Planning Authority). 2003a. Transport Topic Paper, MEPA, Floriana.

MEPA (Malta Environment and Planning Authority). 2003b. Rural Strategy Topic Paper. Volume 1. Final Draft, MEPA, Floriana.

MEPA (Malta Environment and Planning Authority). 2003c. Minerals Subject Plan for the Maltese Islands 2002. Final Report May 2003, MEPA, Floriana.

MEPA (Malta Environment and Planning Authority). 2004a. Landscape Assessment of the Maltese Islands. Draft Public Consultation September 2004, MEPA, Floriana.

MEPA (Malta Environment and Planning Authority). 2004b. Landscape Sensitivity Assessment Model - Public Consultation Survey. Unpublished Report.

MEPA (Malta Environment and Planning Authority). 2004c. Bathing Water Quality Monitoring Programme 2004. Report on physiochemical monitoring, MEPA, Floriana.

MEPA (Malta Environment and Planning Authority). 2004d. Strategic Environment Assessment For the New Structure Plan for the Maltese Islands. Scoping Report. Structure Plan Team December 2004.

MEPA (Malta Environment and Planning Authority). 2005a. Malta's Greenhouse Gas Emissions Inventory 1990-2003, July 2005, MEPA, Floriana.

MEPA (Malta Environment and Planning Authority). 2005b. Report for the Analysis of Heavy Metals by Dust Speciation. June 2005. Pollution Prevention and Control Unit, MEPA.

MEPA (Malta Environment and Planning Authority). 2005c. Land Reclamation Study: Project Identification Report. January 2005.

MEPA (Malta Environment and Planning Authority). 2005d. Common Database on Designated Areas for Malta (http://cdr.eionet.eu.int/mt/eea/cdda1/).

MEPA (Malta Environment and Planning Authority). 2005e. Candidate Natura 2000 Sites in the Maltese Islands: Documentation, Maps and Information. (http://www.mepa.org.mt/environment/index.htm?natura2000/natura2000.htm&1)

MEPA (Malta Environment and Planning Authority). 2005f. Supplementary Planning Policy Guidance Major Accident Hazards And Hazardous Substances. February 2005, MEPA, Floriana.

MEPA (Malta Environment and Planning Authority). Forthcoming. Malta test - Area of Built-up Land. DEDUCE Interreg IIIC project results.

MEPA (Malta Environment and Planning Authority) Nature Protection Unit. 2005. Background note on Trends of Selected Taxonomic Groups. MEPA, Floriana.

MFSS (Ministry for the Family and Social Solidarity). 2005. National Action Plan against Poverty and Social Exclusion: Light Update Report, June 2005.

MHAE (Ministry for Home Affairs and the Environment). 2002. State of the Environment Report for Malta 2002, Santa Venera, Malta.

Ministry of Economic Affairs and Finance. 1996. Financial Estimates 1997, Malta.

Ministry of Finance 1993 - 2004. Financial Estimates 1992 – 2005, Budget Office, Malta.

Ministry of Finance and Commerce. 1997. Financial Estimates 1998, Malta.

Ministry of Finance and Economic Affairs 2003. Financial Estimates 2004, Budget Office, Malta.

Mitschoff, J. 1991. Upgrading and Modernization of Sant Antnin Sewage Effluent Irrigation System in Malta. Final report. Malta.

Mosteiro, A. and Camilleri, M., 2005. Pilot Study on Dolphin fish 2004 – Malta. FAO-COPEMED.

MRA (Malta Resources Authority). 2004. A water policy for the Future. Consultation document. 10th March 2004, MRA.

MRA (Malta Resources Authority). 2005. Initial Characterisation of Groundwater Bodies. MRA February 2005. website: http://www.mra.org.mt/wfd_grb_initial_characterisation.shtml

MRAE (Ministry for Rural Affairs and the Environment). 2004a. National Allocation Plan for Malta (2005- 2007). Submission to the EU Commission, 18th October 2004.

MRAE (Ministry for Rural Affairs and the Environment). 2004b. The First Communication of Malta to the United Nations Framework Convention on Climate Change. Report prepared by the University of Malta Physics Department (editors Charles V. Sammut and Alfred Micallef) for the Ministry for Rural Affairs and the Environment, April 2004.

MRAE (Ministry for Rural Affairs and the Environment). 2004c. EkoSkola Environmental Management in Schools, MRAE, Valletta.

MRAE (Ministry for Rural Affairs and the Environment). 2004d. CEER Centre for Environmental Education and Research, MRAE, Valletta.

MRAE (Ministry for Rural Affairs and the Environment). 2005a. Il-materjal migbur mill-bring-in sites kwazi rdoppja f'sena wahda. 04.05.2005 (http://www.mrae.gov.mt/pressarchive.asp)

MRAE (Ministry for Rural Affairs and the Environment). 2005b. Government Green Leaders Initiative Launched. 12.01.2005 (http://www.mrae.gov.mt/newsitems.asp)

MT (Ministry for Tourism) 2001. Carrying Capacity Assessment for Tourism in the Maltese Islands; Tourism development policies 2000 – 2010. Marie-Louise Mangion.

Nolle, M., Vella L. and Axisa N. 2005. State of the Environment Report for Malta 2005 – Background Report on Air Quality.

NSO (National Statistics Office). 2002a. Environment Statistics, NSO, Valletta.

NSO (National Statistics Office). 2002b. Environment protection expenditure by local councils: 2002. News Release No. 59/2004, 12th April 2004.

NSO (National Statistics Office). 2003a. Hotel Waste Survey results (unpublished).

NSO (National Statistics Office). 2003b. Waste Statistics Pilot Projects and Evaluation Composition of Municipal Waste.

NSO (National Statistics Office). 2003c. Environmental protection expenditure by local councils. News Release No. 134/2003, 1 September 2003.

NSO (National Statistics Office). 2004a. Agriculture and Fisheries 2002, NSO, Valletta.
NSO (National Statistics Office). 2004b. Bathing water quality in the Maltese Islands. News Release No. 131/2004, 20 July 2004.

NSO (National Statistics Office). 2005a. Gross Domestic Product for March quarter 2005. News Release No. 125/2005, 9 June 2005.

NSO (National Statistics Office). 2005b. Motor Vehicles: October – December 2004. News Release No. 28/2005, 23 February 2005.

NSO (National Statistics Office). 2005c. Property Prices Index: March 2005. News Release No. 104/2005, 18 May 2005.

OECD (Organisation for Economic Co-operation and Development). 1994. Environmental Indicators: OECD core set. Paris: OECD.

OPM (Office of the Prime Minister). 2003. Malta Single Programming Document 2004-2006, OPM, Valletta.

PA (Planning Authority). 2000. Public Attitudes Survey. PA, Floriana.

PA (Planning Authority). 2002a. Housing Topic Paper. Final Draft February 2002, PA, Floriana.

PA (Planning Authority). 2002b. Coastal Strategy Topic Paper. Final Draft Februray 2002, PA, Floriana.

RDD - MRAE (Rural Development Department - Ministry for Rural Affairs and the Environment). 2004. The Rural Development Plan for Malta, 2004-2006, Rural Development Department, June 2004, MRAE.

Sammut, S. 2005. State of the Environment Report for Malta 2005 – Background Report on Soil.

Schembri P. 1993. 'Physical Geography and Ecology of the Maltese Islands'. In Lerin F, Mizzi L and Busuttil S (eds.) Malta: Food, agriculture, fisheries and the environment. Paris: CIHEAM (International Centre for Advanced Mediterranean Agronomic Studies) Series B No. 7.

Sillanpaa, M. 1982. Micronutrients and the nutrient status of soils: a global study. FAO Soils Bulletin 48; Rome: Food and Agriculture Organization of the United Nations.

Sivarajasingham, S. 1971. The Soils of Malta. [UNOP/SF Project MAT/5, Water disposal and water supply] Rome: Food and Agriculture Organization of the United Nations; 82pp.

Stevens, D.T. 2005. State of the Environment Report Short Note on Soil Biodiversity, MEPA, Floriana.

Tanti, C., Role, A., Borg. C., Calleja, I. 2002. 'Protection of Soil and Rural Landscapes in Northwest Malta.' In: UNEP/MAP. 2003. MAP CAMP Project "MALTA" Final Integrated Project Document and Selected Thematic Documents, MAP Technical Reports Series No 138 Volume II, UNEP/MAP, Athens.

UN-ECE (United Nations Economic Commission for Europe). 1984. Air Pollution Studies 1: Airborne sulphur pollution. United Nations, New York.

Vella, J. 1997. Heavy Metals in Soils Amended by Composted Municipal Waste. Thesis (MSc) University of Malta.

Vella, S. 2000. 'The Status of Soil Mapping in the Maltese Islands.' In: The European Soil Information System, Proceedings of a Technical Consultation Rome, Italy, 2-3 September 1999. European Soil Bureau European Commission and Food and Agriculture Organisation of the United Nations. FAO, Rome, Italy.

Vella, S. J. 2001. 'Soil Information in the Maltese Islands'. In: Zdruli, P., Steduto, P., Lacirignola C., and Montanarella, L. (eds). Soil Resources of Southern and Eastern Mediterranean Countries. Options mediterraneennes Serie B: Studies and Research Number 34 pp. 171-191; Bari, Italy: CIHEAM (Centre International de Hautes Etudes Agronomiques Mediterraneennes.

Vella, S.J. 2003. 'Soil Survey and Soil Mapping in the Maltese Islands: the 2003 position'. In P. Bullock, R.J.A. Jones & L. Montanarella (eds.). Soil Resources of Europe: incorporating EU Candidate Countries. EUR 20559 EN 000pp. Office for Official Publications of the European Communities, Luxembourg. [In press].

Vella, S.J. and Camilleri, S. 2003. 'Irrigated Agriculture and Soil Salinisation in the Maltese Islands', in Journal of Environmental Science and Health, Part A, Vol. A 38, No. 8, pp 1579 – 1595.

Vermeend, W. and van der Vaart, J. 1998. Greening Taxes: The Dutch Model. Kluwer-Deventer.

WasteServ Malta Ltd. 2004. Development of Rehabilitation Strategies: Maghtab, Qortin and Wied Fulija Landfills. Summary Report. Report compiled by Scott Wilson for WasteServ Malta Ltd.

WSC (Water Services Corporation). 2001. Annual Report 2000-2001, WSC.

WSC (Water Services Corporation). 2003. Annual Report 2003, WSC.

The Times. (11.01.2005). "Malta uses 52m plastic bags annually."

The Times. (16.05.2005). "New plans for recycling facility 'completed'."

Major Legislation

Environment Protection Act, (Act XX of 2001) (Cap. 435).

Development Planning Act, (Act I of 1992) (Cap. 356).

Fertile Soil (Preservation) Act, (Act XXIX of 1973) (Cap 236).

Occupational Health and Safety Authority Act, (Act XXVIII of 2000) (Cap 424).

Websites

http://europa.eu.int/comm/environment/ippc
http://glossary.eea.eu.int/EEAGlossary/
http://home.um.edu.mt/islands/ncsd/ncsd.html
http://www.birdlifemalta.org
http://www.ekoskolamalta.com
http://www.epa.gov/oar/oaqps/gooduphigh/ozone.html#1
http://www.greenfacts.org/glossary/mno/mutagen-mutagenic.htm
http://www.iso.org
http://www.mepa.org.mt
http://www.mepa.org.mt/EIA-Malta
http://www.mepa.org.mt/environment/index.htm?natura2000/natura2000.htm&1
http://www.mra.org.mt/Downloads/WFD/GW_INIT_CHAR_Part%201.pdf
http://www.mra.org.mt/wfd_gwb_initial_charcaterisation_objectives.shtml
http://www.nso.gov.mt/site/page.aspx?pageid=163
http://www.oecd.org/env/policies/database
http://www.overpopulation.com/faq/Basic_Information/population_density/index.html
http://www.ramsar.org

ACKNOWLEDGEMENTS

Gilbert Agius (AdT); Ramon Agius (Department of Public Health); Chris Amos (MEPA); M. Attard (AdT); Rene Attard (MEPA); Vincent Attard (Nature Trust); Vincent Attard (OHSA); Victor Axiak (University of Malta); Nadine Axisa (MEPA); Alfred Baldacchino (MEPA); Claudio Boffa (MSA); Charles Bonnici (Department of Public Health); Peter Paul Borg (MHEC); Chiara Borg (MFSS); Joanna Borg (MEPA); Jonathan Borg (University of Malta, Reviewer); Michelle Borg (MEPA); Simone Borg (Reviewer); Frederick Bowman (MEPA); Marie Briguglio (MEPA); Johann Buttigieg (MEPA); Eman Calleja (MRAE); Neville Calleja (Department of Health Information); Lawrence Camenzuli (Ghaqda Dilettanti tas-Senter u Gabjun); Alex Camilleri (MEPA); Alfred Camilleri (NSO); Marvienne Camilleri (MEPA); Matthew Camilleri (Malta Centre for Fisheries Science); Sharlo Camilleri (National Soils Unit, MRAE); Carmel Caruana (MEPA); Godwin Cassar (MEPA); Christopher Ciantar (WasteServ Malta Ltd., Reviewer); Stephen Conchin (MEPA); Nicholas Crockford (MTA); Joseph Curmi (Water Services Corporation); Henriette Debono (WasteServ Malta Ltd.); Sarah Debono (MEPA); Sylvana Debono (MEPA); Alan Deidun (Nature Trust); Anja Delia (MEPA); Dimitrio Duca (MEPA); Krista Falzon (MEPA); Ashley Farrugia (MEPA); Francis Farrugia (MSA); Victor Farrugia (Plant Health Department); Federation for Hunting and Conservation; Joseph Felice Pace; Saviour Formosa (MEPA); Gabrielle Galea (MEPA); Lisa Jane Gambin (MEPA); Marie Therese Gambin (MEPA); Joseph Gauci (MEPA); Mark Gauci; Paul Gauci (University of Malta, Reviewer); Suzanne Gauci (MEPA); Vincent Gauci (MEPA); Sergei Golovkin (MEPA); Philip Grech (Reviewer); Dennis Kasap (MEPA); Edwin Lanfranco (University of Malta, Reviewer); Nadia Lanzon (MEPA); Franck Lawyers (MEPA); Maciek Lewandowski (UK Environment Agency); Joseph Magro Conti (MEPA); Frans Mallia (MEPA); John Mangion (MRA); Joseph Mangion (Birdlife Malta); Tony Meli (MRAE); Kevin Mercieca (MEPA); Mary Grace Micallef (WasteServ Malta Ltd.); Carmen Mifsud (MEPA); David Mifsud (MRAE); Ian Mifsud (Birdlife Malta); Michael Nolle (MEPA); Mark O'Neill (MEPA); Paul Pace (Maltese Association of Environmental Education); Rudolf Ragonesi (Friends of the Earth, Gaia Foundation); Claire Said (MTA); George Said (NSO); Joseph B. Sammut (Cleansing Services Department, MRES); Charles Sammut (University of Malta, Reviewer); Sonya Sammut (National Soils Unit, MRAE); Manuel Sapiano (MRA); Ramona Scerri (MEPA); Martin Scicluna (Din l-Art Helwa); Marco Scotto (MEPA); Martin Seychell (MSA); Diane Spiteri (MRAE); Martin Spiteri (MCMP); Lucien Stafrace (MEPA); Darrin Stevens (MEPA); Tania Sultana (MTA); Christine Tanti (MEPA); The Sunday Times of Malta; Hubert Theuma (Nature Trust); Charmaine Vassallo (MEPA); Mario Vassallo (University of Malta); Saviour Vassallo (MEPA); Louis Vella (MEPA); Joseph Vella (NSO); Karen Vincenti (MHEC); Neil Weatherley (UK Environment Agency); Andy Welsh (Malta Geographical Society); Alfred Zammit (Kaccaturi San Ubertu).

Photo Credits (clockwise per page): Page i: MEPA, MEPA, MEPA, MEPA, MEPA ImageBank, MEPA, MEPA, MEPA, MEPA, MEPA ImageBank, MEPA; Page 1: M. T. Gambin, MEPA ImageBank, ANG, ANG, ANG, ANG, M.T. Gambin, MEPA ImageBank, ANG, MEPA ImageBank, MEPA, MEPA ImageBank; Page 4: ANG, MEPA ImageBank, MEPA ImageBank, MEPA, ANG; Page 6: ANG, MEPA ImageBank, ANG, MEPA ImageBank, ANG; Page 8: ANG, MEPA ImageBank, MEPA, J. Fabri, MEPA; Page 10: MEPA, ANG, MEPA, M. T. Gambin, MEPA ImageBank; Page 12: MEPA ImageBank, MEPA ImageBank, MEPA ImageBank, MEPA ImageBank; Page 14: MEPA ImageBank, ANG, ANG, MEPA, MEPA ImageBank; Page 17: ANG, ANG, ANG, MEPA ImageBank, MEPA ImageBank; Page 20: MEPA ImageBank, M. Polidano, ANG, MEPA ImageBank, MEPA ImageBank; Page 22: MEPA ImageBank, ANG, ANG, ANG, ANG; Page 24: ANG, ANG, ANG, MEPA ImageBank, ANG; Page 27: J. Fabri, MEPA, MEPA ImageBank, MEPA, MEPA ImageBank, BICC, MEPA ImageBank, MEPA, ANG; References: MEPA ImageBank, M.T. Gambin, ANG, MEPA; Notes: J. Fabri, MEPA ImageBank, MEPA ImageBank, MEPA ImageBank.

MEPA ImageBank contributors: J. Abela Medici, M. Briguglio, J. Caruana, A. Delia, S. Farrugia, S. Formosa, R. Galea, M. Psaila.

LIST OF ACRONYMS

AdT	Awtorita' dwar it-Trasport (Malta Transport Authority)
BICC	Building Industry Consultative Council
CEER	Centre for Environmental Education and Research
Cl	Chlorine
CO_2	Carbon dioxide
COM	European Commission
DDT	Dichloro-diphenyl-trichloroethane
DNA	Deoxyribonucleic acid
EEA	European Environment Agency
EEC	European Economic Community
EIA	Environment Impact Assessment
EMAS	Eco-Management and Audit Scheme
EPA	Environment Protection Act
EU	European Union
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GIS	Geographical Information System
GMO	Genetically Modified Organism
ha	Hectares
IPCC	Intergovernmental Panel on Climate Change
IPPC	Integrated Pollution Prevention and Control
LN	Legal Notice
MCMP	Ministry for Competitiveness and Communications
MEPA	Malta Environment and Planning Authority
MFSS	Ministry for the Family and Social Solidarity
MHEC	Ministry for Health, the Elderly and Community care
MRA	Malta Resources Authority
MRAE	Ministry for Rural Affairs and the Environment
MRES	Ministry for Resources and Infrastructure
MSA	Malta Standards Authority
MTA	Malta Tourism Authority
MRF	Materials Recovery Facility
MUS	Malta University Services
NCSD	National Commission for Sustainable Development
NO	Nitrogen oxide
NO_2	Nitrogen dioxide
NO_3	Nitrate
NO_x	Nitrogen oxides
NSO	National Statistics Office
OECD	Organisation for Economic Co-operation and Development
OHSA	Occupational Health and Safety Authority
PA	(then) Planning Authority
PCB	Polychlorinated Byphenyl
PM	Particulate Matter
POP	Persistent Organic Pollutant
PSI	Pollution Standards Index
REACH	Registration, Evaluation and Authorisation of Chemicals
SAC	Special Area of Conservation
SASWTP	Sant' Antnin Solid Waste Treatment Plant
SEA	Strategic Environmental Assessment
SO_2	Sulphur dioxide
SOER	State of the Environment Report
SPA	Special Protection Area
TEQ	Toxicity EQuivalent
TPS	Temporary Provision Schemes
UN	United Nations
UCA	Urban Conservation Area
UN-ECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UV	Ultraviolet
VRT	Vehicle Roadworthiness Test
WFD	Water Framework Directive
WHO	World Health Organisation
WSC	Water Services Corporation

NOTES

1 OECD 1994.
2 NSO 2005 estimates. While the EU average in 2004 was 118 persons/km^2 (CEC 2004a), Malta has the third highest population density in the world, after Monaco and Singapore (see http://www.overpopulation.com/faq/Basic_Information/population_density/index.html). In comparison, Italy has 193 persons/km^2, Cyprus 84, Luxembourg 164 and the UK 239.
3 This does not exclude the fact that 15 percent of Malta's population remains at risk of poverty (defined by Eurostat as 60 percent of the median of the national equivalised income) (MFSS 2005), but this is relative not absolute poverty and does not necessarily involve lack of food and shelter.
4 Based on previous System of National Accounts calculation, rather that the European Standard Accounts system (ESA95), on which the 2000-2004 estimates are based. See NSO website. (www.nso.gov.mt/site/page.aspx?pageid=163).
5 NSO 2005a.
6 See chapter on Waste.
7 See chapter on Land.
8 COS 1997.
9 NSO 2005b.
10 Based on ESA95 guidelines, excluding Financial Intermediation Services indirectly measured.
11 AdT Licensing and Testing Department data, August 2005.
12 MEPA 2003a.
13 MEPA 2005a.
14 EEA 2003.
15 Enemalta Corporation 2003.
16 Enemalta Corporation 2003.
17 See chapter on Air.
18 Schembri 1993. This does not necessarily suggest that winds are of a consistency and strength to ensure that wind farms would be viable, however Farrugia *et al.* 2005 suggest that almost 30 percent of Malta's energy demand, based on 2003 figures, could be satisfied from renewable energy sources, some 10 percent of which could come from wind.
19 MT 2001.
20 NSO 2003a.
21 2003 and 2004 data from MEPA's diffusion tube network is used for SO_2, NO_X, benzene, and O_3 readings giving average pollutant concentrations but not threshold exceedences at a point in time. Data from the fixed station at Floriana provided information about particulate matter (threshold exceedences and average concentrations), as well as the four pollutants mentioned above. See Nolle *et al.* 2005.
22 http://www.epa.gov/oar/oaqps/gooduphigh/ozone.html#1.
23 Nolle *et al.* 2005.
24 The EU Air Quality Directive (2002/3/EC) for O_3 provides the following limit values: 120 μg/m^3 8-hourly running average value for human health protection not to be exceeded more than 25 times per year; and also 180 μg/m^3 hourly information threshold for human health protection. Detailed information of Malta's situation by locality regarding these and other pollutant thresholds may be viewed in Nolle *et al*. 2005.
25 The EU Air Quality Directive (85/203/EEC) thresholds for NO_2 are: Hourly Limit Value: 200 μg/m^3 for human health protection not to be exceeded more than 8 times a year; Annual Limit Values: 40 μg/m^3 for human health protection, 30 μg/m^3 for ecosystem protection.
26 EEA 2004a.
27 Colls 2002.
28 EEA 2004a.
29 MHAE 2002.
30 The Air Quality Directive (89/427/EEC) thresholds for SO_2 are: hourly limit value: 350 μg/m^3 for human health protection not to be exceeded more than 24 times per year. Daily limit value: 125 μg/m^3 for human health protection not to be exceeded more than 3 times per year. Annual limit value: 20 μg/m^3 for ecosystem protection. The WHO recommends an annual limit value of 50 μg/m^3 for human health protection.
31 http://www.greenfacts.org/glossary/mno/mutagen-mutagenic.htm.
32 Nolle *et al.* 2005.
33 MHAE 2002.
34 The EU annual average benzene target was set at 10 μg/m^3 (or 3 ppb) to be reached by 1st January 2005 and 5 μg/m^3 (1.5 ppb) to be met by 2010.
35 A collective name for fine solid or liquid particles added to the atmosphere by process at the earth's surface. Particulate matter includes dust, smoke, soot, pollen and soil particles. (http://glossary.eea.eu.int/EEAGlossary/).

36 Nolle *et al.* 2005.
37 EEA 2003.
38 The daily PM limit value for human health protection as set by the EU Air Quality Directive (99/30/EC) is 50 μg/m³, which should not be exceeded more than 25 times a year.
39 MEPA 2005b.
40 The Pollutant Standards Index is an indexing system that measures pollution levels for the major air pollutants. (www.deq.state.la.us/evaluation/airmon/psi.htm)
41 MEPA 2005a.
42 MRAE 2004a
43 CEC 2005a.
44 MEPA 2005a.
45 The National Allocation Plan is prepared pursuant to obligations under the EU Directive that establishes an emissions trading scheme for greenhouse gas emissions within the European Union (MRAE 2004a).
46 MRAE 2004a.
47 MEPA 2005a.
48 EEA 2004b.
49 CEC 2005b.
50 MRAE 2004b.
51 MRAE 2004b.
52 MRAE 2004b.
53 EEA 2004c.
54 Houghton *et al*. 2001.
55 CEC 2005c.
56 EEA 2004b.
57 MRAE 2004b.
58 Data from the Physical Oceanography Unit of the International Ocean Institute's Malta Operational Centre at the University of Malta, cited in MRAE 2004a.
59 EEA 2004c.
60 These issues are also being taken into account in the review of Malta's Structure Plan, which will encourage energy generation from renewable sources and incorporation of energy efficiency measures in major developments.
61 The CLC 2000 database is part of the European Commission programme to Coordinate Information on the Environment (Corine), and records land cover and land cover changes across Europe. See EEA (2004d).
62 The figures are slightly underestimated because granted applications for the period 1988 to 1994 were not considered as GIS records for that period are unavailable. Roads are included in the calculation. This calculation involves a number of assumptions: that the plot area in the GIS accurately reflects the area developed, and that all development permits granted were followed by development.
63 Average selling prices recorded by leading estate agents Dahlia Ltd. indicate that the price of apartments increased by 25 percent between 2002 and 2004, while those for terraced houses rose by 20 percent, for maisonettes by 26 percent, for villas by 57 percent and unbuilt plots by 86 percent over this period. The 2004 State of the Construction Industry Report (BICC- MRI 2005) also notes a rise of 75 percent over 2002 prices in 2003 for semi-detached dwellings, and a rise of 5 percent in flat prices. The National Statistics Office report a 14 percent rise in the all property price-index between early 2003 and early 2004 (NSO 2005c).
64 93 percent of all 2004 dwelling permissions were for apartments and maisonettes (MEPA Dwellings Database).
65 36 percent of these are second homes (COS 1997). See also PA 2002a.
66 See UN-ECE 1984.
67 38 percent permanently vacant (i.e. not second homes) in the Grand Harbour Local Plan Area (COS 1997).
68 PA 2002a.
69 (Act 1 of 1992). See Structure Plan policy UCO 7 (MDI 1990) for details.
70 See Structure Plan policy UCO 4 (MDI 1990) for details.
71 Of the 47 UCAs, 26 are approved by the MEPA Board but still pending local plan approval for them to come fully into force**.** The seven MEPA local plan areas are Gozo and Comino, North West, North Harbours, South Malta, Central Malta, Grand Harbour and Marsaxlokk Bay, of which the last two have been approved.
72 Two notable examples are Palazzo De Fremaux in Zejtun and a number of houses at St. George's Bay, Birzebbuga.
73 In July 2005 MEPA began to compile an inventory of the most significant buildings in Valletta commencing from those identified in the 1935 Antiquities Protection List, the churches and chaples, and monuments from the British period. In all approximately 100 sites have been identified for eventual scheduling.
74 At Rabat and Mdina two illegal developments uncovered Roman ashlar masonry and substantial archaeological deposits. At Marsa engineering works in 2005 uncovered substantial remains from the Roman period harbour warehouses and deposits.
75 MEPA 2003b.
76 PA 2002a.
77 MEPA 2003b.
78 This figure is based on a GIS exercise to map 360° views from all points in Malta. Urban areas include only buildings within the 1988 Temporary Provisions Schemes, conservatively estimated to be only two storeys high.
79 See also chapter on Landscape.
80 See discussion on status of Malta's aquifers in chapter on Waters.
81 RDD-MRAE 2004.
82 Calleja 2004.
83 Haring *et al.* 2004.
84 MEPA forthcoming. This figure for built-up land includes waste dumps and quarries.
85 PA 2002b.
86 This chapter is based on Sammut (2005).
87 See the Fertile Soil Act (Act XXIX of 1973).
88 These include sources on salintity (Sivarajasingham 1971, Vella and Camilleri 2003), trace nutrients (Silanpaa 1982, Camilleri 2000, and Cauchi 1999), heavy metals (Vella 1997, WasteServ Malta Ltd. 2004), soil biodiversity (Stevens 2005), soil erosion (Tanti *et al*., 2002), soil-water characteristics (Mitschoff 1991) and soil mapping (Vella 2000, Vella 2001 and Vella 2003).
89 MALSIS 2004.
90 MALSIS 2004.
91 MALSIS 2004.
92 MEPA 2003b. This is the most recent data available.
93 MALSIS 2004.

94 NSO 2004a.
95 This section draws upon Stevens (2005).
96 CEC 2002a.
97 Stevens 2005.
98 Maltese and common names have not yet been allocated to these species.
99 CEC 2002a.
100 Tanti *et al.* 2002.
101 MALSIS 2004.
102 Fertile Soil Act (Act XXIX of 1973), amended in 1983.
103 MEPA 2004a.
104 See the Environmental Pressures, Land and Waste chapters for information about the key drivers of landscape change such as housing, energy, transport and waste infrastructure.
105 This builds upon MEPA 2004a.
106 Based on public rating of 40 photographs of Maltese landscapes (MEPA 2004b).
107 MEPA 2004b.
108 See Public Consultation Draft published in late 2004 (MEPA 2004a).
109 See Structure Plan Policy RCO 1 (MDI 1990).
110 RDD-MRAE 2004.
111 MEPA 2004a.
112 MRA 2004.
113 This data derives from a financial indicator representing only consumption for which bills have been sent.
114 NSO 2004 data.
115 Following the passing of LN 357/04 under the Food Safety Act (Act XIV of 2002).
116 MRA 2004.
117 WSC 2003.
118 LN 194 of 2004, which transposes the Water Framework Directive (2000/60/EEC).
119 Good 'quantitative status' is defined as groundwater levels where the long-term annual abstraction rate does not exceed annual recharge in the WFD. Good 'qualitative status' is defined as groundwater whose chemical composition is not affected by saline or other intrusions; do not exceed quality standards established in other related Community legislation; and do not fail to achieve the environmental goals specified under Article 4.
120 MRA 2005 (see http://www.mra.org.mt/wfd_gwb_initial_charcaterisation_objectives.shtml).
121 MRA 2005 (see http://www.mra.org.mt/Downloads/WFD/GW_INIT_CHAR_Part%201.pdf).
122 MRA 2005.
123 CEC 2002b.
124 WSC 2001.
125 WSC contributions by source of water have been divided uniformly across all sectors according to share of production by source. The graph does not take into account public distribution system losses.
126 As collected by NSO.
127 One of the requirements of the WFD is the establishment of a comprehensive monitoring network for all groundwater bodies by December 2007.
128 Plant Health Department, MRAE.
129 The biological status of coastal waters is discussed under the Biodiversity Chapter of this report.
130 The 1975 Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean.
131 NSO 2004b; DPH 2004.
132 The negative coefficients imply that either there is overabstraction or that the demand of overlying groundwater dependant activities is estimated to exceed the available groundwater (this is particularly so in the perched aquifer systems). This means that groundwater is being 'imported' from other aquifer systems.
133 This review is based on MEPA 2004c.
134 Axiak 2004.
135 See COM (2002) 539 on the EU Thematic Strategy for the Protection of the Marine Environment. It is likely that this strategy, once approved, will be followed by a framework directive.
136 EU Maritime Policy Paper including impact of growth and jobs on water.
137 MRAE 2004b.
138 Cowiconsult 1992.
139 A 2003 NSO survey provides the first picture of municipal waste generation and composition (NSO 2003b).
140 Ta' Zwejra near Maghtab, Qortin Waste Transfer Station and Sant' Antnin Solid Waste Treatment Plant (SASWTP) and construction and demolition waste disposal sites in disused quarries.
141 At Ministry of Resources and Infrastructure (MRES).
142 Municipal waste is waste produced from households, as well as other waste, which because of its nature or composition, the competent authority deems it to be municipal waste. For the purpose of this report, it is considered to be waste collected by or on behalf of municipalities and accounts for waste produced from households, hotels, restaurants, as well as non-hazardous hospital waste, rejects from Sant' Antnin waste treatment plant, bulky refuse, agriculture and beach waste/seaweed.
143 Including bulky refuse, agricultural waste and waste from beaches/seaweed.
144 Packaging waste represents 37 percent of the 8 percent municipal waste fraction of total solid waste.
145 See Legal Notice 337/01.
146 This includes bring-in sites in operation as at 22.06.2005.
147 WasteServ Malta Ltd.
148 WasteServ Malta Ltd. information, 2005.
149 WasteServ Malta Ltd. 2004.
150 Although WasteServ Malta Ltd. adopted the European Union Waste Catalogue in 2003, the data used in this indicator is not based on this classification system. This was done in order to present time series data, which is based on the former classification.
151 The Times (16.05.2005)
152 WasteServ Malta Ltd.
153 MEPA 2005c.
154 This includes bring-in sites in operation as at 22.06.2005.
155 94/62/EC.
156 G.A.S. s.r.l (2002). (See www.mepa.org.mt)
157 See data emerging from Lanfranco (forthcoming).
158 See Directive 2001/18/EC for procedures and measures transposed by LN 290/2002 under the Environment Protection Act. (Act XX of 2001).

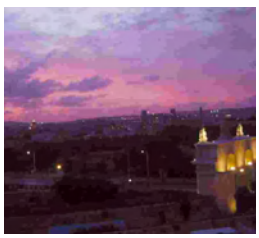
159 LN 257 of 2003 under the Environment Protection Act (Act XX of 2001).
160 The Carnet de Chasse is a register in which the hunter/trapper keeps an annual record of catches.
161 No later data is available.
162 Directive 92/43/EEC transposed as LN 257 of 2003 under the Environment Protection Act (Act XX of 2001).
163 79/409/EEC.
164 Ramsar Convention on Wetlands (www.ramsar.org).
165 82/72/EEC.
166 Protocol on Specially Protected Areas concerning Biological Diversity in the Mediterranean (SPA and Biodiversity Protocol).
167 LN 257 of 2003. 31 of these sites are of International importance and 7 of National importance.
168 See http://www.mepa.org.mt/environment/index.htm?natura2000/natura2000.htm&1.
169 Under the Council of Europe Bern Convention.
170 See Malta Structure Plan policy RCO 1.
171 Found only in the Maltese Islands.
172 These are animals, plants or other living organisms that are non-native, i.e. not usually found living in the Maltese Islands, and that do not have an established place in local ecosystems.
173 CEC 2005a.
174 CEC 2001.
175 http://www.greenfacts.org/glossary/mno/mutagen-mutagenic.htm.
176 Nolle *et al.* 2005.
177 CEC 2003a.
178 CEC 2005d.
179 Reply to PQ 10785, citing the ISAAC study of 1995.
180 EEA 2003.
181 See sections on Air, Water, Soil and Waste.
182 See chapter on Air.
183 See chapter on Climate change.
184 CEC 2003a.
185 COM(2001) 31 final; COM(2001)264 final.
186 96/82/EC transposed into the Control of Major Accident Hazards Regulations LN 37/2003 and amendment LN 6/2005 under the Occupational Health and Safety Authority Act, (Act XXVIII of 2000) (Cap 424).
187 MEPA 2005f.
188 See Waters chapter for information on pesticides.
189 EEA 2003.
190 CEFIC 2005.
191 Regulation EC No 304/2003 under the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade.
192 Those that requested MEPA's authorization for release from Customs**.**
193 CEC 2005b.
194 UNECE Convention on Long-range Transboundary Air Pollution Protocol on POPs.
195 The Stockholm Convention on POPs.
196 CEC 2001.
197 96/61/EC, transposed as LN 230 of 2004.
198 http://www.europa.eu.int/comm/environment/ippc.
199 New substances include all substances not on the market in the EU in 1982.
200 CEC 2003b.
201 CEC 2003c.
202 Includes funds directed towards public environmental bodies, waste, sewage and water infrastructure, rehabilitation projects, and heritage conservation.
203 By way of comparison, in 2005 21 per cent of government expenditure will be targeted at social security benefits, while 5 percent will go to education.
204 see NSO 2002b, 2003c for local council data.
205 CEC 2004b.
206 1990-2003: actual expenditure; 2004: approved estimate; 2005: estimate; 1996-2002 include environmental protection expenditure by Local Councils.
207 The aim is to reduce the 2004 figure of 52 million (see also chapter on Waste) {The Times (11.01.2005)}.
208 Vermeend, W. and van der Vaart 1998.
209 See chapter on Waters.
210 More information may be found on www.oecd.org/env/policies/database.
211 CEC 2005e.
212 PA 2000.
213 Camilleri 2001.
214 MRAE 2004c.
215 http://www.birdlifemalta.org
216 http://www.ekoskolamalta.com
217 MRAE 2004d.
218 At EU level this is covered by two Directives (90/313/EEC and 2003/35/EC) and a proposal (COM [2003] 624). The Directives have been transposed through LN 116/2005 and LN 139/2005, and the IPPC and EIA regulations, while the proposal is still under negotiation by EU institutions.
219 CEC 2004b.
220 http://www.iso.org
221 Coffey *et al*. 2004.
222 http://home.um.edu.mt/islands/ncsd/ncsd.html.
223 The year in the chart refers to the date applicants were informed by MEPA that their application qualifies for an EIA.
224 OPM 2003.
225 MRAE 2005b.
226 http://www.mepa.org.mt/EIA-Malta.
227 MEPA 2003c.
228 Another factor explaining the decrease is that there is a lead-time between submission of a development application and the commissioning of an EIA.
229 The first EIA was prepared in 1988 for the Delimara Power Station at Marsaxlokk Bay.
230 MEPA 2004d.
231 See COM (2002) 725 final/4.
232 EEA 2005.










Malta Environment & Planning Authority
St Francis Ravelin Floriana Malta

Tel: +356 2290 0000 Fax: +356 2290 2295

www.mepa.org.mt