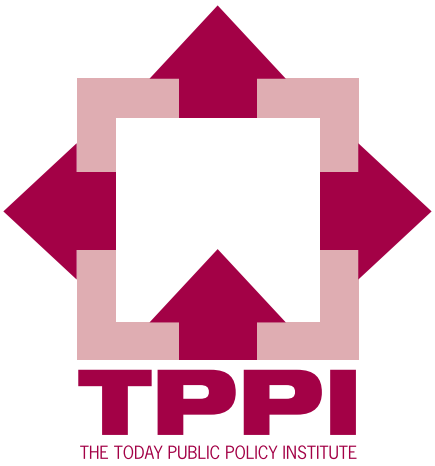
WHY MALTA'S NATIONAL WATER PLAN REQUIRES AN ANALYTICAL POLICY FRAMEWORK



WHY MALTA'S NATIONAL WATER PLAN REQUIRES AN ANALYTICAL POLICY FRAMEWORK

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Lead Authors: Lee Roberts
Marco Cremona and Gordon J. Knox

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Why Malta's National Water Plan requires an Analytical Policy Framework

The Today Public Policy Institute
c/o The Malta Chamber of Commerce, Enterprise and Industry,
Exchange Buildings, Republic Street, Valletta
VLT 1117 MALTA
Email: martins@onvol.net

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EXECUTIVE SUMMARY

1. Malta is among the world's most water-stressed countries. Its groundwater reserves are being depleted and affected by both nitrate pollution and increasing salinity – consequences of largely unregulated human activities. Since the early 1980s, Malta has been increasingly dependent on energy-intensive desalination (by Reverse Osmosis). However, groundwater still contributes most of the water used in the country, especially by water-hungry agriculture during the dry seasons. Water recycling and rainwater harvesting have lagged behind inadequately regulated private groundwater extraction.

2. Despite the growth of local agriculture since accession to the EU, Malta relies heavily on importation of agricultural produce and other commodities whose production requires significant water use. This import of "virtual water" constitutes more than ten times the total amount of water consumed from domestic sources. This makes Malta very vulnerable to water crises in other parts of the world, over which it has absolutely no control.

3. The main driving force for Malta to address these problems, especially the depletion of the aquifers, has been the EU and the obligations arising from the EU Water Framework Directive. The efforts have been patchy and have not changed the rate of groundwater depletion. This is in part because Malta has not had a comprehensive integrated water policy and plan. The water policy document in place in 2012 was not the result of a thorough analysis. While the purpose of many of the proposed interventions is relevant, without an integrated Policy Framework, it is likely that these measures would be implemented as stand-alone ventures with inadequate consideration of priorities and options, and linkages to overall goals. They would also lack the analysis needed to project the economic and social benefits expected, and measure whether the costs of these measures were justified by the impact.

4. The public is largely unaware of the water problem and its dimensions. Even within government, there is a dearth of reliable data and facts relating to the water situation. This was recognised before the last election by the three political parties - Partit Nazzjonalista (PN), Partit Laburista (PL) and Alternattiva Demokratika (AD) who all pledged to produce a National Water Plan.

5. Shortly after the 2013 election, the NGO: the Malta Water Association (MWA), presented a document (Terms of Reference) to Government and the Opposition on how to develop a sound Policy Framework through systematic analysis. MWA also stressed that the development of a national plan requires national consensus and agreement among the

political parties to de-politicise the debate concerning water for the benefit of the nation. It is not known whether Government has taken the MWA's advice and recommendations on board.

6. So far, in the development of the National Water Plan, the Government has relied largely on stakeholder consultations and presented facts and data with considerable inherent uncertainties. Consultation in the absence of a sound Policy Framework runs the risk of a plan based largely on vested interests and electioneering imperatives, without the analytical framework to select from the options based on measurable economic and social outcomes. The risk is one-off initiatives unrelated to a sound understanding of the overall economic context.

7. Policy analysis and the resulting Policy Framework produces a comprehensive picture, based on reliable data and facts and minimised risks and uncertainties, of the many aspects planners need to consider: (i) the real value of water and its economic contribution as a justification for future public expenditure; (ii) the choices, costs and benefits of various options for enhancing water supply; (iii) essential sectoral linkages, especially between water management and the agricultural sector; (iv) social, environmental and income factors; (v) the legal and regulatory framework; (vi) the demand for water and its elasticity; and (vii) financial issues including tariffs, revenues, and the levels of justified subsidies to water users.

8. Policy analysis needs to be done in phases, with the most urgent issues considered first so that action can be taken. Pilot projects provide a sound basis for generating much of the data needed and testing feasibility, modality, affordability, and economic and social impact. Tariffs need to more closely reflect the full costs of water production and distribution, and any remaining subsidies calculated, rationalised, justified, and made transparent. Reverse osmosis needs to be considered a fall-back, rather than the leading edge of water management.

9. The highest priority must be given to the rehabilitation and conservation of the water aquifers, which will require extensive analysis of the rate and causes of deterioration, and an integrated and costed strategy to achieve measurable goals. Alongside, the potential for maximising rainfall harvesting and waste water recycling needs to be analysed to put in place a feasible and affordable set of actions that will win public support.

10. Because agriculture is the major user of Malta's groundwater, a Water Policy Framework and Plan requires the same level of analysis of the agricultural sector so that farmers' water use can be properly understood in terms of economic and income contribution, efficiencies, market competitiveness, and social value, before long-term commitments are made concerning water usage in this sector.

11. The Policy Framework needs to properly define the concept of sustainability, which is currently used in an abstract form. Beyond the household and commercial uses of water, analysis also needs to focus on what is required to improve and protect the contribution of water to Malta's natural environment.

12. The creation and management of a long-term Water Plan requires a level of analysis and information generation for which the Government does not currently possess the capacity. Malta needs to follow the practice of other European countries in which objective and comprehensive analysis is carried out by independent Policy Institutes.

INTRODUCTION

13. This paper is intended as a contribution to the debate about the actions that are essential to ensure that Malta, in future, will have access to sufficient water resources to meet the needs of its population and economy.

14. It must be said from the outset that Malta cannot, in the near future, be self-sufficient in water at an economically affordable rate. This would be so even if the two most important sources are better managed, namely the restoration and preservation of its aquifers, and the effective harvesting of rainwater. Malta is an island city state with a dense population, limited hinterland and a very low per capita ground water availability of around 50 to 60 cubic metres/person/year.

15. Consumption from various sources far exceeds this availability, and has to be supplemented by reverse osmosis desalination. Although there is always water for household use (electricity cuts notwithstanding), Malta is heavily reliant on virtual water imports. This is especially so in the case of agricultural commodities, largely because of the insufficiency of local water and agricultural hinterland to cater for water-intensive production in a competitive market. Although water self-reliance cannot be achieved at affordable costs, there is much room for improvement in the management of Malta's indigenous water resources.

16. The following key issues have been identified as being the most pressing: (a) the over-extraction of water from the sea-level aquifers and their gradual decline as viable water sources; (b) the under-utilised potential of rainwater harvesting; (c) defining, in the form of measurable goals over time, the scope of water-use efficiency, particularly among domestic and agricultural consumers, which includes waste water-recycling, reduction in water wastage, and active conservation by all consumers; (d) concern about long-term reliance on reverse osmosis especially as long as it remains a carbon intensive process; (e) growing pressure on Malta to conform to the requirements of the EU Water Framework Directive; and (f) climate change trends.

17. While Malta's water scarcity and the stress on its aquifers are well documented, and there are debates and government initiatives from time to time, there is widespread ignorance about the real nature of the problems, issues, and choices. This is the result of a dearth of sound analysis and reliable data. Proposals appear to be made and initiatives taken largely on the basis of ideas, discussion, and limited observation.

18. Before the last election, there were many consultations with NGOs such as The Malta Water Association, in which it was freely admitted that, despite attempts in the past to define Malta's water priorities, these had never resulted in a long-term water plan. The two main political parties, Partit Nazzjonalista (PN) and Partit Laburista (PL) pledged to produce a Long-Term National Water Plan for Malta. This was echoed by Alternattiva Demokratika (AD) which had long called for such a plan.

19. On taking power, PL reaffirmed that such a plan would be produced, and the Malta Water Association offered detailed terms of reference on how such a plan should be prepared,

based on extensive analytical work needed because of the dearth of reliable data and facts concerning Malta's water. The Association argued that there was a need for a Policy Framework created as a result of objective empirical research and analysis, and that this Framework should be the basis for national consultation. The Plan would be drawn from the framework. Such a framework would (a) draw the essential linkages among the various aspects of water management (sources of supply and their quality; demand and usage; environmental and conservation priorities; contribution of water to the national economy; tariffs and revenues related to water; social priorities; and the regulatory framework) (b) the economic relationships between water and the key sectors that are dependent on water (such as agriculture, tourism, and industry). To date, some public consultations have taken place, without such a Policy Framework, based on significant unknowns, and broad goals.

AIM

20. The purpose of this paper is to argue that policy analysis, and the creation of a National Policy Framework is an essential pre-requisite to the formulation of a credible long-term water plan for Malta, and that a national water plan cannot deliver the required results without such analysis.

OUTLINE OF THE REPORT

21. The report is laid out in ten parts

PART 1: Background and Essential Facts related to Malta's Water

PART 2: The Political Context

PART 3: The Essential Characteristics of Policy Analysis

PART 4: The Inescapable Realities Involved in Developing a National Water Plan

PART 5: The Core Issues a Water Policy Framework Must Answer

PART 6: The Need for Agriculture Sector Analysis

PART 7: Considering the Options within a Policy Framework

PART 8: Malta's Responsibilities as a Member of The European Union

PART 9: The Question of Analytical Capacity

PART 10: Proposed Next Steps

Part 1
BACKGROUND AND ESSENTIAL FACTS RELATED TO MALTA'S WATER

22. Malta has a semi-arid climate typified by mild wet winters and hot dry summers. Throughout history, the need to harvest and conserve water has been paramount. Across the Maltese Islands are numerous sites that give witness to past generations' efforts to save and manage water. Evidence includes prehistoric rock-cut tanks and channels, Roman villa cisterns, and a multitude of medieval works, such as construction around natural springs, and flask shaped cisterns.

23. Later, the Knights of Malta constructed an extensive network of cisterns and drainage systems to capture water in their new capital, Valletta. This did not suffice, so that an early late 17th century aqueduct was built to carry water from agricultural springs in the Rabat area. During the British period, dams and weirs were built to hold winter rains for storage, or soak-aways to channel the water into the ground. In the same period, the deeper Mean Sea Level Aquifers were discovered and exploited by shallow wells (known as *spieri*).

24. Large scale exploitation of the mean sea level aquifers of Malta and Gozo began in the 1950s, and continued to increase to meet the national potable water demand. Over time, thousands of private boreholes were drilled (without permission) resulting in a situation where the quantities extracted by the private sector today exceed those by the Water Services Corporation (WSC). It is most likely that the rate of exploitation today is higher than it ever has been.

25. However, even the combined sources - winter rainwater in the soil, ground water extraction, sea water conversion to freshwater by desalination, very limited rain water harvesting and recovery of water from treated sewage effluent, and some direct sea water uses - do not meet the water and food needs of Malta's population. The Maltese Islands are equivalent to a densely populated city state surrounded by a sea water moat and a limited hinterland. There is insufficient land and water availability to grow all the food and make all the products Malta needs.

26. Studies by experts from the Netherlands indicate that Malta imports 900 million cubic metres equivalent of *Virtual or Embedded Water* (Hoekstra, 2013, p. 149). This is water consumed in other countries to produce food and goods that Malta purchases from overseas. This volume is around **ten times** the total amount of water consumed in Malta from local sources, (including water retained in soil, groundwater, desalination, some rainwater harvesting, and limited reuse of treated effluent). Malta's heavy reliance on Virtual Water of foreign origin underlines the scarcity of Malta's water, higher than many other countries (Hoekstra & Mekonnen, 2012), traditionally perceived as water scarce. Even among water-stressed countries, Malta's dependency on external water is at the highest level:

Dependency on External Water: Water-Stressed Countries

Country	*Degree of External Water Dependency*
Malta	92%
Kuwait	90%
Jordan	86%
Israel	82%
United Arab Emirates	76%
Yemen	76%
Mauritius	74%
Lebanon	73%
Cyprus	71%

27. Among European countries Malta is the most highly stressed for indigenous water sources (European Commission eurostat, 2014).

28. While the domestic water situation has been apparent to Government for at least two decades, awareness of virtual water issues is recent and limited. Furthermore, the general public has little or no awareness of either Malta's domestic water situation, or Malta's reliance on imported virtual water. There are huge information gaps concerning Malta's internal water sources and utilization, which makes planning and policy formulation very tricky. The table below illustrates some key facts that are known, at a reasonable level of confidence, and facts where the data is so scant or estimates vary so much, that for all practical purposes, the facts are not known.

Key Known and Unknown Facts Concerning Malta's Water

Total estimated extraction from aquifers (minimum)	43 million cubic metres/year
WSC groundwater extraction	14 million cubic metres/year
WSC network losses (Water Services Corporation, 2012)	4.3 million cubic metres/year
WSC Reverse Osmosis (RO) production	16 million cubic metres/year
Treated Sewage Effluent (TSE) recycling	<1 million cubic metres/year
Average Rainfall (Climate Adaption EU, Not dated)	500 to 600mm/year
Rain water harvesting	Not known
Estimated rainfall recharge to aquifers (Sapiano *et al*, 2006)	Only untested estimates exist
Private RO production	Not known
Direct Sea Water Utilisation in hotels & industry	Not known
Industry borehole extraction	Not known
Bottling plants borehole extraction	Not known
Domestic users borehole extraction	Not known
Agriculture borehole extraction (Malta Resources Authority, 2012; National Statistics Office, 2012)	28-30 million cubic metres/year
Other borehole extraction, (building, bowser, etc.)	Not known

Part 2
THE POLITICAL CONTEXT

29. The media periodically features debate about the state of Malta's water. Leading environmental NGOs, the Malta Water Association, and notable Maltese water experts have taken the position that Malta's water situation is far more parlous than the public understands, and that it requires concerted action from Government. Press comment often berates what is seen as the sense of complacency that surrounds the many problems related to Malta's water resources and their misuse. Over time, that campaign has made inroads. It became increasingly more difficult to deny the facts when even farmers became vocal about the deteriorating condition of salinity in water pumped from the aquifer. Nevertheless, there remains a widely shared perception that because the country no longer suffers from prolonged water cuts, the water problem has been resolved. Although Reverse Osmosis (RO) has gone a long way in alleviating issues of water supply, the country still faces an acute crisis of water sustainability.

30. Otherwise, typically, water brings headlines largely when intense storms bring floods to Malta's urban heartland. This has resulted in the €56 million National Flood Relief Project (NFRP), which the Government described as the "largest engineering project ever to be launched in Malta" (Malta Environment and Planning Authority, 2011). It did not take too long before a challenge arose to the assertion that in addition to bringing welcome relief from flooding, NFRP would also "top up the national water reserve with a further 700,000 cubic metres of water" (Gozo News, 2012). To date, no definitive or convincing explanation has been offered as to how this volume of rainwater would be captured. Even if the figure is valid, it is a paltry volume amounting only to 1% of the total annual indigenous water needs. The reality is that most of the rainwater that flows through the NFRP will be dumped into the sea, and lost.

31. The periodic media observations about Malta's water problems have been accompanied over the last decade or so, by postings on government web sites stating Malta's water reserves are indeed stressed. This was in part the result of revelations about Malta's obligations under the European Union Water Framework Directive, which Government predicted (probably a significant under-estimate) would cost €200 million in capital investment. By October 2011, it was being publicly acknowledged that "the freshwater availability per capita in the Maltese islands ranks as one of the lowest in the world", and that "our current practices of water supplies call for major reform if we want to ensure the availability of freshwater resources for us and future generations" (*Flimkien għall-Ambjent*, 2011).

32. In 2012, the National Audit Office published its Performance Audit: Safeguarding Malta's Groundwater (NAO National Audit Office Malta, 2012). The report acknowledged that while "the prevailing and climate change threats to groundwater have generally been identified", and "that although the implementation of various initiatives have commenced, efforts must be stepped up to ensure the sustainability of this resource". The audit was based on the four key documents that make up the regulatory framework for managing Malta's groundwater: 'A Proposal for a Water Policy for the Maltese Islands' (Water Policy), the 'National Climate Change Adaptation Strategy' (NCCAS), 'The Water Catchment

Management Plan for the Maltese Islands' (WCMP), and the 'Nitrates Action Programme' (NAP).

33. While the report acknowledged progress in creating a Water Catchment Plan and in measures to control nitrate pollution, it pointed out that:

- the assessments of risk that over-abstraction posed to Malta's groundwater, had to rely on assumptions in the absence of data on groundwater abstraction (among the missing or sub-standard data, the report specified private, commercial, and agricultural groundwater abstraction volumes; time series data relating to variables associated with climate change;

- cost estimates were provided only for the WCMP, (and these were based on 2009 assumptions); and that neither the Water Policy, nor the NCCAS provided any cost estimate (the Ministry for Resources and Rural Affairs (MRRA) had started a cost estimation exercise for the NCCAS recommendations);

- the implementation of many proposed measures had been delayed because the Water Policy was still in draft form, waiting for presentation and debate in parliament; and that the implementation of Water Policy measures would be completed by 2015;

- still to be completed were measures for efficient, fair and equitable groundwater pricing as specified in the EU Water Framework Directive (only water abstracted by the Water Services Corporation had so far been brought under a pricing mechanism);

- implementation of the NCCAS could be hindered by the fact that the prevailing legal and regulatory framework did not extend to climate change adaptation, and the lack of adequate human and financial resources within agencies responsible for implementing climate change adaptation measures;

- under the WCMP, the implementation of groundwater metering was hindered by complexities both legal (identification of ownership and multi users of water sources) and technical (problems to due the various methods used over the years for drilling of boreholes); as well as shortages of MRRA staff responsible for installing meters;

- while progress had been made in installing groundwater metres for the commercial sector, the completion of groundwater metres for the agricultural sector had been delayed until mid-2013, and as a result, the requirements of L.N. 241 concerning groundwater metring could not proceed;

- the enforcement of the EU obligatory NAP had been limited to measures listed in the 2004 programme rather than the revised and updated version published in 2011;

- while the use of nitrates had recently been legally regulated, the relative enforcement was not proceeding, and the explanation given was that the farming community was not fully aware of its NAP obligations.

34. The report concluded that the prevailing condition of Malta's groundwater points to past short-comings in the regulation of this resource. While the agencies responsible for

implementing the measures in the four regulatory papers were confident about achieving future deadlines, the major causes of past delays were due to insufficient administrative capacity at different departmental levels and lack of adequate management information systems. These in turn impede enforcement of measures such as those to limit nitrate contamination.

35. In addition to the need to speed up progress, the Report recommended:

    (a) An intensified Research and Development programme relating to all aspects of groundwater and the potential threats of climate change. The goal would be to produce projections at a higher level of confidence. This would require the needed resources to be provided to the MRA, the Malta Environment and Planning Authority (MEPA), and the University of Malta. Opportunities should also be taken to collaborate with international institutions;

    (b) The research programme should include the creation of comprehensive and integrated data bases critical to policy formulation and decision making, and the monitoring of measures to safeguarding groundwater;

    (c) Studies should be launched to determine the social and financial costs of Malta's groundwater, and the results used to evaluate the cost-effectiveness of proposed measures to safeguard groundwater;

    (d) The results of studies should be disseminated to raise public understanding of the value, risks and vulnerabilities associated with Malta's water. Better knowledge would increase the value of public consultation;

    (e) Policy and strategy papers should include financial estimates of implementation, to help prioritise the selection of projects and appraise their feasibility; and

    (f) Information campaigns should be launched to educate farmers about their responsibilities for reducing the use of nitrates under the requirements of the NAP, and enforcement intensified.

36. Since 2012, relatively little observable progress has been made on the various observations and recommendations of the NAO Report. This paper will reinforce many of the report's findings and proposals.

37. Given the frequency of media and public comment on Malta's water, it was no surprise that Malta's three main political parties, the PL, PN and AD all committed, at the last election, to the production of a long-term "National Water Plan". The preliminary work that led to this paper was a response by the Malta Water Association (MWA) to these manifesto commitments. As a contribution, in March 2013, MWA offered the new PL Government Terms of Reference for the creation of a National Water Policy Framework, which will provide the essential analytical foundation for the development of a feasible and sound National Water Plan (Malta Water Association, 2013).

38. MWA also emphasised the importance of achieving full consensus among PL, PN, and AD on the approach to the developing a policy framework on the water sector. Because of the

importance of this goal for Malta, the issue should be raised above electoral jockeying for position and treated as a national goal. This is especially important, as the development of the policy framework and the national plan derived from that framework will probably span more than one administration. With this in mind, MWA sent the Terms of Reference to all three parties and held follow-up presentations and discussions. Nothing tangible has so far emerged from that initiative, although the Government states that the national plan is being developed, and a few stakeholder conferences have been held. So far there has been no formal response from PL or PN to the Terms of Reference (Grech, 2015).

39. However, while it has been publicly acknowledged that Malta needs a Water Plan, the general public remains poorly informed and educated on the issues, and there is not unanimity about how such policy should be crafted and where its emphases should lie. This is in great part due to the lack of reliable information, data, and analysis relating to Malta's water resources and little sign that anything substantial is being done to address these lacunae. There are also strong vested opinions, an understandable desire among policy-makers to navigate safely around controversial choices, and the tradition of "making policy on the hoof" based mainly on electoral priorities, targeted consultation with strong lobbies, and (EU-funded) projects dictating policy rather than being derived from a sound policy framework.

Part 3
THE ESSENTIAL CHARACTERISTICS OF POLICY ANALYSIS

POLICY ANALYSIS PRECEDES PLANNING

40. A National Water Plan requires a high level of objectivity which can come only though a rigorous process of analysis, so that the Policy Framework, from which the National Plan should be drawn, reduces to a minimum arguments based on vested interests or electoral popularity, and replaces opinions with incontrovertible facts.

41. The terms "Policy Framework" and "Plan" are sometimes used inter-changeably. They are by no means the same thing. A Policy Framework is the result of in-depth data gathering, assessments, and analyses, that lay out the priorities, options, choices, risks and obstacles, dangers, costs (both capital and maintenance), and sequences. A Policy Framework is the essential guide for policy-makers, whether they are business managers, or managers in government. The analyses look at past performance, at the way success or failure has been assessed, at prioritising the crowded agenda of needs and demands, calculating the costs and benefits (in reliable measureable form) of the various options available to meet the priority needs and demands.

42. The analysis takes into account many important factors, including the law, the scope of public interest, the impact of decisions (past and future) on the environment, special needs and interest groups, the sacrifices that would have to be made if action on a specific

option is decided, and the economic and social benefits that would justify investment. The goal is to hold government accountable for the expenditure of national taxes and grants, by insisting on the measurement (and publication) of results, instead of vague claims and opinions, to show whether results justify the spending of scarce resources.

THE HAZARDS OF PLANNING THROUGH PUBLIC CONSULTATION

43. As government is there to serve the people, an essential preparatory requirement is to consult the voters as to what they want to see happen, where they would like their taxes to be spent. Public consultation, and consultation with special groups that have a strong interest in the outcome, are naturally part of the necessary analysis. However, there is a need to understand what consultation can achieve, and its limitations. Consultation is a vital parallel step, but it does not replace policy analysis.

44. There are some potential weaknesses and limitations to public and special group consultation. Where the public is well aware of all the facts and dimensions relating to a policy issue, the accuracy of their input and feedback may be expected to be higher than in cases where there is large public ignorance. Sometimes that is the case, sometimes it is not. The stronger the vested interests are in a particular solution or policy preference, the more likely it is that those with these interests will present a case lobbying for their choices and preferences to be embraced. They may very well, and understandably, skate over or interpret facts and consequences in a way that serves their interests. If the policy choices are particularly controversial, public consultation can intensify acrimony among rival groups, and opposition to reforms that threaten their interests.

45. The risks in public consultation are even higher when the important facts about a situation are not known, or understood, and worse still, when there are strong but incorrect opinions and even myths in the public domain. Worst still is a public consultation when not even those leading the consultation are sure about facts, choices, and consequences.

46. Public consultations are almost invariably treated by the public as opportunities to fight for what they want. That is most understandable, although those who launch public consultation exercises seldom behave as if they know what they are getting into. When government asks its population about its needs, it may hope that it will receive accurate, objective information that will permit the construction of a plan to meet those needs. Even in those countries where policy analysis is the norm, governments may engage in such exercises with the assistance of expert market research advisors, and face the prospect of ending up with piles of irreconcilable demands and doubts about the accuracy or realism of the information they have collected.

47. In many countries, it is not uncommon for public consultations to be followed by silence (For some discussions on this complex issue see Geist, 2014; Hallsworth *et al*, 2011; Holmes, 2011;Leniham 2009).[1] The public are told little more than that the government is

[1] "In many democracies, citizen participation in policymaking and service design has been debated or attempted, but too infrequently realised. There have been some notable achievements, in both advanced and developing countries, and there is abundant public policy literature advocating thoroughgoing collaboration. But genuine engagement in the 'co-production' of policy and services requires major shifts in the culture and operations

taking public views into account. It is exceptional for the public to witness strong, direct connections between the thrust of the consultation process and any actions that follow. That deepens public cynicism and distrust of the political process. It also significantly lessens the motivation to participate in future public consultations of a similar type.

48. In the policy-makers' back room, when the analysts reveal the breadth, unreality and contradictions that have emerged from the public consultations, there is often a sense that the public is crazy to expect so much. Well, were any limits or expectations laid out at the start of the exercise? How does a government leader seriously introduce a public consultation process with the warning that the public has to be reasonable? That would be viewed as an immediate clue that there are some hidden agendas at work.

49. Even more risky and fool-hardy is a public consultation that is really intended to be a campaign to win electoral support for a particular policy. Given that electoral politics are always about strong divisions, such a device will be quickly unmasked. It may be risky to tell the public the truth, but it's nothing like as risky as trying to deceive them.

50. The most dangerous approach to public consultation is to declare an "open agenda" approach when the situation doesn't justify such confidence, inviting candour, placing no limits, and assuring the public that the government is really listening. One thing is certain. A government will be given credit only for results, not for the process. No one seriously believes that a government will be given credit for asking for public input, and then ignoring what they are told. The political costs of failed public consultation are very high.

51. Even more dangerous are governments faithfully following popular opinion regardless of whether that course is objectively likely to address the identified needs or problems, likely to be feasible and succeed, take the best choices available, likely to produce lasting results, carry no risks or unintended consequences, or produce benefits that are worth the money and effort spent.

HOW PUBLIC CONSULTATION HAZARDS CAN COMPLICATE THE PRODUCTION OF A NATIONAL PLAN FOR MALTA'S WATER SECTOR

52. **The Underlying Natural Tendency to Discount.** People anywhere have an aversion to making significant changes in the face of risks and threats. As long as the risk or threat is not imminent, there is a strong tendency to believe those who claim the threat is exaggerated, or to remain passive and continue with everyday life. This behavioural response is not merely a function of lack of information. Since the Rio Summit of 1992, the scientific information on the perils of climate change driven by Global Warming have accumulated and been refined to the point where most scientists accept the predictions about the dangers the planet faces as highly probable. The latest IPPC Report indicates that the risks related to climate change are greater than predicted a decade ago and the

of government agencies. It demands of public servants new skills as enablers, negotiators and collaborators. It demands of citizens an orientation to the public good, a willingness to actively engage, and the capabilities needed to participate and deliberate well. These are tall orders, especially if citizens are disengaged and certain groups within the population are marginalised." (Holmes, 2011).

earth is already manifesting some of the impacts, originally predicted for decades ahead. Predicted impacts are also more severe than believed some years ago.

53. Despite the abundant and easily accessible information, public acceptance of Global Warming as a driver for climate change is still ambivalent. Meanwhile, the carbon dioxide and methane content of the atmosphere continues to increase. While some governments are moving towards modest steps to counter global warming, there is no overarching global strategy to counter Global Warming after almost 25 years of UN debate.

54. So why should the public response to Malta's water crisis be any different? Unlike the Global Warming climate change scenarios, there is limited high quality information regarding Malta's water situation, although there is enough to show that the situation is seriously amiss. However, the risk of a future crisis is not compelling for most people. So a public consultation starts with a general tendency to disbelieve or discount bad news, especially when the implications of remedies suggest major changes in life-style and/or increased expense.

55. **Quality of Information.** Although the overall contours of the water crisis in Malta are understood, especially the declining volumes and quality of aquifer water, there is a lack of precision about many of the dimensions of the problem, not only among the general public, but also within government, the political parties, and even among water experts. There are almost certainly huge margins of error in data that is available on different aspects of the water sector. Much of this data is inherited from varied sources with uneven reliability; much consists of estimates and guess-work, and there are many areas in which information is simply missing. A case in point is the absolute lack of virtual water consumption data required for commonly-grown crops in the climate and environment of the Maltese Islands.

56. The real economic value of Malta's water is not publicly known; the real costs of extraction and delivery (which include the environmental costs and social costs) have not been adequately calculated; there are no definitive studies to determine how close, in years, is the tipping point for the aquifer (the point at which sea water ingress, or nitrate concentrations cannot be reversed by affordable human action).

57. There are no definitive studies on the options and their various costs of capturing rain-water, much of which currently ends up in the sea; the real extent of subsidies associated with water usage by different sectors of the economy are not publicly known, and have probably not been calculated. Also, there is only the vaguest notion of what indigenous water adds to Malta's GDP.

58. There are two major drawbacks to holding public consultations burdened with this information deficit. Firstly, no one is able to tell the public enough of the truth to allow for considered public response. It is almost impossible to disguise the poor quality of known information, and this will naturally result in disbelief (if the presentations are made with unwarranted confidence) and confusion (if presentations are made with the tentativeness that is warranted).

59. The second major drawback is that even if a convincing case could be made during the consultation process, the lack of high quality information and analysis prevents

anything but the most generalised proposals. Such an approach will not identify the real options in enough detail to allow policy-makers to choose options based on measurable benefits. Neither will the choice be clear enough nor their comparative advantages and weaknesses, nor their costs.

60. Any government information officer, who, at this time, publicly states the cost of a major remedy to Malta's water crisis, is at best relying on estimates based on questionable data. The underlying analytical framework is not there to permit responsible calculations. The result is predictable. Even if there is a public consensus on measures proposed during a public consultation, based on the current dearth of analytical foundations, the measures, if implemented, are unlikely be cost effective.

61. **Vested Interests.** While public consultation will inevitably be presented as an opportunity to allow the people of Malta to have their say, it is certain that the process will be led by vested interest groups. There is nothing inherently wrong with such groups gathering to defend their interests. That is a natural and inherent characteristic of a democratic system. The problem arises when government, conducting such consultation, is unable because of the absence of an analytical framework, to assess the impact on the economy, the budget, and the people in general, of supporting or dismissing the case made by a vested interest group.

62. Because Malta is so highly politicised, a consultation process without clear analytical parameters, will almost certainly be driven by political considerations. The MWA has lobbied for a non-partisan approach to water, but this is very difficult to achieve. Political parties courting voting lobbies are a political fact of life. It is too much to expect either political party to approach such public consultation without an electoral agenda, and if in addition, there is inadequate data and analysis to assess the feasibility of demands made during the consultation, this amounts to a high degree of hazard for the planning process and investment decisions.

THE PURPOSE AND NATURE OF A NATIONAL WATER POLICY FRAMEWORK

63. The purpose of a policy framework for Malta's water sector is to provide the most objective, factually supported, and comprehensive basis for making policy decisions, plans and budget allocations. A policy framework based on the best available information aims to reduce political dispute based on guess-work and opinion, enabling a plan to be made for the long-term in Malta's national interests.

64. There are many variables and factors that need to be met in the creation of a national plan and investment programme that will use tax-payers money, EU grants, government resources, private contributions, and have a measurable long-term impact on the economy. Water is a resource that cuts across every sector, impacts on and is impacted by every sector.

65. A comprehensive policy framework will provide not only a reliable information base, it will define the exact nature of the problems to be solved; provide indicators and criteria which can be set as measurable goals; determine the range of options available, their costs (including opportunity costs) and their relative advantages and limitations; indicate

the preferred sequence for intervention; identify the risks of unintended consequences; and set up an impact evaluation to determine the benefits achieved and whether these provide value for money.

66. The policy framework needs to take account of what has been done in the past, to improve Malta's water supply, availability, and management; and what has resulted from such actions, and whether there has been systematic measurement of results? What vital lessons can be learned in terms of analytical rigour, political and social responses, and maximising benefits, technical solutions adopted, and costs? Most public investments have been made on a case by case basis, such as the National Flood Relief Project, a major and costly undertaking. Looking back, were the goals adequately stated; were measurable outcomes projected; how is the impact being evaluated; will the cost be justified in terms of economic and social benefits achieved? Finally, were there any short-comings in tackling the flood problem in isolation, rather than as part of a policy framework in which all the related options and opportunities could have been considered? Had this project been designed within such a framework, could it have more effectively combined both flood relief and rainwater capture, and helped alleviate stress on groundwater and reliance on desalination?

67. A movement towards a more systematic form of planning for the water sector was prepared during the last administration, and a planning document produced. This effort comprised a comprehensive list of initiatives that should be taken to improve the supply, management and usage of Malta's water resources. Although the document lacked the analytical framework necessary for a public investment programme, it should be treated as an input to the creation of a policy framework. Finally in terms of past experience, careful attention needs to be given to the successes and short-comings of project implementation, and whether there has been an effective use of external consulting expertise.

68. At a macro-level, a policy framework tells the government what water contributes to the national economy and its various sectors, to enterprise earnings, and to household requirements. Instead of water being treated as a "free good" it becomes an economic asset with clearly understood economic value, and legal regulation concerning ownership and usage. Above all, a policy framework aims to make government decision-making in the water sector more long-term, better integrated within the sector and with other sectors, more responsible in terms of expenditure of national resources, and more rational in terms of the choices and options that exist. It replaces guess-work, opinion, and political rivalry with an objective set of valid and reliable priorities, choices, and outcomes.

69. Those who prefer to see plans and government spending emerge from discussion rather than analysis will often claim that policy analysis is unnecessary and academic. Are not the imperatives and choices clear? Why does everything have to be measured? At a general level, the broad priorities **are** clear, but exactly how to respond to them is anything but clear.

70. For example, it is known, at a **general level**, that rainwater harvesting is a high priority goal. But without policy analysis, it is impossible to determine which method would the most affordable, and which would have the highest level of public compliance. Without quality data, how would it be possible to determine the advantages of selecting rainwater harvesting over some other intervention that would enhance water availability? How would it be possible to project the sustainability and maintenance costs of the selected

method, ensure the efficient utilisation of the water that it would provide, or assess the costs of public safety?.

71. In sum, how can Government justify spending tax payers' money or EU grant money without sound calculation of what such an intervention would add to Malta's economy, and without the means of evaluating the results? The reason measurement is essential is because a responsible government has to know, in advance, how much an initiative will cost and the benefits that will accrue. A responsible government also has to show the tax payers the improvements that have been made, in tangible terms, as a consequence of spending tax payers' money. Without such measurement, plans and projects risk becoming "a shot in the dark".

FROM ANALYSIS TO ACTION

72. The logic of pursuing a national water plan through analysis and a policy framework, needs to be viewed with the overall public investment cycle. This begins with Analysis (including a thorough review of past performance, and identification of priority needs). Some initial consultation is needed at this stage as well to ensure that needs and constraints are properly understood. Analysis produces the best possible accumulation of the essential facts related to the contribution of the water sector to the overall economy, to other sectors that utilise water, scope for remedies and improvements with their costs and projected achievements, choices that have to be made, constraints, imperatives such as environmental management goals, legal and regulatory frameworks, stakeholder and civil society priorities, and methods for calculating projected economic benefits and measuring impact.

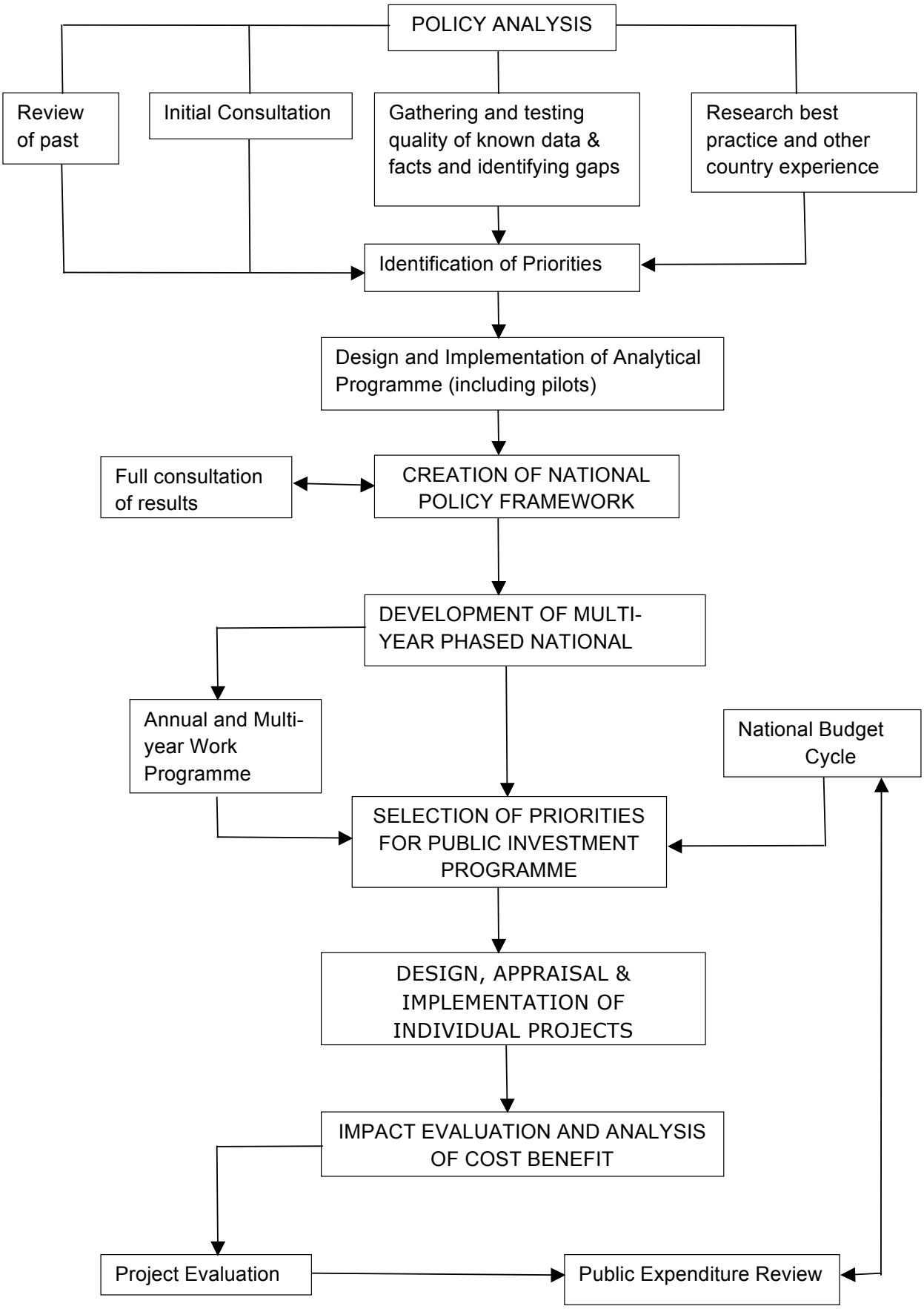
73. The full consultation process needs to be based upon the realities, possibilities, choices and costs provided by the Policy Framework. This consultation should lead to changes in the Policy Framework and the Creation of a National Water Plan. This in turn is converted into a Public Expenditure Programme (PEP), in which priority areas are selected for financing, from a mixture of financial sources: the Maltese national budget, EU and other grant contributions, loans and issued bonds, private sector investments, and user contributions through licences and user charges. Each item in the PEP is given allocated responsibility for implementation and accountability for results.

74. If the Policy Framework is thorough with all the necessary linkages, the task of creating individual Projects will be more efficient, as the linkages and contingencies will already be spelt out, as well as costs and measurable outcomes. However Project Analysis will still be required and the process of implementation will follow the well-known Project Cycle (World Bank, 2004), which will not be elaborated here. [2]

75. Finally, there should be a process of Evaluation at two levels: (a) based on the projected goals, costs and outcomes of each project; and (b) as part of a Public Expenditure Review which determines what the initiative has added to the economy overall and specific targeted sectors; and a judgement of the outcome of this particular expenditure.

[2] There are many Project Management manuals available. The manual cited in the references [World Bank, 2004. The LogFrame Handbook] is based on a rigorous approach to Policy Analysis and Planning.

76. The Chart below provides a summary presentation of the complete Policy Cycle, which is generic to all sectors:



Part 4
THE INESCAPABLE REALITIES INVOLVED IN DEVELOPING A NATIONAL WATER PLAN

77. Governments (not just in Malta) are inclined to announce the formation of long-term plans without regard to the fact that such plans are almost certainly not going to be implemented as stated. In the case of the Malta water sector, the only long-term "plan" that can be realistically produced at this stage will be of such a general nature, that significant analysis will have to be done at the stage of implementing individual projects. Because the remainder of the sector will largely not be analysed, it will be almost certain that such projects will become stand-alone initiatives, unconnected to the rest of the water sector and other key sectors. Such item-by-item implementation inevitably results in missed opportunities and non-rational outcomes. That is why the analysis has to be done prior to the plan being drawn up, and before major water projects (or non-water projects having a major impact on the water sector) are approved. The analysis provides the basis for the plan.

78. Because of the dearth of analysis and reliable information about Malta's water sector, (as well as the shortage of funds for public investment) the only realistic and responsible way of moving forward is to take a **phased approach**. That requires a continuing programme of analysis and research, and a rolling plan. Not everything can be done at once, and no Maltese administration has the certainty that a long-term plan will remain intact when political change occurs. Some key information can be gathered and analysed relatively quickly, for example the important aspects of market demand for water. Other information and analysis will take longer to emerge, such as the prospects for the aquifer and the scope for recharge.

CHALLENGE OF MAINTAINING ACCURATE DATA

79. There are many factors that are not only poorly understood at this point, but are subject to rapid change. For example, farmers are the major users of water, but contribute only a small part, 2%, to GDP (Fuchs, 2002). The economics of farming in Malta depends ultimately on the market competitiveness of domestic produce against imported produce. While it is known that Malta is dependent on agricultural imports, and has a negative balance of trade in agriculture[3], the details of the actual competitiveness of Maltese agricultural production have not been adequately analysed, and the market conditions in the European Union are changing quite rapidly with the admission of Maghreb countries to the market without the tariffs that have limited their competitiveness until now.

80. Contingencies and shocks also suddenly occur, such as mounting surpluses due to the Russian retaliatory sanction on EU produce, and the possibilities of extended periods of summer drought. For this reason, there needs to be a fully analysed and updated market analysis for domestic produce and imported agricultural products.

[3] Agriculture contributes 2.4 percent to total exports, and 8.1 percent to total imports.

81. Global warming driven climate change is a long term issue, which will affect water in a number of important ways. For example, the climate change projections for Malta foresee declining annual rainfall, but more intense precipitation events. This will impact on the ground water, and water available for agricultural use (as well as flooding incidence), in ways not fully understood. Extended droughts are also likely, which will place more pressure on ground water. Higher temperatures inevitably lead to an increased use of water. Given that the amount that can be drawn from over-exploited aquifers is limited, water from Reverse Osmosis plants will have to increase to cover the shortfall extraction.

WATER COSTS AND WATER TARIFFS

82. The policy analysis and the plan that emerges cannot ignore the huge paradox at the centre of Malta's water sector. While the utility supply of mixed RO and ground water currently meets potable drinking standards (although WRC recently announced some necessary purification requirements), the costs of production and distribution of such water do not take account of the carbon foot-print that results from its production. Either no effort has been made to base water tariffs on full economic costs, or no such analysis is publicly available.

83. So the tariffs inevitably include a subsidy that is both unknown and opaque. The utility piped water mix is heavily chlorinated to ensure its safety, and as a consequence, there is a perception that few people drink it. What starts as first class water, created at significant economic and environmental cost, ends up being used as second class water. This is a major economic irrationality. It may be that this is inescapable, but no known effort has been made to analyse whether there are strategies to resolve this paradox.

PHASED APPROACH AND PILOTS

84. Often the only way to gather reliable information on the viability and cost of an initiative is to launch pilots designed in such a way to be monitored and measured. Some of the key aspects of a future water plan, such as the harvesting of rainwater, or sewage effluent reuse, will depend on such pilot approaches, testing the most promising variations in widely differing situations, within the context of the broader policy framework analysis.

85. The goal of policy analysis is to provide a practical tool for a government that is responsible to its people for the careful and rational stewardship of the nation's resources. There will always be some element of risk, some factors that have not been accounted for, when a government launches major initiatives. The role of policy analysis is to limit such risks. And because all the analysis will not be available at the start, it is inevitable that planning for the water sector must be done on an incremental basis, dealing with urgent and do-able priorities at the start, and moving forward in a rational sequence.

86. There will be high priority areas that cannot be rapidly analysed because the data will take time and effort to accumulate. That is particularly the case in terms of the future of the aquifer. Nevertheless, we know enough already about the rapidly deteriorating condition of the aquifer to understand that alternatives must be urgently enacted to stop over-extraction and these alternatives must be properly analysed. There is also a need to study

and test alternative methods of water production, including what may be considered to be radical solutions such as the potable reuse of wastewater.

REALITIES LINKED TO RELIANCE ON REVERSE OSMOSIS

87. The future inevitably lies in low-carbon and carbon-free methods of water production. RO generation needs to be fully evaluated in terms of its real costs, impact on the environment, and its risks and externalities, the current experience of the Maldives shows that RO is not a guaranteed panacea (BBC News Asia, 2014).

88. Oil spillage is so common today that the prospects of oil spillage reduce the absolute certainty that RO can be relied upon. RO facilities are also highly vulnerable to sabotage. While solar-powered RO is still developing, its potential needs to be fully understood and factored into future plans for RO infrastructure (for example, solar-powered RO may well require decentralization of RO infrastructure). Being the most water stressed countries in Europe; Malta should be cognisant of technological advances in this field.

Part 5
THE CORE ISSUES A WATER POLICY FRAMEWORK MUST ANSWER

89. The core issues, (which as stated above will take time to answer adequately) include the condition, prospects, and remedies regarding Malta's ground-water and the state of and prospects for the aquifers. The status of Malta's aquifers is simple in some ways to understand, but involve a series of complex issues.

90. There are no reliable calculations of the proportions of water Malta obtains from various sources. There are only estimates and rational assumptions. It appears as if about 56 percent of its water comes from aquifers, and about 34 percent from Reverse Osmosis. The remainder comes from some combination of limited rainwater capture and waste-water recycling. There is also rainwater captured in the soil and utilised by farmers, horticulturists and gardeners.

THE CONDITION OF MALTA'S AQUIFERS

91. Malta's groundwater aquifers (Heaton *et al*, 2012) exist at two levels: 1) those located within porous limestone beneath the islands as fresh water lenses floating on sea water with a water table a little above sea level and 2) several minor aquifers perched on higher ground, mainly in the west of the island, in porous limestone overlying impermeable blue-clay.

92. The inland "perched aquifers" provide farmers in the north-west of Malta and in some

areas in Gozo, with water from shallow wells and springs and historically supplied the 17th century aqueduct to Valletta. The deeper Mean Sea-level Aquifers are the largest sources of Malta's groundwater, providing about 80% of this resource. The latter is tapped by the water utility (WSC) and thousands of private registered and an unknown number of unregistered boreholes.

93. The sea-level aquifers are degraded in two main ways. As the aquifer is over extracted, seawater intrudes, resulting in salinization. The other main known contaminant is nitrate (British Geological Survey, 2012), which infiltrates from the surface. The nitrate levels of Malta's groundwater are already higher than the specified EU limit; indeed, in some cases nitrate levels are four times higher than the acceptable limits. Nitrate pollution occurs through the leaching of nitrogenous substances into the aquifers, mainly from farming activities: fertilizers and live-stock manure run-off. There have been no known modelling studies to show the rate at which nitrate contamination of the aquifers is changing and will change in future.

94. There are only rough estimates of when, with current extraction rates, groundwater will become unusable for the public water supply without expensive polishing. Nor is it known at which point the nitrate contamination will be irreversible at affordable cost, within the scope of existing technology. These trends involve many factors, resulting in a gradual process leading to an inescapable outcome.

95. This process of deterioration needs to be better measured, monitored and understood. Analysis is needed to determine how fast the contamination is changing; what levels of continued abstraction are feasible, for how long and under what conditions and costs; and how recharging the aquifer is best attempted (for example, will human intervention make a significant difference compared to natural rainfall recharge, and at what cost?). How soon will it be that a bore-hole sunk today will not yield enough usable water to warrant its investment?

96. Clearly, the deteriorating condition of the aquifers creates the highest priority for the development and maximisation of alternative water sources. The development of a sound long term strategy depends on a full understanding of the costs involved. If Malta acts in time, it will still be possible to protect and improve the condition of the aquifer in parallel with developing alternative water sources.

97. To be feasible, such a dual track strategy requires considerable analysis of the options, and the impact of shifting from dependence on the aquifer to reliance on alternative water sources. This impact will be felt both by the economy in general, and all users of water (households, agriculture, tourism, industry). Each in turn has its own economic realities (such as the market for locally-produced agricultural produce). Merely understanding the issues involved here is a poor substitute to fully analysed studies.

98. Such thorough analysis does not exist in Malta at present, or at least is not visible in the public domain. Nor has a comprehensive theoretical model been created to guide such an analysis. Notwithstanding that it makes intuitive sense to increase rain-water capture, this needs to be guided by analysis of costs, benefits and options. There are not only economic, financial, engineering and environmental factors involved, but also health and social factors. The solutions have to make economic sense and be satisfactory to

the people of Malta, and the inevitable trade-offs and contingencies have to be fully understood so that they can be managed. This cannot be achieved through discussion and debate alone.

Part 6
THE NEED FOR AGRICULTURE SECTOR ANALYSIS

99. Because agriculture is the main user of water in Malta, it will be impossible to produce a sound water plan for Malta without being able to answer some key questions about the agricultural sector and its role in the economy. Government has a responsibility, to all, to ensure that a scarce national resource, such as water, is both efficiently and effectively used.

100. Thus, it is impossible for Government to plan the future management of water, without a full analysis of all the major uses of water, but particularly the agricultural sector. Water is a collectively owned resource, and therefore the economics of major users must be analysed and understood. In a general way, comments that follow on agriculture will also apply to other sectors.

101. The future of agriculture in Malta is a sensitive challenge for any government to manage, precisely because there is such a dearth of information and analysis on the sector, and such powerful vested interests. When a topic, such as the role of the agricultural sector in Malta is publicly discussed, the absence of analysis and reliable facts almost inevitably results in sharp polarisation and exaggerated opinion. Either the sector is fine and must be supported in any way requested, or the sector is doomed. A proper analysis will show that neither extreme is legitimate, and will identify what should be done in a reliable and detailed fashion.

THE FAO REPORT ON MALTA'S AGRICULTURE AND WATER

102. The only reasonably thorough analysis of Malta's agricultural sector was released in 2006 by the United Nations Food and Agriculture Organization (FAO) under the Title: "Economic Analysis of Water Resources in the Agricultural Sector". Last year, public consultation took place on a foreign consultant's preparation of a document entitled "Draft Analytical Report for Discussion: Towards the Development of Malta's Agricultural Policy", but nothing definitive has emerged from this. Within the context of the May 2012 National Strategy for Climate Change and Adaptation, the Government agreed to "conduct a comprehensive study leading to the design of a National Agricultural Policy" (Climate Change Committee for Adaption, Malta, 2010).

103. The earlier FAO report suffered by relying completely on dated information of uncertain validity, although the arguments in the paper were well advocated, and included many of the important issues that would need to be included in a proper policy analysis, aside from the significant omission of a market and demand analysis. However, because of the

lack of empirical data and an inevitably sketchy treatment of each of the key factors, the paper cannot substitute for a policy analysis on which a national plan and government expenditure can be based.

104. Notwithstanding, the study provides a valuable starting point. It came up with a series of options for the future which, given the date and limitations of the study, should not be regarded as definitive today; but they are examples of the types of decisions that will emerge if a proper analysis were done today. In summary, the FAO report (Sapiano *et al*, 2006) offered the four following broad policy "scenarios":

(a) **Scenario One** was based on the assumption that the provision of water to agriculture would increase at a faster rate than domestic supply, and reach 21 million cubic metres/annum by 2010. Use of groundwater would be limited by an unspecified recharge amount which would maintain the aquifer at its current levels. The shortfall would be met by increased RO production. The strategy would lead to increased costs of supplies but no projections were provided. A licensing system would be introduced to manage water supply to agriculture, using what FAO refers to as "macro-economic instruments", also not elaborated.

(b) **Scenario Two** assumes no additional regulation of groundwater, and no quotas for abstraction. So agricultural use of groundwater would continue to increase; the Water Services Commission (WSC) would simply reduce its use of aquifer water, replacing the shortfall with RO water. As the quality of groundwater would continue to deteriorate, there will be an increasing cost of treating aquifer water to render it useable. There would be monitoring to ensure the "sustainability" of the aquifers, but the term "sustainable" is never defined or given any econometric dimension. Somehow, the report assumes that extraction limited to 23 million cubic metres/year would provide "sustainability. The factors and data involved in imposing this limit and defining sustainability were not published. In any event, shortfalls resulting from this limit would be met by rainwater harvesting and treatment of sewage effluent, both of which require significant investments. The scenario ends with the conclusion that the cost of water to the agriculture sector will inevitably increase to cover the costs of water treatment.

(c) **Scenario Three** is based on maximum "sustainable" (again not analysed) extraction of groundwater for agriculture, with household and commercial needs met by significant improvements in the efficiency of water supply and use (i.e. cuts in wastage) plus household and "local" recycling of waste water. Incentives are to be provided by unstated "fiscal measures", and an increase of public appreciation of environmental conservation needs. As in the previous scenarios, there would be increased use of RO water and rainwater capture/sewage recycling.

(d) **Scenario Four** divides the use of aquifer water between WSC and farmers, leaving farmers to make up the shortfall through rainwater harvesting and treated waste water.

105. These have been included here not because they are recommended, but to illustrate how even a disciplined review can fall short of a policy framework when more data and analyses are required. It is noticeable that the four scenarios have all the appearance of

"logical brainstorming"; the ingredients in each are mixed purely on the basis of logical alternatives, not drawn from a full analysis of economic costs and benefits, implementation requirements, social reactions, or criteria for determining successful outcomes.

106. Admittedly, the report does state that such considerations would be necessary, but that does little more than underline the impression that the proposed scenarios are not adequately grounded. Distinct combinations of measures were proposed, when they need to be included in a single strategy. The benefit of a rigorous and thorough policy framework is that government would not be faced with just the choices FAO offers.

KEY ASPECTS OF AGRICULTURAL POLICY ANALYSIS

107. A policy framework for the agriculture sector needs to provide Government with accurate projections of what it is reasonable to spend in support of the sector in terms of investments and subsidies. Current estimates are that agriculture contributes very modest (2 percent) returns to GDP. Decisions on funding should be based not simply on macro-economic returns, but also on incomes, contingent value to tourism, comparative employment and income studies, market competitiveness, demand analyses, opportunity costs, and a host of other factors.

108. As long as these are based on reliable analysis, are transparent, and logically presented publicly, decisions to continue to subsidise agriculture can be perfectly reasonable and responsible. What is unacceptable is to make such decisions with no policy framework, a lack of reliable cost projections, and justifications based only on consultation and electoral considerations. Right now, given the absence of a policy framework, such a decision would almost certainly be non-rational and opaque, with the real nature of the subsidies uncalculated and unpublished.

109. Economically viable policy on future water supply to agriculture will have to safeguard the aquifers or ensure alternative sources of supply (or a combination of each). This is bound to lead to changes in the way the sector operates. To understand what changes are needed requires answers to questions such as:

- How competitive is Maltese agriculture in terms of large EU surpluses and competing market imports? This is largely unknown, and not adequately studied. As this is a dynamic issue (markets constantly change) there is a need for a constant up-do-date information base that includes all the necessary variables. It is not even possible, with much reliability, to differentiate the origin of much of the produce sold in Malta, so regulatory requirements need to be sharpened

- How do agricultural incomes compare to the changing nature of incomes from alternative employment? It is known that many farmers supplement their incomes through other employment, but no reliable information base exists on the proportion of the supplement, or its sustainability.

- What are the real profit margins for different agricultural crops and livestock varieties, taking proper account of subsidies, and wastage (whose levels are unknown), and various forms of marketing costs?

- Are farmers earning a fair share of the income from sales, given that most rely on marketing cooperatives and associations? Are these adequately regulated?

- Based upon an accurate appreciation of actual incomes (and comparators within the employment sector) what would be the affordability and therefore demand elasticity for different sources of water supply aside from the aquifer?

- What can be done, within the current input-output ratios to increase the efficiency of water usage among farmers?

- Given (changing) market conditions, costs of production, and real profits, which subsectors appear to best balance the limits of water usage and income?

- How does government create an incentive structure to encourage farmers to adopt optimal water use practices, without relying on compliance with regulation which often proves very difficult, costly, or unfair to enforce?

- How does the government make a case (based on empirically-derived decisions) for an agricultural water-use policy, taking account of the opportunity costs, social equity requirements, and externalities?

- How should the government introduce virtual water and water footprint science and principles into the future planning of agriculture, horticulture, live-stock farming, and planting on public land?

- And what EU constraints and obligations limit or define the options for reform?

110. None of the above can be answered without analysis based on empirical data, offering an objective basis for comparison of options and full economic costs and returns. Although agriculture is by far the most water-dependent sector, similar types of analysis are required to determine the needs, efficiency of usage, and wastage levels for all the other major sectors: households, industry, services, public parks/gardens and road verges and roundabouts, hotels and restaurants, and the like.

Part 7
CONSIDERING THE OPTIONS WITHIN A POLICY FRAMEWORK

111. If a policy analysis reinforces the natural assumption that saving Malta's groundwater, for generations to come, is prudent (or even if it is not), the alternative sources of water have to be developed. Rain provides Malta's with soil water, direct harvesting and aquifer recharge. Recycled wastewater provides options, but the scope and cost have not been sufficiently studied.

112. Reverse Osmosis will remain the quick and easy option as the capital investments have been largely made, but the system needs perfectly clean seawater, and relies on a reliable source of electricity, currently fossil-fuel generated. At some time in the near future there will need to be a transition to green electricity.

113. However, a policy framework cannot focus purely on the future practical options for water supply, but need to address the current context. The system of distribution of piped water contains many problems, some remaining leaks, inefficiencies in the way water is distributed, a tariff system that does not encourage care in water use, end even some degree of consumer cheating. In combination, factors like these have the effect of increasing the water subsidies that are not made public, or probably not known.

114. Public ignorance and complacency about the real condition of Malta's water pose a significant challenge to the prospects of a sound national water policy and plan. Malta needs a water-educated population culturally committed to more rational and efficient consumption and water conservation.

115. In terms of practical ways forward, there are some obvious options that need full analysis. For example, what are the economic costs and benefits (compared to other options) of expanding the collection of rain in reservoirs, cisterns, and soak-aways? How much can be gained through properly applied low-cost water efficiency devices to reduce consumption and pay back the initial investment? It is not sufficient to simply conclude that these make common-sense, and start spending money.

116. Although there is proven technology for greywater and waste water recycling, there is little immediate incentive, and the bold and praise-worthy experiments performed by a handful of hotels, a few households, and some industrial ventures remain outliers. The public and farmers will remain deeply suspicious of using recycled waste-water, unless there are no alternatives. There are many leaks, inefficiencies, and even cheating which interrupts the intended distribution of water and reduce revenues, making subsidies of water tariffs even higher.

117. While incentives are preferable to regulation, some level of regulation is unavoidable. But care must be given to the likelihood of compliance and the feasibility of enforcement.

118. It is likely that all of the options need to be maximised to have an impact. However, even maximising all the options has limits. With a fully used budget, and constraints on the use of EU resources, government should not charge ahead and translate each of these options into capital projects and regulations. Although it is likely that all the feasible options should be pursued, they are not equal in terms of what they will yield. Neither is it the case that the most expensive options will yield the greatest return.

KEY REQUIREMENTS OF LAYING OUT POLICY GOALS

119. Government needs to know (i) what can be achieved, in measurable terms; (ii) what alternative methods for achieving desired results exist, and how they compare in terms of cost benefit, and economic rates of return; (iii) how the hard inputs (such as engineering) combine with soft inputs (such as regulation and incentives); (iv) on what basis the urgency of needs and solutions should be prioritised, and once that is done, what is the logical sequence for implementation; (v) what social impact will there be and what consultation is necessary; (vi) how do all the solutions fit together, across the water sector, and with other key sectors, in a symbiotic fashion; (vii) how will progress and success be measured; and (viii) will it be possible to show that the outcome will be significantly better than doing nothing new at all (and do we know with adequate certainty what the water situation will be like in ten, twenty, or fifty years from now, better than we know about the current status ?)

120. **Instruments of Analysis**: None of these questions can be adequately answered based on the current state of knowledge and information. Educated guesses can be made using estimates, but their uncertainties are so large that Government would not be advised to move forward on that basis. It is important to emphasise that not only does policy analysis provide the answers to key questions, it provides the foundation for government proposals on public expenditure providing the criteria and indicators for a public and transparent, rigorous evaluation of the economic, social, and environmental impact of such public investment programmes.

121. The policy framework approach also expects that government will be operating with an integrated approach across all sectors. Important policy decisions (such as those for the water sector), and large public investments, invariably impact and are impacted upon by other sectors. At present, there is not a dedicated ministerial portfolio for water, which is unusual in the EU, and not encouraging for a national water plan. It is also clear that there is insufficient capacity within Government to manage a policy-based approach to water management

122. Policy analysis and a policy framework are not a snap-shot at a particular moment in time. The situation will always be changing; sometimes significantly (such as the removal of tariff barriers for agricultural produce imported into the EU from countries with EU associate agreements); sometimes more slowly, irregularly, but insistently (such as climate change). Social changes, such as the emergence or disappearance of employment alternatives for farmers, can have major impacts on incentives and the perception of urgency. For many other reasons, the analysis required to develop a policy framework, must be done in such a fashion that it is permanently maintained, updated, and fed by targeted research on key factors and options.

123. Government initiatives and pilots should be designed to enable detailed measurement of results, to avoid future costly projects that fail to achieve good value for money spent. Policy analysts also need to keep up-to-date with progress in similarly water-stressed countries. There must be a freely accessible, up-to-date, verified, integrated data-base available to policy-makers, all water-users, and analysts. Today, much of the data is buried in ministries or government agencies, and almost impossible to extract. Because it is clear that the Government does not have the resources and capacity to do what has been described above, the future management of policy analysis will be addressed below.

THE REGULATORY FRAMEWORK

124. All effective policy frameworks must recognise that while the government is the executive, the efforts have to be communal. It is impossible to successfully impose a policy framework and the subsequent plan and implementation, onto a population and business sector. Comment has already been made on how difficult it is in Malta to achieve compliance and while some regulation will be needed, the use of regulation should be parsimonious because of the complex and costly nature of enforcement. The use of incentives, participation, and cooperation, is less costly and usually more successful than relying on regulation alone. Notwithstanding, some essential improvements are needed in the regulatory framework, which is at present ambiguous, outdated, and too easy to ignore. It is, for example, quite unclear where the provisions stand for household and commercial rainfall capture, or under what circumstances borehole should be considered to be 'illegal'.

125. It is unlikely that adequate improvements to the policy framework can be made through patching individual laws and regulations. A new policy framework for Malta's water requires a new regulatory framework specifically designed to serve its purpose. Some existing water-related laws and regulations will be appropriate to keep on the statute book. However, the entire legal and regulatory framework needs to be inclusively analysed. There are both known and unknown gaps, contradictions, and ambiguities.

126. Another vital issue is the need for clear legal definition of the ownership of water and right of access. As elaborated below, Maltese law does not consider water a "free good", but there is a need to clarify exactly what water ownership means in terms of the different sources of water. Along with this, responsibility and accountability for water management and safety needs to be clarified. There are instances in which aspects of responsibility appear ambiguous, or confusingly divided among different agencies. A very clear example of ambiguity in responsibility and enforcement relates to the construction of rainwater cisterns in new buildings, resulting in a situation where proper enforcement is effectively non-existent.

127. Just as is the case for the policy framework itself, the regulatory framework needs to be tested in terms of public response, the clarity of the standards they set, and the feasibility of the type of behaviour expected. Such a review of the regulatory framework for water will require up-front, an unambiguous definition of the legal status of water in Malta as an essential economic asset. Much of the confusion in the past in terms of managing Malta's water stems from the inadequacy of that definition, of which, more below.

MACRO-ANALYSIS

128. This level of analysis is no less important than those in the foregoing, but because the macro-economic framework of Malta is not currently adequately analysed, this will take longer to implement.

129. At the heart is an accurate, empirically-based understanding of what water adds to the economy: the overall gross domestic product; earnings and taxes on earnings; the price structure of commodities that utilise water; the water that Malta imports in the form of "Virtual Water" (commodities which incorporate water costs as an integral part of their production, currently 10 times the water consumed domestically (Cremona, 2009). Any sound long-term National Water plan has to be based on determining the "Value of Water" to Malta's economy, its industries and commerce, and households, currently not defined in the Maltese context.

130. There are many different approaches to calculating the value of water. A common approach used in some countries is to calculate the replacement cost: if there were no domestic supply, what would it cost Malta to import all of its water needs? Because stress on Malta's water is likely to increase, replacement cost is not static but will change according to supply and demand. Also, the value of water will be influenced by different contexts and scenarios. Each value will have its own relevance and utility.

131. Perhaps part of the reason why the economic value of water has not been determined is the wide-spread belief that naturally occurring water is a "free good", a gift of God. In fact, since 1943, Government has indicated otherwise, introducing the right to licence and control access to water. Its status is no different to "underground minerals and antiquities" (Malta Water Association, 2012). Neither is water to be treated as simply a freely acquired asset from which to make a profit. The EU Water Framework Directive, by which Malta is bound, states "Water is not a commercial product like any other, but rather a heritage which must be protected, defended and treated as such" (Commission Staff Working Document, 2012). Calculating the value of water to the Maltese economy is required by the fact that Government invests tax payers' money in water-intensive sectors which bring the greatest value in the form of earnings, revenues, and future opportunities. Government also invests in efforts that avert shocks and respond to disasters. Such investments must be justified not simply because they make sense, but because of their particular contribution to the Maltese economy.

132. **Water Security**: Water security is immensely important for Malta, despite the fact that almost nothing is invested in water security and the issue is hardly ever discussed. Malta's water is subject to manifold risks. Besides the salinization/nitrification/pollution issues already referred to, there are environmental hazards (such as a major oil spill which would, until neutralised, disable reverse osmosis), geo-political realities (sabotage or acts of terrorism), and public health risks (including water pollution, and the lack of effective measures to control the increasing risk of vector disease due to unguarded water sources).

133. Ultimately, the issue that most requires a proper macro-analysis of water and its value, is that of water tariffs. There are many problems with existing water tariffs. They contain a number of uncalculated and hidden subsidies. Their justification based on an economic value of water has not been publicly demonstrated. The differentiation between household and commercial tariffs is unrelated to the extent to which water contributes to commercial profit. Additionally, the division of the household tariff between a water charge and a consumption charge does not appear rational, especially as government says it is committed to reduce water usage.

134. There are a number of considerations to rethinking and re-calculating water tariffs. Firstly, when the value of water is calculated in terms of its contribution to income, and social value is more systematically determined, these should be reflected in water tariffs. Secondly, tariffs need to reflect all economic costs, which will include the environmental costs of using fossil fuel electricity to produce RO water and distribute the WSC RO/ groundwater mix, as well the environmental cost of groundwater pumped from over-exploited aquifers by the public utility and private boreholes.

135. Throughout the developed world and in many developing countries, tariffs are set to send signals, to ensure that water, a scarce strategic asset, is used for the most beneficial purposes. Such tariffs reflect a basic right to water, protect low income users, advantage low consumers, and penalise profligacy. At present, no differentiation is made based on how water is used. This may not matter in a country where water is abundant, but water-stressed countries are compelled to pay attention to the uses to which scarce water is put. This is already recognised, in part by the annual swimming pool charge. By and large, water tariffs need to be set at a level to discourage wastage and uneconomic use. The proper stewardship of water argues for higher tariffs for profligate use, whereas electoral advantage argues for lower, undifferentiated tariffs.

136. Discussion of water tariffs invariably raises the subject of subsidy. There is no inherent reason why any responsible government should not allow subsidies to exist. The argument has always been against the careless, hidden, and cavalier use of subsidies, or subsidies as a lazy alternative to effective economic management. The general rubric is that subsidies should (i) be properly calculated; (ii) completely transparent and in the public domain, (as should all other aspects of public expenditure); (iii) not be used to prevent reasonable cost recovery; (iv) be rational and avoid creating economic or market distortions; and (v) be publicly justified in terms of their importance, and defended in terms of their opportunity costs (the other initiatives which subsidies prevent being funded).

137. At present, Malta's water tariffs do not meet most of the requirements in the above rubric, and the basis and justification for subsidies has never been laid out. All we do know, from an EU study, is that Maltese consumers pay (Water Services Corporation, Not dated) EUR 1.39 for the first 33 m^3 of consumed water that has a production cost of EUR 0.40 (Campling *et al*, 2008). These production costs almost certainly do not include all the costs, including the environmental cost of electricity generation, and the cost of resource depletion.

138. A missing ingredient in the current analysis of Malta's water is an absence of any reliable market analysis. Levels of demand are extrapolated from levels of water supply, despite the fact that even government sources have admitted (albeit not consistently) that up to a third of state-provided water is wasted through leaks, theft, and various malfunctions, and subject as well to inaccurate water readings. So, statements about water demand and what people are really willing to pay for water, is based largely on anecdote, invalid inference, and political imperatives.

139. In the future, water will be produced from a variety of sources, and, as now, for a miscellany of users. If tariffs are to be rational, they need to reflect the different costs of water generated by different means. That is why a full market survey of households and all commercial water users is imperative. Such a survey will seek to discover the value households and the commercial sector place on water from different sources, the use of water for different purposes, and the willingness and ability to pay (the demand elasticity that exists in the market).

140. The goal is eventually to rationally link, through tariffs on different means of supply, the value of water to usage. Such a comprehensive market survey will also help determine where the capacity to pay varies by income and social class. The most justified use of subsidies is to target those who fall below the norm. Advocates of social justice argue that, in a water-stressed environment, the rich should not be given the same benefit of water subsidies as the poor. Water tariffs should be set at the rate most can afford, and subsidies applied to poorer households.

THE CONCEPT OF SUSTAINABILITY

141. Papers and presentations regarding Malta's water invariably include mention of "sustainability". Usually, this mention is in the context of the options for extracting groundwater "within the limits of sustainability". As a theoretical concept, this is obviously crucial. It provides a caution that extraction is contingent on maintaining the aquifers in some kind of balance, and therefore it calls for the acceptance of environmental realities with key political implications. The problem arises when the term "sustainability" is used in a purely conceptual and non-operational form, with no values or dimensions. Such a use of the term may have some cautionary value but little practical significance.

142. Efforts have been made to provide some sense of what "sustainability" may mean through the use of a commonly repeated formula, that extraction of groundwater should not exceed 23 million cubic metres a year. It appears as if the FAO Report, detailed earlier, may be the source of this standard. This does have the merit of being a theoretically measurable target, but it is not the outcome of rigorous measurement. At best it is an estimate, with a likely wide range of uncertainty.

143. There is no doubt that as long as a future water plan aims to preserve the aquifers (rather than abandon them in favour of other sources of water), sustainability lies at the very heart of the policy. It is crucial that "sustainability" is properly defined, calculated, regularly measured using a valid and reliable methodology, reviewed over time, and the results made public along with their policy implications.

144. As the condition of the aquifer is regarded as deficient, it makes no sense for the concept of sustainability to simply freeze the current status of the aquifers in terms of volume and salinity levels, and deriving "sustainable" extraction rates from that unsuitable base-line. Sustainability almost certainly involves not just a definition of extraction rates, but the replenishment needed to bring the aquifer back to what are regarded and factually represented as acceptable standards (both volumes and purity).

145. Therefore the path to making sustainability operational involves determining what is needed at the outset in terms of the improvement of the aquifers. This will provide a modelling insight into what exactly is occurring in the aquifers, and how the condition of the aquifers (over time and changing circumstances) will be affected by natural and human recharge, the restriction of extraction, and other factors such as projected climate change, and possibilities resulting from technological innovation. Only then will it be possible to operationalise the vital concept of "sustainability".

146. Such work will, of course, have massive policy and political implications, because the results will impact both private borehole and public utility ground water extraction. The results and their implications need to be made available and debated in public, because there will be a range of options for government action and public expenditure in the water sector. In principle, there will be many options which follow from a clear statement of what has to be done to bring the aquifers back to acceptable standards, and requirements to maintain this status once achieved.

147. Each option will need to be accompanied by clear projected implications in terms of costs, other opportunities sacrificed to bear such costs (now and in the future), and the impact on user behaviour. Just as important will be the explanations of how the monitoring will be done and reported. Finally, such presentations will have to underline the realities: that while regulation and frequent updates will be important, they have to rely on a reasonable expectation of compliance.

WATER POLICY AND ITS RELATION TO ENVIRONMENTAL POLICY

148. Throughout much of this report, the focus has been on water as an economic resource, one that helps generate income for individuals, groups, sectors, and the economy as a whole. However, water is a lot more than that. Water sustains the living biosphere in which the people of Malta live. That is a perspective that is of interest not only to conservationists, but also to the tourism sector that benefits from environmental stewardship.

149. The Policy Framework for water has to include a detailed analysis of the way water sustains the physical environment. It also needs to analyse how that contribution is challenged by unmanaged changes in surface waters, soil waters, and ground waters particularly the perched aquifers (whose springs sustain aquatic life during the dry summer months). Additional analysis is needed on how the generation of water through electricity generated RO is a burden to the environment; and how the way much waste water is discarded adds stress to the natural environment. Discharges from animal husbandry are particularly problematic in Malta. It may be hard to place an economic value on the role water plays in sustaining, and if poorly managed, harms the environment, although it is an important factor in the tourism receipts upon which the island depends.

150. The complication for the policy analyst is that water as an environmental factor cannot be isolated from other policies aimed at preserving the environment. It would be pointless, for example, to adopt a strong position on protecting the environmental benefits of naturally occurring water, and neglect control over building development on green land, or the impact hunting makes on the bird population, both domestic and migratory. Just as a water policy needs to be comprehensive, so an environmental policy has to be comprehensive too.

151. Notwithstanding, it is possible to highlight some areas of in-depth study and analysis that need to be included in a Water Policy Framework from an environmental perspective:

(a) How, in detail, does naturally occurring water sustain biodiversity in Malta, especially in the valleys, and protected areas?

(b) What are the most important challenges and problems related to that vital conservation role water plays?

(c) What actions need to be taken to deal with those challenges and problems?

(d) How can overall water policy not only protect but enhance the conservation contribution of water, and how does the management of natural water need to be integrated into overall environmental management and water policies?

(e) What plan can be developed to ensure that RO water production, and water pumping, becomes progressively carbon-friendly, tied to future goals to harness solar energy in Malta.

Part 8
MALTA'S RESPONSIBILITIES AS A MEMBER OF THE EUROPEAN UNION

152. In addition to the requirements derived from a rigorous analysis and the resulting policy framework, Malta also has obligations through its membership of the European Union. These are defined in the "Directive 2000/60/ec of the European Parliament and of the Council of 23 October 2000 Establishing a Framework for Community Action in the Field of Water Policy", which has been amended a number of times. Known more commonly as the EU Water Framework Directive, it spells out the obligations and targets (The European Parliament and the Council of the European Union, 2000) to be reached by all EU members in terms of "the need for action to avoid long-term deterioration of freshwater quality and quantity" in their respective countries.

153. The Water Framework Directive spells out many of the features needed in a policy framework for Malta, but not all of them as the Framework lacks the macro-economic perspectives that are needed to guide policy and public expenditure decisions in Malta

(or any other member state). However, there is nothing in the requirements of the Water Framework Directive that contradicts or opposes the requirements of a Maltese water policy framework.

154. The Directive establishes a useful set of obligations which the government must satisfy. The limitations are that the Directive (a) contains very little in the way of methodology (Commission Staff Working Document, 2012a)[4]; (b) relies largely on a summarised reporting system which assumes rigorous standards and measurements, which do not yet exist, at the required level in Malta; and (c) involves no serious independent technical appraisal of the responses received from Malta. The regulatory quality of the reporting system on Malta's compliance with the Directive can be derived from the March 2011 EU report (Commission Staff Working Document, 2012b).

155. In Summary, the Water Framework Directive covers the following factors on which Malta is expected to report to the Commission:

- *The integrated planning process at the scale of river basins, from characterisation to the definition of measures to reach the environmental objectives.*
- *A comprehensive assessment of pressures, impacts and status of the aquatic environment, including from the ecological perspective.*
- *The economic analysis of the measures proposed/taken and the use of economic instruments.*
- *The integrated water resources management principle encompassing targeting environmental objectives with water management and related policies objectives.*
- *Public participation and active involvement in water management.*

MALTA'S COMPLIANCE STATUS WITH EU WATER FRAMEWORK AGREEMENT

156. Malta's current status in terms of its compliance with the Water Framework Directive is classified as "Bad Application". This is based on the reporting Malta has or has not done to the Commission, and not on any independent on-location assessment. The fault is in

[4] The accompanying document to the Directive is meant as a guide to individual countries in their surveillance and reporting to the Commission on their adherence to the RBMP (river-basin management plan [Malta is quaintly defined as "a single river basin"]). The key tool is called Programme of Measures (PoM), which are little more than judgements to be reached on stated generalised categories. The document, while stating that many member countries lack the methodological sophistication to properly conduct its tasks under the Directive, provides no methodological guidelines. As to be expected from a bureaucratic process covering an immense range of differences among member countries, the Guideline is largely administrative and procedural. The Commission has set up what is described as "a Common Implementation Strategy (CIS), led by Water Directors of Member States and the Commission with participation from all relevant stakeholders". The CIS has supplemented the Framework Directive Guidance Document with "more than 30 guidance documents and policy papers", all of which fall short of methodologies for implementation. However, there are many papers and case studies providing methodological guidance available from organisations like the World Bank and the large number of Water Policy Analysis Institutes in various European Countries.

the reporting (albeit that there may or may not be many deeper faults). An early fault was described "not having established a network for monitoring of inland waters". [5]

157. The recent report (Commission Staff Working Document, 2012b) on Malta's compliance with the Water Framework Directive, included the following observations:

A range of weaknesses exist, however. The weakness of monitoring and the status assessment and the justification for the exemptions are particularly worrying.

- *Inland surface waters were excluded from the RBMP; no inland surface waters were designated.*
- *Private groundwater abstractions as a major pressure on GW bodies and GW tables are not monitored adequately.*
- *"Technical feasibility" is used as a reason to apply exemptions; however, the definition of technical feasibility is insufficient.*
- *The problem of water scarcity or over-abstraction is not considered a concern in the RBMP, although 4 groundwater bodies (26%) are in poor quantitative status and water abstraction for agriculture is deemed to be a significant pressure in 5 groundwater bodies.*

158. While there may be justifiable substantive grounds for such feedback, it provides little more than a commentary on compliance with a somewhat superficial reporting procedure. It remains to be seen how a future improvement in Malta's "compliance" relates to actual improvements on the ground.

159. The weakness of the analytical and information base on Malta's water sector is made clear by many references in the body of the report. Examples include: absence of "concrete thresholds or criteria"; reliance largely or only on "expert judgement"; "there was no information found on confidence, precision or uncertainty of the results"; "How the parameters selected respond to different pressures is unclear. No explanation is provided on how the groundwater chemical monitoring programmes are designed to detect trends. Private groundwater abstraction as a major pressure on groundwater bodies is not monitored adequately"; "The only criterion considered for determining groundwater quantitative status is that the available resource is not exceeded by the long-term abstraction"; "the programme of measures in Malta seems not to be based on the assessment of status, which is largely missing or weak…..There is no assessment of cost- effectiveness of measures".

160. The report reveals that based on government assessment, "two groundwater bodies (GWBs) were assessed as being of good status in 2009. One more GWB is expected to reach good status by 2015, but 12 of them (80%) will still be in poor status". The tables that accompany this summary offer statistics, such as the following:

Groundwater quantitative status: Good or better by 2009: Number of GWBs = 11 = 73.3%.

[5] The Commission vs. Malta (Case C-351/09, ruling of 22.12.2010)

161. There is no way to evaluate what this really means, nor the reliability of the judgment, nor any indication as to how such improvements will be secured or even measured. This clearly falls well short of the type of assessment monitoring that will be required in a rigorous national policy framework.

162. In terms of the pressures Malta will face in complying with the Water Framework Directive, the report on Malta's performance does contain some important observations and declarations. When it comes to the measures Malta plans to take to remedy the condition (volume and contamination) of groundwater, the report states:

According to the plan the cost of measures will be mostly borne by the public national budget. It is stated that the participation of industrial and tourism sectors is very low, measures are projected to cost about 0.009% and 0.05% of the gross value added of the industrial and tourist sectors respectively. This is in strong contradiction with the statements that are used to extend the deadline for the achievement of objectives. The agriculture sector is not even mentioned as contributor for sharing the costs of measures. The reason behind this approach is unclear. Most of the supplementary measures are voluntary and there is no justification or explanation on why the Maltese authorities believe the measures will be taken up by the different sectors and be effective in reaching the objectives.

163. Emphasis in the report points to the insistence given by the Water Framework Directive, on **cost-recovery**, and this is going to be the chief pressure Malta will be facing from the Commission in future, heavy with political implications:

It is not clear how an adequate contribution by the different water users to the recovery of the costs of water services is ensured. Contribution to cost recovery is calculated for water distribution (80%), but it is not disaggregated into different water users separately, at least for households, industry and agriculture. Incentive pricing is in place including metering and volumetric pricing. It is not clear whether incentive pricing is set up for agriculture. Self-abstraction was not charged until 2010, but it was planned to be charged from 2011. There is no confirmation whether it took place or not. (**It has not**). *The RBMP refers to the polluter pays principle in general. However it seems that environmental and resource costs have not been included in the cost recovery calculation.*

The cost-recovery should address a broad range of water services, including impoundments, abstraction, storage, treatment and distribution of surface waters, and collection, treatment and discharge of waste water, also when they are "self-services", for instance self-abstraction for agriculture. The cost recovery should be transparently presented for all relevant user sectors, and environment and resource costs should be included in the costs recovered. Information should also be provided on the incentive function of water pricing for all water services, with the aim of ensuring an efficient use of water. Information on how the polluter pays principle has been taken into account should be provided in the RBMPs.

Part 9
THE QUESTION OF ANALYTICAL CAPACITY

164. Malta has an abundance of engineering and administrative capacity to manage the practical elements of managing water delivery in Malta. Malta also possesses talent that, if assembled and directed, would be able to handle much of the analytical work that is required to create a rigorous water policy framework. The problem is that Malta is not accustomed to undertaking this type of analysis. Possibly in part due to Malta's early graduation from the World Bank, it has no indigenous sector policy analysis institutes such as exist in all other EU member countries, and in many developing nations.

165. It is customary among OECD members, for independent policy institutes to carry out the analytical work necessary to establish a policy framework and a subsequent government plan and public investment programme. Government is expected to have sufficient capacity to be able to assess and use the products of such policy institutes, but rarely to carry out and maintain the research and analysis required.

166. Malta is not deficient in talent, but is deficient in the utilisation and management of that talent. In addition, the talent is not collected within discrete institutions which have a long-term responsibility, not just to carry out the initial analysis, but to support progress within a sector by continual impact evaluations, targeted research, and an updated information base. Such organisations, especially in Europe, but also beyond, support one another through a network of participating policy institutes linked to major international bodies such as the World Bank, specialised UN agencies, and dedicated global institutions with a particular sector specialisation. To the extent to which Malta does participate in such networks, usually it is only a government ministry that is listed as the partner.

167. Due to its size and limited revenues, Malta's government is small, and stretched to cover even its most basic responsibilities of legislating, and managing public investment programmes. In most ministries, the number of staff with sector technical and analytical skills is very limited and they invariably have to perform a large number of administrative duties.

NEED FOR A SECTOR POLICY ANALYSIS INSTITUTE

168. In the long-term, it is imperative for Malta to establish at least one policy and research institute able to develop policy frameworks for target sectors. In the absence of such an institute, to develop a policy framework for water, at the level described in this paper, Malta will have to engage assistance from outside. This assistance should be viewed as two pronged:

    (a) To help Malta to undertake the analytical work needed to develop the policy framework; and

    (b) As a capacity-building exercise to learn through doing under an experienced team leader and coach.

169. Because the policy framework and subsequent plan for water has so many political ramifications, it is essential that this work be both carried out and seen as independent. Of course, the government makes the final proposals for consultation and takes the final decisions. But the task is **not** to "fit policy" around already decided political decisions. The policy framework needs to be all encompassing and objective, and it is the government's task to explain why it may deviate from obviously desirable choices.

170. In terms of seeking outside guidance and assistance, this is **not** a task for an external consulting firm. Such organisations prepare reports for governments, which is not the goal here. In addition, they seldom contain either the economic or sector analytical skills required. They have not been established and staffed to meet such requirements, even if they are reluctant to admit that.

171. The work proposed needs to be carried out by a Maltese team, under the guidance of external expertise and experience. The latter simply means a few people from an organisation that has produced many such policy analyses before. The international standards set for such work resides in the World Bank and affiliated UN agencies. Both work constantly with the network of national and international policy institutes, which both receive funding from these international development agencies and contribute to the UN and World Bank comprehensive research and data bases.

172. Malta may also seek out a water policy institute in Europe, and set up a partnership to (i) carry out the analysis and assist in its translation into a policy framework and subsequent plan; (ii) advise on the essential capacity building required within government to effectively convert the plan into a public investment programme, carry out essential project analysis and appraisal, manage implementation, and evaluate impact; (iii) assist in the establishment of a Sector Policy Analysis Institute for Malta, (which will cover all the main sectors and ensure cross-sectoral perspectives); and (vi) help the Maltese Institute join the appropriate specialised sector networks in Europe and beyond. A list of potential institutional partners in the water sector is provided in the Annex.

Part 10
PROPOSED NEXT STEPS

173. As indicated earlier, creating a National Plan from a properly analysed Policy Framework, needs to be a phased process that combines analysis with action. It is **not** proposed that all future action is stalled until such time as the analytical and consultation phases have been complete. In fact, much of the analysis will depend on launching pilot projects in which various options are tested and both the inputs and outputs are carefully analysed based on determined criteria.

174. These are seen as the most urgent priorities to be tackled within the first phase of developing the Policy Framework:

A. Enabling Environment for the National Water Plan

The politicisation of water is at present the biggest obstacle to the production of a truly national plan. As long as water issues are caught up in the constant electioneering environment, no administration will take the obvious risks of making tough necessary decisions. There needs to be a consensus between the two main parties on the goals, processes and outcomes for the creation of the policy framework and the subsequent plan. A mechanism needs to be established to ensure the full involvement of PL, PN, and AD in reviewing the results of the analytical phase, creation of the Policy Framework, and the subsequent development of the National Plan. Because of the importance of the comments related to water contained in the National Audit Report of 2012, NAO could be asked to undertake a watching brief on this process and report on its outcome.

B. The Institutional Framework and Capacity Mobilisation

It is clear that a task of this importance and magnitude cannot be properly carried out by the limited staff currently working on water issues in the Ministry responsible. Either the task will take too long, or the crucial data collection and analysis will not be done with the required rigour. This task requires a staff of policy analysts devoted full-time. It will not be sufficient to plug the gaps with ad-hoc consultancies, because it is essential that the overview and inter-linkages are properly integrated both within the water sector and between the sector and others water particularly impacts (especially agriculture, and environment).

In the absence of a Maltese Institute of Policy Analysis, the effort will need to be launched through a combination of task-forces, using both cross-ministerial experts and experienced individuals selected from the private sector and academia, backed up by a high quality international policy institute, which can provide guidance, and on-and-off the job training. For this to be possible, there needs to be a full implementation plan, preferably in the form of a Government White Paper, that includes the costs proposed for inclusion in the next budget. The Paper would be debated within parliament and made available for public comment.

To ensure that the proper high-level government attention is focused on this task, water management and conservation needs to have its own dedicated ministerial responsibility.

Steps need to be taken immediately to launch the consultations that will lead to the creation of an independent Malta Institute of Policy Analysis, which will eventually be multi-sectoral but may focus in the short-term on water and agriculture, whose policies need to evolve in tandem. There should be outreach to European and Multilateral policy institutes (such as those included in the annex) to assist in the launching of the Maltese institute.

It is further proposed that a post-graduate course in Policy Analysis (with a diploma version for working specialists in industry and government) be offered by the Department of Economics at the University. The Master's course in Hydrology and Water Studies, started in 1995 but discontinued in 1997, should be re-introduced.

In addition, there is a need for a continuous education programme for the general public to increase awareness and understanding of the state of Malta's water resources. Initially, it would explain the current situation, but over time would evolve in line with the policy

framework findings and development of a national plan. Support for the National Plan requires a public that is fully informed and educated about the issues and eventual solutions, including the costs.

C. Establishing the Essential Data Base

It has been made clear that Malta is severely hampered by a lack of reliable, regularly updated facts and information regarding the water sector. A full data-base may take time to establish, but work should start immediately to bring together all the data that currently exists, assess its sources and its validity and reliability, and identify gaps. Clear responsibility and location for this data-base needs to be established, and the team responsible given a work programme based on the strongest priority data needs for the analytical programme. The work programme would specify the data flaws and omissions, propose the methodologies (based on best international practice) for gathering and validating the data, and set out a timetable, budget, deadlines, and individual responsibilities. The Government would need to ensure that all ministries and agencies that generate needed data will both cooperate and meet the data standards specified.

Various specific data collection will be the responsibility of the analytical task forces working on putting together the Policy Framework, but a central body and location must be established for maintaining the data-base and ensuring standards (eventually this responsibility would probably migrate to the Institute for Policy Analysis).

D. Action Pilots

Pilot projects need to be set up for the most obvious over-riding priorities, ensuring that in the absence of the full Policy Framework, they are designed to both test a number of options that satisfy standards of feasibility, and to generate facts and data for the analysis that will contribute to the Policy Framework. In other words these pilots need to be designed as experimental studies with measurable goals and projected economic and social impact.

The most obvious over-riding priorities are those relating to sources of water which are alternative to ground-water and desalinised water. Therefore, pilots need to be launched to discover the most cost-effective alternatives for groundwater exploitation and desalination, such as rainwater capture, storage and utilisation, wastewater recycling, water saving measures in all sectors, etc. that will meet economic, social and environmental standards. Special attention will need to be given to the overall economic justification given reasonable assumptions of reliance on other water sources. Equally important will be public incentives and the current ambiguous regulatory framework concerning cisterns, safety and purification requirements, maintenance, and projections of Malta's future rainfall patterns under prevailing climate change.

Companion pilots should be launched to establish the scope and potential, options, and benefits and costs of various forms of water recycling and purification, the appropriate technologies, the optimum size and locations, and public attitudes. This should include a study of initiatives already taken especially by selected organisations; and of international best practice.

Some pilots could be introduced in the form of competitions, in which proposals are submitted in response to a clearly stated, measurable protocol, and winners implement

their alternative designs in return for rewards. Some areas that could benefit from this approach may include best practices for reducing agricultural water usage, and water recycling and purification.

E. Most Urgent Focus Areas for Analysis

Malta needs to establish a fully operational model of what is happening to its sea-level and perched aquifers. Inevitably this will have to be based on a process of selective, representative testing, and will remain indicative. However, it is possible, with a rigorous experimental framework to produce, test and refine models that will provide the essential answers to the questions: how rapidly are the volume and purity of the aquifers deteriorating; how uniform are the trends in different geographical locations; how do the results tie up with known patterns of water extraction; what is the projected useful life of the aquifers under different scenarios of extraction, recharging, and nitrate run-off; what targets can be set for reducing extraction based on projected aquifer volumes and purity; how much remedy is required to bring the aquifers back to the conditions that would constitute the base requirement for sustainability.

These models would then form the basis for the actions necessary to reach targets, the continuous monitoring and evaluation programme, the legal and regulatory framework required, incentives and enforcement, and the full costs of the emerging action programme. In the course of this analysis, special attention will have to be given to the accuracy of existing extraction data, with special attention to unregulated and unobserved extraction. The study should also be able to state, with reasonable certainty, the consequences and costs of taking no action beyond what is currently done.

The second urgent area relates to the cost and value of water. Almost all analysis to be done for the Policy Framework requires a reliable series of calculations of what water use adds through incomes, revenues, and the overall economy. The full costs of generating and providing water from various sources, needs to be calculated, to include (i) the input cost of energy for extraction, purification, pumping; (ii) water leaks and wastage as a cost factor; (iii) the environmental cost of processes that rely on fossil fuels. Alongside there needs to be an analysis of water tariffs and charges, to establish their relationship to real costs, the degrees of subsidy for each source, the rationality of the overall tariff structure, and the extent to which current water tariffs provide the necessary incentives for the frugal use of a scarce resource. As the EU Water Framework Agreement requires the implementation of cost recovery for water provision, it will be necessary to establish what degree of cost recovery will be mandated and how that will impact on tariffs. This study needs to be complemented by a survey to establish the price-demand elasticity of water.

The third urgent area is to establish a reliable analysis of the costs, earnings and competitiveness of Malta's agricultural production, as farmers are the major users of ground-water. Most of the parameters of this study have been outlined in Part Six above. The government needs to establish a justification for future investment in the sector based on economic and social returns, levels of subsidy required, prospects for competitiveness against agricultural imports, and inputs that can make agriculture more cost-efficient.

Finally, the main long-term projections for climate change published by the UN Intergovernmental Panel on Climate Change (IPCC) should be incorporated into Malta's

long-term water planning. Currently it is predicted that over time, Malta will receive less average rainfall with more intense precipitation events, extended drought periods, and higher average temperatures.

SUMMING UP

175. Malta faces serious problems in maintaining its natural ground-water resource, which is being incrementally over-extracted and polluted by nitrates, and will gradually vanish as a usable asset. Instead of taking the action needed to establish and maintain a sound status for Malta's aquifers, emphasis has instead been given to sea-water purification through reverse osmosis. There has been a lack of objective, competent policy analysis and long-term plans, and initiatives that have been undertaken (like the National Flood Relief Project) have not been designed as part of a comprehensive planning process. Such initiatives are seldom accompanied by rigorous project analysis, clear stated measurable goals, and cost-benefit calculations. Instead, the management of water has been mainly subordinated to the political advantages and risks of the two party electoral processes. While consultation is a natural part of Maltese life, that which occurs takes place in the context of wide-spread ignorance of the facts, possibilities, and limits. This invariably results in promises that are neither achieved nor achievable. Malta has had limited experience in carrying out the type of in-depth economic and social analysis that could result in a Water Policy Framework. The Government has neither the capacity nor resources to carry out such work, and Malta lacks the presence of the sector policy institutes that in other European countries provides an independent and objective service upon which national planning can be based.

176. While Malta has exceptional technical talent, and possibly the experience and skills to prepare a proper Policy Framework, the tendency has been to improvise, to rely on consultation, and to follow political imperatives (such as reducing tariffs). Consultation invariably takes place in the context of ignorance about the basic facts, resulting in special-interest group lobbying, and undertakings that the Government has no way of delivering. Not only would a proper policy framework grounded in analysis and practical research, provide a sound foundation for the allocation of public resources, it would also provide the degree of objectivity that would move the water debate outside political rivalries and reliance on opinions and vested interests. So far, efforts by the Malta Water Association to encourage Government embark on such a process, have been largely fruitless. This paper has been an appeal to policy makers and opinion leaders to commit to the analytical programme that needs to provide the foundation for a sound and feasible water plan for the Maltese people.

177. While this report has been concerned mainly with Malta's indigenous water sources, Malta is highly exposed to pressures that affect global water because of Malta's heavy reliance on virtual water imports in a world where water shortages are becoming increasingly critical (Hunziker, 2015). How will Malta's economy, heavily reliant on limited indigenous water, cope with these emerging global realities?

Annex:
EXAMPLES OF WATER POLICY INSTITUTES & NETWORKS

EUROPE
Netherlands Water Partnership (NWP), The Hague, Netherlands
www.nwp.nl/

Ecologic Institute EU, Berlin, Germany
http://www.ecologic.eu/

Associação Portuguesa dos Recursos Hídricos, Lisbon, Portugal
http://www.aprh.pt/index.php/en/

Society Hydrotechnique de France, Paris, France
http://www.shf-hydro.org/the_association-17.html

Eawag Aquatic Research, Dübendorf, Switzerland http://www.eawag.ch/forschung/abt/index

The Centre for Ecology & Hydrology, Edinburgh, UK
http://www.ceh.ac.uk/

The Jaroslav Černi Institute for the Development of Water Resources, Belgrade, Serbia
http://www.jcerni.org/index.php?lang=en

The Water Research Institute (IRSA), Rome, Italy
http://www.irsa.cnr.it/ShPage.php?lang=en&pag=home

SYKE, The Finnish Environment Institute, Helsinki, Finland
http://www.syke.fi/en-US/Research__Development/Baltic_Sea_inland_waters_and_aquatic_resources

IMDEA Water Institute, Madrid, Spain
http://www.water.imdea.org/

Danish Water and Wastewater Association, Skanderborg, Denmark
http://www.danva.dk/Default.aspx

Federal Agency for Water, Vienna, Austria
http://www.baw.at/

U Leuven, Brussels, Belgium
http://www.iupware.be/

OTHER WEST
The Goyder Institute for Water Research, Adelaide, Australia
http://goyderinstitute.org/

AFRICA & ASIA
The Arab Countries Water Utilities Association, Cairo, Egypt
http://www.acwua.org/

Kuwait Institute for Scientific Research,
http://www.kisr.edu.kw/en/about-us

Institute of Water Policy, Lee Kuan Yew School of Public Policy, Singapore
http://lkyspp.nus.edu.sg/iwp/

Zuckerberg Institute for Water Research, Sede Boqer, Israel
http://web2.bgu.ac.il/ziwr/

China Institute of Water Resources, Beijing, China
http://www.iwhr.com/zswwenglish/index.htm

The Water Institute of South Africa, Halfway House, South Africa
http://www.wisa.org.za/Content_page.aspx

REGIONAL/INTERNATIONAL
IME – Institut Méditérannéen de l'eau, Marseilles, France
http://www.ime-eau.org/fr/web/bienvenue.php

European Network of Freshwater Research Organisations, Utrecht, The Netherlands
http://www.euraqua.org/

The Stockholm International Water Institute (SIWI), Stockholm, Sweden
http://www.siwi.org/
Global Institute for Water Security, Saskatchewan, Canada
http://www.usask.ca/water/

International Water Management Institute, Colombo, Sri Lanka
http://www.iwmi.cgiar.org/

The International Center for Agricultural Research in the Dry Areas, Beirut, Lebanon
http://www.icarda.org/

International Water Resources Association Montpellier, France
http://www.iwra.org/

Rosenberg International Forum on Water Policy, Oakland, USA
http://rosenberg.ucanr.org/forum8.cfm

ODI Water Policy Programme, London, UK
http://www.odi.org.uk/programmes/water-policy

FAO Water, Rome, Italy
http://www.fao.org/nr/water/

Global Water Forum, UNESCO, Paris, France
http://www.globalwaterforum.org/

UN Water, New York, USA
http://www.unwater.org/

World Bank Water Programme, Washington DC, USA
http://www.worldbank.org/en/topic/water

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BIOGRAPHICAL NOTES

Marco Cremona has an M.Sc. in Water Studies and Hydrology from the University of Malta in 1997, and is today considered one of Malta's leading hydrologists and water treatment engineers. He has worked as a water treatment engineer since 1992, and diversified his interests to include environmental issues, participating in the first Maltese Environmental Impact Assessment (EIA) in 1997. Later the Government commissioned him to draft national master plans relating to waste and storm-water. In 2010 he was entrusted with devising Malta's strategy related to water within the National Climate Change Adaptation Committee.

His achievements also include the introduction to Malta of anaerobic digestion technology which converts organic waste into a biogas fuel, which has been taken on board by Government at the Sant Antnin Waste Treatment Plant and the Ta' Barkat Sewage Treatment Plant.

Marco invented and built the world's first sewage-to-potable water plant for hotels (HOTER). This project qualified for the final of CNBC/Allianz Good Entrepreneur Competition (for the best green business idea in Europe), broadcast worldwide in December 2009. He designed his home as one of Europe's most completely water self-sufficient homes, which won the France 5 Report Terre 2009 award as the 'Best Environmental Project in Europe". His GEO-INF project that mitigates flooding and enhances groundwater recharge is a finalist in the world's most prestigious environmental award, the Energy Globe Award. In 2012, Marco Cremona was shortlisted for the Stockholm Water Prize 2012. And in December 2014, Marco was entered into The National Order of Merit as a Member.

Marco has provided water expertise to development projects in post-tsunami Sri Lanka and in Africa, and was a founding member of the Malta Water Association.

Gordon J. Knox graduated in Geology from University College London, and gained his Doctorate from the University of Liverpool working on the structure of the Andes of Peru. He had 28 years' experience in the international oil and gas exploration business with Royal Dutch/Shell. He has lived and worked in a variety of geological settings and locations including the Netherlands, Nigeria, United Kingdom, New Zealand, Thailand, Sultanate of Oman and Australia. Work environments included land and marine operations; field work, head office and research and technology centres. His positions ranged from Research Geologist to Regional Geological Adviser for South Asia, Middle East and sub Saharan Africa to Exploration Manager.

In 2003, he was an International Distinguished Lecturer for the American Association of Petroleum Geologists on the topics of Risk and Uncertainty in Petroleum Exploration, and Ways of Working in Exploration; and also a Visiting Lecturer at the University of Malta in Applied Geology. Since 2004, he has developed a voluntary interest in Malta's water situation and lectures and writes about the subject. He is one of the founder members of the Malta Water Association, formed in March 2011.

Lee Roberts graduated from the University of London in occupational psychology. He applied his expertise in research design to creating objective methods of assessing candidates for managerial appointment at one of Britain's largest banks. This won him a job at the World Bank where he worked for 20 years. He focused initially on introducing and managing the organisation's Staff Survey Programme. He then joined the staff of the Economic Development Institute (EDI) where he created models for Capacity Building in African Countries. He was also responsible for evaluating EDI's training programme in China.

Later he moved to operational work, and was responsible for coordinating the World Bank Programme in Ethiopia and Eritrea, and later in Slovenia and Croatia. As part of his work he became a Senior Policy Analyst, focusing on the health sector and poverty reduction, and helped design the Ethiopian Recovery Programme and the first Social Fund in Africa, as well as designing country strategies and participating in public investment and sector reviews. He spent some 15 years working on programmes in more than a dozen African countries. His most recent work involved the design of a policy framework for Public Health in West Bengal. His particular skill involves the methodologies and analyses required to formulate policy and evaluate the impact of policy implementation. Much of his project work included components focused on agricultural water.

He joined the Malta Water Association in 2012.

LIST OF PUBLISHED REPORTS

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- For Worse, For Better: Re-marriage After Legal Separation (Lead Author: Martin Scicluna) – June 2009
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- 10 Years in the Union: Malta's EU Story (Lead Author: Patrick Tabone) – June 2014
- A Review of the Constitution of Malta at Fifty: Rectification or Redesign? (Lead Authors: Michael Frendo and Martin Scicluna) – September 2014
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