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Institutional and Economic Instruments for Sustainable Water Management in the Mediterranean Region

Coordination Action

DELIVERABLE NO 9

THE RANGE OF CURRENTLY APPLIED ECONOMIC INSTRUMENTS

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Preface

"The range of currently applied economic instruments" is the 9th Deliverable of the INECO Project (Institutional and Economic Instruments for Sustainable Water Management in the Mediterranean Region, Contract No: INCO-CT-2006-517673). The Deliverable summarizes part of the work undertaken within the framework of Work Package 7 of the INECO project, for analyzing the deficiencies concerning the effective implementation of economic instruments in the INECO Case Studies.

Overall, the INECO Project is divided in three (3) phases. The 1st phase was devoted to the definition of "significant" water management problems in Cyprus, Egypt, Tunisia, Lebanon, Syria, Algeria, and Morocco. On the basis of these problems, which defined the INECO Case Studies, subsequent steps involved:

- A detailed situation analysis of the issues at hand;
- Institutional mapping and stakeholder analysis to identify actors, decision-makers and users that affect or are affected by the problem examined;
- Engagement in a participatory approach with stakeholders to discuss the problem and share opinions and experience on how it can be addressed in a desired water resources management situation.

During the 2nd phase of the project, alternative institutional and economic options are identified, suggested and adapted to assist in the mitigation of the "focal water management problems" defining the INECO Case Studies. To that end, this deliverable summarizes the detailed outcomes on the analysis of currently applied economic instruments in the residential, agricultural, tourism and recreational sectors, focusing mainly on long-run sustainability goals with regard to environmental, economic and societal objectives in water use and service provision.

This report was developed by Partner 2 of the INECO Project, International Office for Water, on the basis of the outcomes of a dedicated questionnaire, targeting specific issues of relevance for the Case Studies. Contributions were completed under the responsibility of the INECO Regional Partners, namely:

- Aeoliki Ltd and the Water Development Department of the Ministry of Agriculture, Natural Resources and the Environment (Cyprus);
- The Tunis International Center for Environmental Technologies (Tunisia);
- International Consultants – Egypt (Egypt);
- Conseil et Developpement s.a.l (Lebanon);
- Studies and Integration Consulting (Syria);
- Agence de Bassin Hydrographique Constantinois-Seybousse-Mellegue (Algeria);
- ISKANE Ingenierie (Morocco).

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1. Introduction

1.1 The scope of the analysis on the "Range of currently applied economic instruments"

Economic and institutional instruments studied in INECO are linked to the focal water management problems forming the INECO Case Studies. Focal problems can be grouped in two major categories: those associated with water quantity and those associated with water quality, and are briefly summarized below in terms of (a) scope; (b) current impacts on the environment and projected trends; (c) efforts already undertaken for problem mitigation.

In this context, this document is intended as a synthesis of information on the analysis of the currently applied economic instruments under the perspective of requirements for attaining the mitigation of the focal water management problems experienced in each Case Study. On the basis of the typology of the water management issues (Deliverable 8 of INECO), analysed instruments pertain to the following categories:

- Instruments aimed at encouraging water conservation/discouraging water waste or at introducing alternative water supply sources (Case Studies of Lebanon, Cyprus, Morocco and Tunisia);
- Instruments aimed at water pollution prevention and control (Case Studies of Algeria, Syria and Egypt).

Furthermore, this document analyses issues related to the recovery of water service costs, as well as cross-cutting issues relevant to intra- and inter-sectoral water allocation, where applicable.

The report is structured as follows: **Chapter 2** focuses on water pricing and cost recovery issues, providing information on: (a) the contribution of each use sector (industry, agriculture, households) to the cost of water services; (b) subsidies required to cover costs related to the provision of water services; (c) Background information on household water tariffs (water consumption metering and current tariff structures) (d) actual structure of water utility costs and (e) sewerage charges application and deficiencies in the recovery of the corresponding costs. **Chapter 3** presents issues relevant to penalties and sanctions (ex post liability) for non-compliance to discharge emission standards. **Chapter 4** focuses on effluent charge systems and barriers hindering their effective implementation. **Chapter 5** provides an overview of instruments aimed at encouraging water conservation and water pollution prevention. **Chapter 6** presents barriers and issues associated with the application of market-based instruments, which is considered premature in all the cases considered. Finally, **Chapter 7** summarizes broader considerations with regard to cost recovery, and emerging needs for the reform of current policies for water allocation.

1.2 The scope of the INECO Case Studies

As mentioned above, the analysis of currently applied economic instruments is primarily aimed at identifying deficiencies of the current framework that lead to the exacerbation of the water management problems faced. In this regard, this section provides an overview of the INECO Case Studies, summarizing main problems, trends and efforts for problem mitigation.

The Case Study of **Lebanon** focuses on *Increasing water stress* for meeting domestic, agricultural and industrial water demands *in the Damour River Basin*. The problem is further exacerbated by upstream pollution, groundwater interbasin transfer, and lack of financial and technical capacity to address

infrastructure requirements and enforce legislation on water resource protection. During the summer period, rivers and water channels become either completely dry or are used for the disposal of waste water. Groundwater becomes polluted from agricultural drainage and industrial effluents. A national plan has been developed by the Council for Development and Reconstruction for the development of infrastructure for sewage collection and treatment.

The Case Study of **Cyprus** centres on the *Increased vulnerability of the aquifer of the Pegeia region*, induced by overpumping in order to meet domestic and tourist needs in the region. Although the aquifer is not yet subject to dramatic seawater intrusion, degradation in water quality, due to the above and the excessive pumping, has already been observed in some locations. Furthermore, in the area here is no domestic wastewater collection system and treatment plant; therefore all liquid domestic wastes are stored in septic tanks, and then transferred to absorption pits, a fact that increases groundwater contamination risks. A programme has already been launched for the development of a centralised sewerage network and treatment plant; it is therefore expected that problems from the seepage of domestic wastewater will be eliminated. Furthermore, the produced treated water will reduce the demand for irrigation water and so the pressures to the aquifer are expected to be somewhat reduced.

The Case Study in **Morocco** deals with *Increasing water stress in the Oum Er Rbia River Basin*, resulting from increasing demand and inefficient water use in the agricultural sector, where high losses in irrigation distribution networks combined with the currently adopted irrigation practices (non-efficient irrigation methods and water intensive, non-economically sustainable cropping patterns) contribute to significant water waste.

The **Tunisia** Case Study concerns *Groundwater degradation*, mostly due to uncontrolled abstractions for irrigation purposes and the inadequacy of the presently applied alternatives and disincentives to groundwater overexploitation; water reuse is barely practiced, due to the low quality of treated water, soil types and cropping patterns, and most importantly due to farmer unwillingness to pay for treated wastewater. The problem is further exacerbated by the lack of technical capacity in the agricultural sector, the limited application of water saving methods in irrigation and the current water-intensive cropping patterns.

The case study of **Algeria** focuses on the *Pollution of the Seybouse River*, which receives large volumes of untreated industrial and domestic effluents posing both direct and indirect risk on human health, agricultural production and the river ecosystem. Although water demand is increasing, the region's water resources are presently considered sufficient in terms of quantity. However, pollution of domestic and industrial origin is expected to increase, as demonstrated by the increasing concentrations of nitrates, BOD, and COD measured during the past 10 years. In the Seybouse River Basin, an important program for sewage treatment, launched by the Ministry of Water Resources, will concern the major cities of the basin (Annaba, Guelma). This will reduce the effects of the domestic pollution by 2020. For the industrial sector, there is still need to develop relevant policies.

The Case Study of **Syria** deals with Water pollution in the Barada River Basin (Greater Damascus *Area)*, due to the discharge of high loads of industrial and domestic waste and wastewater, which exceed the river's self purification capacity, and the decrease of river flow, resulting from rainfall decrease and use of the Feige Spring for drinking water supply. Water pollution has caused the collapse of the Barada river ecosystem, which also sustains the large forest of "Ghouta", a cultural heritage area and environmental hotspot in the region. Table 1 summarizes the main impacts of the problem in terms of quantity and quality.

Table 1: Main impacts of Water pollution in the Barada River Basin, Syria

Impacts on Water Quantity	Impacts on Water Quality
• In order to ensure drinking water provision for the City of Damascus, the government dug many wells around the springs, which led to drought lakes formed by these springs. • Creating agricultural, environmental, tourism problems in addition to depletion of underground water around basin, and therefore inevitable impact on Barada spring and the green zone around it. Many tourism projects were abandoned because of drought springs, lakes and rivers. • The drying of the river pushes some farmers to break the pipes of sewage network and irrigate their lands with wastewater, that's led to many other problems with the agriculture producing, environmental troubles and pollution of groundwater. • The lack of adequate water for agriculture led to greater migration from the countryside to Damascus city, thereby reducing the green areas and increasing demand for drinking water in Damascus. • The drought of springs and lack of rain lead to decrease the houses water providing time, it becomes five hours a day during this summer 2008. • The unfair uses of water resources cause the dry of land, and the degradation of soil quality in many areas due to erosion, which reduced the fertility and productivity, which led to the destruction of vegetation and green spaces and forest degradation, and thus decline in biodiversity of land and water in fresh vegetable and animal assets. And through a quick look at the organizational charts of old and current area studied, we note a clear retreat of the green belt and a real change in the nature of vegetation. • The main activities of the Barada Basin people (Damascus countryside) are agriculture and tourist activities, they don't have any other economic options; the loss of water resources will lead the region to disasters. • Digging illegal wells randomly, affects ecologically a quantity of water levels in groundwater where this will lead to a decrease in the amount of water, declining water quality and pollution. • In many areas, the river bed turning to area for waste disposal due to drought, which led to the spread of insects and pollution of these areas.	• Water pollution in Barada River from sewage water: BOD concentration exceeded the permissible limits in most branches of Barada River, especially in the basement part, where it reached 130 mg/l in one of the branches of the river at the beginning of 2006 (the maximum allowed in the British standards for rivers water quality is 25 mg/l). Also the Ammonium concentration increased in Barada River water, it reached more than 13 mg/l in one of the branches of the river at the beginning of 2006 (the maximum permitted limit in the British standards for rivers water quality is 3 mg/l) because of sewage effluent and a decline in the flow of the river. • It has been noted that there is an increase in the amount of Nitrates and Ammonia Ions in some wells in Damascus countryside and their concentrations become higher than the permitted level for drinking water. Thus, this led to stop in 2005 the investment of more than 200 wells for drinking in several regions of Ghouta, where the concentrations of Nitrates reached 100-200 mg/l (limit permitted in the standard of drinking water is 40 mg/l). This is due to the use of nitrogenous fertilizers randomly and the irrigation with untreated sewage water and outlet them to the agricultural lands in Ghouta. Also the Ammonia concentration reached 3.2 mg/l in the year 2005 according to the results of groundwater analysis in Ghouta of Damascus (limit permitted for drinking water standard is 0.3 mg / l). • The increasing use of surface water and groundwater in the industry in the area studied reduced the quantities and quality of water for agriculture, which lead to further depletion of groundwater and to incompetence of water. • The chemical analysis of water samples taken from the irrigation and drinking wells appeared high levels of pollutants, especially in drought seasons. • Many micro, small and medium industries in the basin, discharging their wastewater in the river bed or into the land (included 250 tanning in the area studied), causing many environmental problems. Food industries contribute to increasing the burden of organic pollution, which requires oxidation analysed by the dissolved oxygen depletion in the water, which leads to destroy the aquatic life. • The marble factories, led to a decline in water quality. The high concentration of plankton causes turbidity of water and limits penetration of light, and this stops the vital process. The traditional marble and tanning industry needs continuous stream of water, as well as the disposal of water with a relatively high temperature, which is considered contaminated physicist temperature affects the plants in the area. • The existing pollution monitoring stations along the river indicate that the specifications of the river water gradually get worse with growth of population and industry. This led to water environment damage in the city, in addition to the threat of chemical and bacterial pollution on the population. • The outcome of the review of industries located in the region, found that the statute of the environmental impact of these factories are concentrated primarily in the contamination of both surface and underground water sources, and deteriorating water quality in the absence of sewerage systems and treatment plants. These elements led to an acceleration of scarcity and lack of water resources, where disposal of industrial wastewater in the region without being subjected to any controls, and acted directly to the Barada River and to the public sewer system without resorting to any form of primary treatment, or are remnants of water drainage and industrial installations directly to the lands.

Finally, in **Egypt**, INECO focuses on the *Water quality deterioration* in the region of the *Bahr Basandeila Canal of the Dakahlia Governorate,* where waste disposal, heavy use of pesticides, inadequate domestic wastewater treatment, and uncontrolled discharge of industrial effluents have transformed the open waterway to a repository and conveyor of liquid waste. The major water pollution issue, which is common in the entire Nile water distribution network, poses great risks for human health, agricultural production, and the river and coastal ecosystems. An increase in the volume of industrial wastewater is expected in the region. Furthermore, throughout Egypt, water scarcity in irrigated agriculture is considered a major constraint in the further development of the sector. Compared to agricultural water demand, municipal water demand is smaller, but given health aspects involved, this supply will receive priority over all other users.

2. Water pricing and cost recovery

2.1 Contribution of water uses to the recovery of water service costs

In **Lebanon**, local water service providers (municipalities) hardly manage to recover the operational maintenance cost.

In **Syria**, according to the "Damascus City Water Establishment", revenues from water tariffs recover approximately 90% of operating costs. For the Damascus surrounding, rural areas, accurate figures cannot be obtained; it is however estimated that the recovery of operating costs is around 40%. In agriculture, there is almost no revenue; in the Barada River Basin farmers used to abstract water from the river or from their own wells, free of charge, and continue to do so, even if there are irrigation networks. Legal industrial establishments should pay 30 S.P. for each m^3 delivered; and 40% of their water bill for wastewater treatment. However, it should be noted that there are many illegal industrial workshops in the basin, most of which are charged with residential tariffs and pay only minimum charges.

In **Algeria**, there has never been a comprehensive approach and analysis of water service costs and their recovery. This should be one of the major assessments that need to be undertaken in the next years.

In **Egypt**, water pricing for households and industry is aimed at the recovery of Operation and Maintenance (O&M) Costs. It is generally considered that water delivery charges are relatively low when compared to those applied in other countries, particularly in the Middle East and North Africa. Households connected to the public sewerage network pay modest fees, ranging between one-third and one-fifth of the corresponding operation and maintenance (O&M) costs. Efforts are underway to develop cost-sharing mechanisms for these services. In addition, there are no fees for groundwater withdrawals. The current development strategy is based on improving operational economies and maintaining water and sanitation projects by ensuring the appropriate cost recovery levels. With regard to capital expenditure, the recovery of investment costs is often treated separately from the recovery of operating costs. Capital costs are recovered for mesqa level investments according to a formula that requires repayment of the full capital cost, excluding interest, over a period of 10 to 20 years. Pump costs are fully recovered during the initial 5 years. Assuming 4% inflation and 12% opportunity cost of capital, cost recovery amounts to about 30 to 50%, depending on the recovery period, for costs for civil works. No costs are recovered for improvements above the mesqa level, which account for about 25% of civil works expenditures.

In **Cyprus**, for domestic water, after the tariff increase effected in 01/01/2004, cost recovery of financial costs has improved, reaching approximately 73% in 2005. For irrigation freshwater after the price increase, recovery of financial costs has considerably improved, reaching 67% in 2004, and approximately 77% in 2005. In general, after the pricing reform effected by the Government of the Republic of Cyprus, recovery of costs for freshwater provision has improved considerably. However, full cost recovery is still not achieved, a fact that contributes considerably to the prolonging of the non-rational (from an economic point of view) use of the scarce water resources; water consumption in the agricultural sector (with a contribution of only 4% to the GDP and 7% of the total employment) accounts for 69% of total demand, whereas in the tertiary sector (77% contribution to GDP and 72% of total employment), water demand is only 25%.

No detailed data were made available for **Morocco**.

In **Tunisia**, the recovery of operation, maintenance and rehabilitation costs is low in region of the Sahel and in central and southern parts of the country (Table 2). Furthermore, the collection of fees from consumers is at times inadequate resulting to the lack of financial resources for Agricultural Development Groups.

Table 2: Comparison between of water cost and tariff in Tunisia (values in TD/m³, 1996)

Region	Cost	Tariff	Recovery (%)
North	0,079	0,073	92
Sahel	0,161	0,090	56
Centre	0,088	0,054	61
South	0,036	0,024	67
National level	0,079	0,069	87

2.2 Subsidies to cover water service costs

No information was available for **Lebanon**, **Syria**, and **Algeria**.

In **Egypt**, municipal water and wastewater services are heavily subsidized by the Government. In the municipal areas outside of Greater Cairo and Alexandria, the subsidy level is almost 75%. Similarly, irrigation is heavily subsidised by as much as 77%. It can be argued that the overall policy towards agriculture has contributed to the selection of non-efficient cropping patterns and even to wastage of water.

In **Tunisia**, water services are still subsidized at around 30%.

2.3 Household water tariffs

2.3.1 Water consumption metering and billing efficiency

In all countries, water charges are collected separately of other public utility bills.

In **Lebanon**, the base of metering water consumption is one cubic meter per day, i.e. 365 m³/year. This basis is the same for all categories of subscribers and varies according to the number of cubic meters required per day and per subscriber. The Municipality of Damour applies a special rate, based on a lump sum of LL 100000/year (45 €). It should be noted that in the Damour River Basin there is no reliable statistics on the total number of connections. As only the coastal villages (Damour and Meschref) have a public water supply system, it is estimated that the total number of connections is approximately 10,000 over a total population of 86,000 persons.

In **Egypt**, water consumption is metered at the building block level.

In **Morocco** the water is metered by connection (building block) and by meter (household consumption).

In **Algeria**, water consumption is metered at the household level in the majority of cases, except for some specific situations and regions, where metering is undertaken per building block. The average rate of persons/connection is around 7.

In **Tunisia**, water consumption is metered on a quarterly basis by SONEDE (National Company for water exploitation and distribution). Each house and apartment must be equipped with an individual meter. Overall, the total number of connections to the public water supply system is around 2,000,000.

In **Cyprus**, water consumption is metered at the household level. In the Pegeia Municipality approximately 5500 meters have been installed covering almost 100 % of consumers. Of these, approximately 2,500 water meters correspond to residencies. The rest corresponds to tourist establishments (hotels, apartments, villas), and commercial/industrial units.

2.3.2 Current tariff structures

In **Tunisia**, water is distributed by SONEDE to its customers and billed according to a binomial tariff comprising a fixed and a volumetric charge. For potable water, an increasing block tariff system is applied throughout the country on the basis of the metered quarterly consumption. Water bills also include a VAT of 18%.

The water bill also includes a charge for sewage collection and treatment. The first (social) block (which corresponds to a minimum water consumption) is limited to 20 m³. The second block corresponds to quarterly consumption between 0 and 40 m³ whereas the third block is between 0 and 70 m³. The 4th block, is between 0 and 150 m³, when the consumption exceeds 150m³ the price per cubic meter is 6 times higher than the one of the first block in regions where SONEDE is not subsidized by the state. It is broadly considered that the current regulation system provides incentives for water conservation and recovers the management, operation and maintenance costs of the networks operated by SONEDE.

Table 3: Domestic water tariffs in Tunisia[1]

Volumetric charges	
Quarterly consumption (m³)	**Tariff (TD)/m³**
0-20	0.140
0-40	0.240
0-70	0.300
0-150	0.840
Fixed charges	
Meter diameter	**TD/Quarter**
15	3.300
20	5.830
30	10.740
40	20.570
60	53.460
100	82.810
150	220.670

In **Lebanon**, water charges are uniform throughout the country and comprise an annual fixed charge based on 1 m³i.e. LL240.000 for 365 m³ per year (≈100 €). The Damour municipality has a reduced

[1] Notes: 1TD = 0.56 €
Municipal use charge: 0.140 TD/m³
Tourism = 0.840 TD/m³

fixed charge of LL100'000 (45 Euros) per year for their subscribers. Volumetric components are defined via water gauges, calibrated to provide the required quantity).

In **Egypt**, the tariff structure consists of two flat components; fixed charge and meter charge. The fixed charge is calculated for the minimum consumption volume. Metering charges are applied according to interred value. Households are charged L.E. 0.23/m³. When the consumed volume is less than 30m³/month, households are charged L.E. 0.30/ m³.

The financing of water supply and sewerage services in **Morocco** is performed through the following mechanisms:

- Cost recovery through the set water charges and tariffs,
- Loans, subsidies, grants, etc.

With regard to *drinking water provision*, the recovery of costs is effected through:

- A water supply (or royalties) charge, calculated according to water consumption.
- A contribution to the 1st implementation (PPE - Participation au Premier Etablissement) , aimed at recovering the corresponding investment costs;
- A fixed charge to cover connection costs;
- A fixed charge for the recovery of surveys and assessments;
- A pollution charge, for which the pertinent legislation is under approval.

Water supply charges in urban areas vary among regions and comprise two parts: a fixed charge, and a volumetric charge, which depends on the volume of water consumed. The maximum rates are those of Casablanca, whereas the minimum are those of Meknès.

The water bill depends on the type of use:

- For residential users, the water tariff follows the Increasing Block Rate structure, dividing water consumption into four blocks:
  - 1st block: 0-6 m³ - rate lower than cost;
  - 2nd block: 7 to 20 m³ - rate equal to cost;
  - 3rd block: 21 to 40 m³ - rate higher than cost;
  - 4th block: >40 m³ - rate much higher than cost.
- Preferential tariff, for boundary-marked fountains, where the price is uniform and equal to 2.18 DH/m³.
- For industrial users, the price is also uniform, and equal to 2.23 DH/m³.

In rural areas, the water is generally delivered to the user through an intermediary at prices ranging between 7 and 12 DH/m³. This intermediary buys water from the ONEP at the reduced price of 2.18 DH/m³.

Charges for sewage collection and treatment comprise two parts: a fixed and a variable charge. The fixed charge varies according to the type of use:

- For residential users, it ranges between 36.00 and 55.68DH;
- For commercial establishments it ranges between 144.00 and 242.04 DH ;
- For public buildings, administration offices etc., it ranges between 72.00 and 121,44 DH.

The variable charge is estimated according to the volume of water consumed, and also follows an increasing 3-block rate structure:

- 1st block: 0-6 m³/month;

- 2nd block: 7-20 m³/month;
- 3rd block: >20 m³/month

It should be noted that water billing is performed on a monthly basis in both the case of municipal water utilities and private operators. However, with the exception of big clients, the ONEP implements quarterly invoicing.

Furthermore, a tax concerning the implementation of the 1st establishment (PPE) is also implemented. This tax aims at the recovery, by household and building owners, of the cost required for extending the public sewerage network. This objective is evident by the formula for the calculation of the PPE, which depends on the type of the building, making a distinction between apartment blocks and individual houses. Connection charges depend on the pipe diameter and on the façade, whereas charges for assessments and survey depend on the size of the project, and can exceed even 10% of the project costs.

In spite of the above, water tariffs cannot ensure alone an adequate recovery of costs, due to the limited ability-to-pay of the users. This is particularly true in the small villages and cities, where costs are higher. In this case, the contribution of local authorities, through subsidies and grants is required. Furthermore, it should be noted that the delays at the investment level contribute adversely to the overall financial balance.

Table 4 presents volumetric rates applied for different categories of consumers in **Algeria**.

Table 4: Volumetric charges in Algeria

Categories	**Quarterly consumption (m³)**	**Tariff (in €/m³)**
Households		
1st block	Up to 25	0.065
2nd block	26 to 55	0.21125
3rd block	56 to 82	0.3575
4th block	More than 82	0.4225
Administrations, commercial establishments	Uniform rate	0.3575
Industrial and tourist units	Uniform rate	0.4225

Table 5 presents volumetric rates applied by the Municipality of **Pegeia, Cyprus**. In addition to the volumetric charge, the water bill includes a fixed charge of 14€. The guarantee against settlement of account (deposit) amounts to 85 €. The water rates set for the residential sector apply also to all other water uses (public and commercial establishments, industries) except for hotel and tourist establishment. For the latter, water rates comprise a fixed charge of 430 € and volumetric rates dependent on consumption, equal to 1,03 €/m³ for consumption between 1 and 1500 m³, and 1.54 €/m³ for consumption exceeding 1500 m³. For small hotel apartments the fixed and maintenance charge is reduced to 14€. Volumetric components are the same as with the rest of the tourist sector.

Table 5: Volumetric charges in Pegeia, Cyprus

Categories	Quarterly consumption (m^3)	Tariff (in €/m^3)
Households		
1st block	up to 30	0.09
2nd block	31 to 60	0.34
3rd block	61 to 75	1.03
4th block	76 to 90	1.37
5th block	above 91	1.71
Households over 5 members		
1st block	up to 30	0.09
2nd block	31 to 75	0.34
3rd block	76 to 90	0.68
4th block	above 91	1.03

2.4 Actual structure of utility costs

2.4.1 Share of operational costs over the total cost of water provision

In general, no information is available or has been made available in **Lebanon**, **Tunisia**, **Morocco**, **Algeria** and **Cyprus**.

In **Egypt**, operational costs account for about 65% of the total cost for the provision for water and wastewater treatment plants, in addition to a share of 20 % for distribution/network maintenance.

2.4.2 State funding for infrastructure development

The Government of **Egypt** provides funds for investment and assets.

In **Morocco**, the State, the private sector, associations, and water users, through the applied cost recovery policies, provide the funds required for infrastructure development.

In **Algeria**, funds originate from the State (National Treasury). They are further transferred to the Ministry of water resources or to municipalities, depending on the level of investment.

In **Lebanon**, infrastructure development for all water use sectors is financed by the Council for Development and Reconstruction. Similarly, in **Tunisia**, infrastructure development is financed by the Government and international donors.

In **Cyprus**, infrastructure development has mostly been funded through the National Budget. It is worth noting that for a number of years the funds allocated for water development constituted approximately one fifth of the Development Budget of the Republic of Cyprus. The 2001 value of the water infrastructure investments for the Government Water Works at a rate of 7.5% was estimated at €1.71 billion. Further to the above, EU funds have also been secured to support the implementation of Article 8 of the WFD (Development of integrated water monitoring programmes and tools for the cost effective monitoring and assessment) and the implementation of the Directive 91/271/EEC concerning urban waste treatment (development of techno economical studies, detailed drawing and environmental studies for 28 of the rural agglomerations included in the harmonization programme). Moreover the Operational Programme 2007-2013 : “Sustainable Development and Competitiveness”, foresees investments in the field of water resources management with particular emphasis given to the

construction of waste water infrastructure and works for waste water reuse, replacement of domestic water supply networks and studies for the reformulation of water policy.

2.4.3 Costs for bulk water supply and their % incidence on the total cost of water service provision

In **Egypt** and **Morocco** there are no costs associated with bulk water purchase.

In **Algeria**, water supply is provided by national structures. They only charge the final customer at a price decided by Law, according to the level of consumption, and the type of use.

In **Cyprus**, currently, the Government Water Works cover more than 80% of potable water total domestic and industrial demand, supplied on a bulk basis to the City Water Boards (Nicosia, Limassol, Larnaca, Famagusta, and Pafos), Municipal Authorities and Community Boards. Almost half of irrigation demand is also supplied directly by the Government, through the Government Water Works. The calculation of domestic water tariffs is based on the "Balanced Budget" method is used. The method provides for the recovery of the total operating and maintenance costs, including contingencies for working capital requirements, debt service requirements or depreciation (whichever is higher) and takes into account any shortfall or surplus in the required revenues in the previous years. In 2004, the Government of the Republic of Cyprus proceeded in a major reform of the bulk domestic water tariffs. Currently the bulk domestic tariff for supply from the Government Water Works for the district of Pafos is equal to 0.56 €/m³. Until 2003, tariffs for irrigation water were differentiated on a local basis, according to the Irrigation Scheme, and the quality of services provided, ranging from 0.08 €/m³ at the lowest to 0.12 €/m³. From 2004, a gradual increase of tariffs has been implemented in order to reach by 2007 the uniform charge of 0.19 €/m³. However, due to the persisting drought period of the last years, the Council of Ministers in 2007 postponed the final increase of 0.01 €/m³ in order to alleviate the difficult conditions that farmers are experiencing.

2.4.4 Share of unpaid bills and corresponding losses in undertaking receipts

In **Tunisia**, usually there are no unpaid bills, but in case if bills are unpaid, water is cut by SONEDE after 15 days and the customer pays a penalty when water is reconnected.

In **Lebanon** there is a high percentage of unpaid bills, but there are no reliable data. In Egypt, Most of the bills are paid.

No data have been made available for **Cyprus**. In **Algeria**, unpaid bills account for 40% of the total.

2.5 Sewerage charges

In **Pegeia, Cyprus**, there is no central sewerage system. However for the rest of the island, the wastewater collection, treatment, and drainage systems charges are regulated by the Sewage and Drainage Law. These may be: connections charges, rates based on property values to reflect the benefit of sewerage or drainage works, additional rates for the use of sewage works and / or a rate based charge, based on the extend of surface area of the property drained. Service charges are imposed and collected by the Water Board or Community Board authority of each area, while statements of account for sewerage and drainage charges are sent separately once a year to the owners of property that falls within the Board's boundaries. In general, service charges cover the annual operating and maintenance costs of the sewerage system and secondary wastewater treatment, while fixed charges (sewerage and drainage charges) address the recovery of capital costs. Charges are determined by Regulations that are approved by the Parliament.

In **Syria**, sewerage charges exist; however, reaching full recovery of costs for wastewater collection and treatment would entail a two-fold charge increase.

In **Lebanon**, sewerage charges are imposed by municipal authorities, and are calculated as a share (1½ %) of the rental evaluation of the premise.

Sewerage charges represent nearly 30% of the bill for potable water supply in Algeria, as presented in Table 6.

Table 6: Sewerage charges in Algeria

Categories	Quarterly consumption (m^3)	Tariff (in €/m^3)
Households		
1st block	Up to 25	0.0235
2nd block	26 to 55	0.0764
3rd block	56 to 82	0.1528
4th block	More than 82	0.1528
Administrations, commercial establishments	Uniform rate	0.1293
Industrial and tourist units	Uniform rate	0.1528

3. Penalties and sanctions for non-compliance to emission standards

In **Egypt**, in cases of non-compliance with discharge regulations, the MWRI generally takes action upon request of the MoHP. In practice only licensed discharges are monitored regularly, though the majority of facilities are unlicensed. Actual enforcement for cases involving public facilities (publicly owned industries and municipal discharge), which comprise the majority of all pollution sources is almost non-existent due to a lack of funds and economic and employment considerations. Presently, the EEAA staff is being prepared to enforce environmental impact assessment (EIA) laws. Major industries are being visited due to non-compliance with wastewater treatment regulations. Compliance Action Plans (CAPS) are being agreed upon to obtain a grace period for compliance.

In **Algeria**, theoretically, the National agency for Waste and the Environmental Directorates are responsible for inflicting penalties. As these authorities are local, the system is adequately decentralized for implementation of the corresponding legislation (Decree of September 2007). However, the situation is problematic, as the relevant Decree seems not to be clear enough in its implementation.

In **Tunisia**, the ANPE (National Environmental Protection Agency) is the responsible for inflicting penalties for non-compliance with emission standards (NT 106-02 standard). In order to produce a disincentive to break the rules, it is necessary to obtain an authorization from the MEDD (Ministry of Environment and Sustainable Development).

In **Lebanon**, the Ministry of Public Health and the Ministry of Environment is responsible for inflicting penalties and sanctions for non-compliance with emission standards; however, law enforcement is considered inadequate.

In **Syria**, the Water law Nr. 31 of 2005 established a "Water Police", with the main aim to monitor compliance, identify violations, and submit these to the relevant court of justice. In year 2007, 242

violations were submitted to the relevant Court in the Barada Basin. The total number of violations reported in the same year was 2000; however, most of these involved minor violations and were fined accordingly. New amendments to the Water law Nr. 31, published in early 2008, introduced stricter regulations by eliminating a number of extenuating circumstances. This is expected to have a significant impact in reducing violations and events of non-compliance. In more detail, Law 50, Article 27, details the following:

1. Owners of factories, installations, workshops and activities that release environment polluting emissions shall have to fix apparatuses thereon to prevent spread of these emissions and control solid particles prior to their release from the factory, installation or workshop in the air to the extent allowed under the instructions issued by the Council for this purpose.

2. He who commits any of the violations covered under the provisions of paragraph /1/ of this article and does not remove it within the period that the Minister decides for him or for the person delegated thereby, the Minister shall have the right to refer the violation to the court that has the right to issue a verdict to close said sites and imprison the violator for a period not in excess of one month and a penalty often thousand to fifty thousand S.P. and obligate him to eliminate the violation within the period defined thereto and fine him five to ten thousand S.P. for each day delay in the removal thereof.

3. The punishment stipulated in paragraph /2/ of this article shall be doubled in case of violation repetition for the second time and in case of its repetition for the third time thereafter the verdict will be three times of the punishment.

Table 7 summarizes the corresponding provisions of Articles 24 and 25 of Environmental Law No. 50.

Table 7: Range of fines imposed for water pollution in Syria, according to the provisions of the Environmental Law No. 50

	Range of fines imposed (S.P.)
Article 24	
First Category	from 25,000 to 500,000
Second Category	from 50,000 to 1,000,000
Third Category	from 100,000 to 2,000,000
Article 25	
First Category	from 10,000 to 250,000
Second Category	from 25,000 to 500,000
Third Category	from 500,000 to 1,000,000

However, it can be argued that the environmental law is still inadequately enforced, as a result of (a) legislative limitations, and (b) lack of environmental awareness. Most manufactories discharge contaminants to the sewerage system or simply to land and rivers without treatment, free of charge and without penalties being enforced. In addition, the spatial dispersion of micro- and small-scale industries hinders the effective control over discharges.

4. Environmental charges and taxes

4.1 Effluent charge systems

In **Syria**, the effluent charge system exists in the environment law, but its application is still limited. The main problems associated with its implementation are the overlaps of responsibility between government bodies. Furthermore, it should be noted that the Government provided a grace period for industries to improve their environmental performance, which ended in December 2006. However, many public industries still do not have a wastewater treatment plant. Some units are in the process of reform and therefore the possibility that they will be closed down is rather high. In this regard, the installation of a wastewater treatment plant is not a priority, a fact that encourages non-compliance in the private sector. The new industrial city in Adra cannot accommodate all industrial units, such as tanneries or marbles, which need a huge quantity of water that cannot be provided by the current infrastructure. In this regard, these polluting industries remain in Damascus and its surrounding areas and their wastewater is recharged untreated to the riverbed.

In **Lebanon**, the Ministry of Environment is responsible for setting effluent charge systems. The Ministry can entrust the task to other institutions, but the system has not yet been applied.

In **Algeria**, according to the general legislation, effluent charges could be introducible. The problem is that no specific decrees have been issued. The only regulations available concern discharge standards that should not be exceeded. If the relevant legislation was fully developed, the level of pollution charge would probably have to be based on types of substances and quantity of discharge. This would lead manufacturers to reduce both the quantity of pollutants and the level of pollution.

Egypt already has in place a form of effluent fee. Industrial discharge to the Nile and to drainage canals that meets standards of Law 48/1982 is currently subject to a fee of one piastre per cubic meter. This fee is scheduled to increase fifteen-fold according to a proposal awaiting legislative approval to become a reality. The main points of legislation/regulations that introduce the concept and the main principles are:

- **Law 93/1962 on wastewater disposal in sewage systems**: This Law concerns the discharge of liquid waste into public sewerage systems. Related ministerial decrees 649/1962 and 9/1989 of the MHUNC regulate the discharge of wastewater into public sewer systems. The part of decree 649/1962 that regulated drainage to watercourses was replaced by Law 48/1982.
- **Law 48/1982 on protection of the River Nile and waterways from pollution**: This Law provides the basis for the protection of surface and groundwater against pollution. In the law a distinction is made between the Nile and the irrigation canals which are referred to as `potable', and the drains, lakes and ponds, which are referred to as 'non-potable'. MPWWR (now MWRI) is made responsible for the licensing of wastewater discharge, whereas the Ministry of Health is responsible for monitoring effluents. Only discharge of treated wastewater is permitted, while treated wastewater from animal or human sources can only be discharged to "non-potable" water. In addition, the reuse of drainage water is regulated, as well as weed control and waterway pollution by agro-chemicals. It establishes a fund from the revenues of levies, fines and costs recovery, which can be used for administration, donations, research and rewards. Law 48 of 1982 and its executive regulations have been reviewed in a number of studies. Comments are related to the nature of the standards and their strictness, which hampers compliance and enforcement, the distribution of responsibilities and the relation between this Law and Law 4/1994, which was established for the protection of the

environment in general. Strict enforcement of the present regulations would mean very large investments by industry and municipalities, which are not realistic in the present situation and can even be counterproductive. It would also forbid the reuse of treated municipal wastewater. The application of Law 48 needs to become more flexible; adaptations of the Regulations are necessary to convert it into an effective tool in an overall action plan for pollution control. A revision of Law 48 is in preparation within MWRI for submission to the Cabinet.

- **Law 4/1994 on environment:** During the preparation of the law it has been decided not to integrate Law 48/1982 into this new law. Instead, Law 4/1994 refers to Law 48/1982 for specific regulations on water quality. An important element of Law 4/1994 is the establishment of the Egyptian Environmental Affairs Agency (EEAA). From the viewpoint of Integrated Water Resources Management Law 4/1994 provides regulations for the protection against pollution of sea shores, ports, etc. that are not covered by Law 48/1982. According to Law 4/1994 the EEAA prepares legislation and decrees to protect the environment in Egypt and is responsible for setting standards and monitoring compliance. The agency also participates in the preparation and implementation of the national program for environmental monitoring and data utilization (including water quality). The agency is also supposed to establish an "Environmental Protection Fund" to cover water quality monitoring. With respect to water pollution, the law states that all provisions of Law 48/1982 are not affected and it only covers coastal water and seawater.

The co-existence of Law 4/1994 and Law 48/1982 makes that the division of responsibilities between various agencies with respect to the management of the water quality in the River Nile, the canals and the groundwater is not always clear.

The current effluent charge system introduces a number of institutional limitations, budgetary constraints, and other factors limit current capacity to adequately address water quality concerns. For example, planning and development of water and wastewater plants has not been guided by a comprehensive assessment of Egypt's environmental protection needs. While a relatively large share of GDP has been invested in the construction of municipal wastewater plants, the impacts of these investments on the environment have been limited by their inefficiencies and other factors. Rural water supply and sanitation as well as industrial pollution control have received low policy attention. Charges for municipal water supply and wastewater service, while recently increased, cover only about one-third of operating and maintenance costs—suggesting that the financial viability of these systems is doubtful. Some recent interest in privatization has been directed at solving this problem—the theory being that rate increases and staffing reductions might allow for break-even or even profitable operations.

Law 4 directs EEAA to supervise and operate the national water quality monitoring network through an Environmental Information Center within EEAA. Law 48 appears to assign the same responsibility to MWRI, creating duplicative requirements for data collection, processing and analysis that require resolution. Within both EEAA and the MWRI, there is limited capacity to enforce water quality regulations. Government-owned enterprises, which are the main industrial polluters, often appear to receive special treatment because they are difficult to fine or otherwise force into compliance with water pollution standards. Many of these enterprises also fail to pay what they should for water deliveries. The primary reason given is the fear of creating unemployment should they be closed or their production inhibited. The gradual privatization of some enterprises (notably cement) has improved the situation modestly, but privatization efforts are moving slowly.

Many wastewater treatment plants in the Delta (some of which are partly or wholly financed by external donors) are only partially completed, and others are finished but lack discharge permits from the Ministry of Health and/or MWRI. Finding financing to complete these plants is a high priority as is the permitting of those ready to operate— even if their discharges cannot meet present standards (even limited treatment will certainly be better than none).

In general, better coordination and communication is needed among Government of Egypt initiatives to improve water quality management. The current discharge permit system is based on the concentration levels of discharges. To be effective as a deterrent, the fee should be based on the total pollutants discharged. Such fees are a direct means of affecting polluting behaviour; however they require careful oversight and enforcement as well as routine measurement of both the volume and concentration of effluents.

4.2 Environmental taxes in agriculture

In **Cyprus**, environmental taxes on fertilizers are not in place. However this instrument has been studied in respect to introduce a tax on mineral nitrogen fertilizers according to the nitrogen content of the fertilizer. The effect of such a measure will be the reduction of nitrogen pollution of the soil in a cost-effective way. It has been calculated that a tax of 130% of the mineral fertilizer price will prompt a reduction in fertilizer use from 105 to 57 kg N/ha. Environmental taxes on pesticides are not in place either. However this instrument has been studied in respect to introduce a tax on pesticides according to the dosage instructions, the toxicity and the persistence of the active ingredient. The effect will be the rationalisation of pesticide use and application. It has been estimated that a price increase by 50% would lead to a 25-50% reduction in pesticide application.

In **Syria**, fertilizers' tax is just 3% and pesticides'tax is 5%. In general, the producers can transfer these taxes into produce prices, depending on market conditions.

In Egypt, taxes on fertilizers are not introduced. The Egyptian agricultural sector is taxed via three systems as follows:

- **Direct Tax Bases**: The government of Egypt taxes, directly, the agricultural sector via three subsystems. They are: The traditional land tax, the corporate net profit tax and the Unified income tax on unincorporated farms.
- **The Egyptian agricultural land tax**: It is a levy on presumptive agricultural income. Thus, it might be considered an income tax in the form of a land tax. On the other hand, it represents a somewhat roundabout method of taxing wealth (land ownership) via a tax on presumptive income flow. A tax is levied on all cultivatable agricultural land based upon its estimated annual rental value (Law No. 113/1939). The annual rent value is reassessed every 10 years by a committee process (Law No. 53/1935). The present land tax is based upon assessed values from 1968-1988 that has become effective since 1989. The forthcoming estimate will most likely not be initiated until after 2001 and goes into effect by the year 2003. The law No. 112/1997 issues an additional fee that differentiates the agricultural land holdings by utilization pattern. Such fee is of L.E.0.25 per feddan cultivated in traditional crops, LE.1 per feddan for vegetables and LE.5 per feddan for orchards.
- **Taxes due to Decentralization of Governmental Activities**: A proportion of the taxes on agricultural land suppose to be allocated to the governorate authority. According to laws (No. 43/1979 and No. 145/1988), 25% of basic and additional taxes collected on agricultural land are returned to the governorates in which the property is located. The Local authorities

suppose to allocate such value to the villages, which the taxed land locates within their respective boundaries. The remaining 75% are devoted to the towns. Local government councils in most governorates suppose to charge the agricultural landholders an extra amount of 15% on the absolute value of the initial tax. Such amount represents a source of finance for the local governance.

- **Types of Exemption**: Full exemption is applied for total land holdings, which are not greater than 3 feddans, on condition that this farm is the only source of income. However, many farmers pay the tax rather than submit to tedious process required getting exemption. Many farmers would proceed to this requirement if the cost of registry for subdividing of the land among the legal owners were not so high. Permanent exemptions are granted on agricultural land owned by the state or dedicated to the common benefit of the village citizens. Exemption for 10 years after becoming productive is conferred to reclaimed, desert and fallow lands. Taxpayer whose annual land tax does not exceed LE.4 is totally exempt, (Law No. 370/1953).
- **The corporate net profit tax**: The taxation rate on the net profit of the agricultural corporate varies by the type of corporation. In general there are three types: exporters and manufacturers, other corporations, and projects enjoy tax holidays. Exporters and manufacturers generating annual net profits above L.E. 18000 should be taxed on annual income base. Exporters and manufacturers are taxed at a rate of 34%, of which 2% as development duty, on annual net profits. Other corporations rather than exporters and manufactures are subject to 42% taxation rate, of which 2% as development duty, on annual net profits. Three types of agricultural projects enjoy tax holidays. The projects located in new urban communities enjoy tax holidays for 10 years. The corporations employing more than 50 workers enjoy tax holidays for 5-15 years. The investments in free zones enjoy tax holidays for infinite periods.
- The **Unified income tax on unincorporated farms**: The unified tax on income of natural persons is based upon (Laws No. 157/1981 and 187/1993 and amendment 90/1996, 226/1996, 162/1997 and 5/1998). It is levied on five categories of non-corporate income: 1) Wages and salaries 2) Moveable capital: Interest income and foreign dividends 3) Non-commercial professions 4) Net profits of all operations carried out by commercial and industrial entities whose owners are sole proprietorships: This category includes individuals engaged in the selling of agricultural inputs and/or the marketing of agricultural and industrial activities. All costs are generally deductible. 5) Sole, simple, limited and general partnerships However, if the taxpayer owns agricultural land and buildings, he or she is taxed according to the revenue of real estate wealth. The tax base is the same as that used for agricultural land tax.
- **Indirect Tax Bases:** There are three subsystems for indirect agricultural sector taxation, which are: sales taxation (value added tax), exchange rate overvaluation and import taxation.

4.3 Abstraction charges

In **Cyprus**, abstraction charges have not been applied in the past. However, this type of taxation is considered as a potential measure that could be adopted. The implementation procedure could be:

- Registration of public water suppliers, industrial plants and farms which are self-supplied, especially through private boreholes;
- Registration of the volume of water abstracted and definition of appropriate charges;

- Creation of a monitoring system in order to prevent overexploitation and apply the corresponding charges.

The question of the appropriate charge level for: (a) providing incentives to industry, households (municipalities) and farmers for more efficient water use (please differentiate per use); (b) financing control measures (e.g. monitoring of abstractions) is currently under study by the Water Development Department, which will also be the authority responsible for collecting revenue.

In **Lebanon**, there is a ministerial decree for wells that fixes charges depending on the depth and the flow. It is broadly considered that an appropriate charge level for: (a) providing incentives to industry, households (municipalities) and farmers for more efficient water use (please differentiate per use); (b) financing control measures (e.g. monitoring of abstractions) would be preferential if it would mean low charges for industry and agriculture, and acceptable for households if it would take into consideration the net household income. Local water authorities and municipalities would be the authority responsible for collecting revenues.

In **Egypt**, there is a penalty according to Law 4/1994 (see Section 4.1), which is paid as an abstraction or pollution charge. The EEAA is the authority responsible for applying the "polluter pays" principle.

In **Algeria**, there is a tax of pollution included in the bill of water supply. It represents nearly 30 % of the bill of potable water.

5. Grants and financial/fiscal incentives

5.1 Industrial sector

In **Egypt**, there have never been efforts to relocate specific industries to a designated area in order to develop a collective wastewater treatment scheme. In the Dakahlia Governorate, the industry presents a small percentage of land for relocation. With the establishment of the Environmental Fund, money from different sources is made available for environmental protection projects. Regarding the water sector, the fund provides soft loans to industrial firms for pollution abatement projects, such as recycling and reuse of treated effluents, as well as for setting up small-scale pilot demonstration projects.

In **Algeria**, there have never been efforts to relocate specific industries to a designated area in order to develop a collective wastewater treatment scheme. Relocating industries and developing collective wastewater treatment schemes for specific sectors is not feasible for the moment. The form of a grant offered that could be offered to specific industries for developing wastewater treatment facilities is direct financial aid, possible through the special funds of the Ministry of Water Resources or the Ministry of the Environment. The grant can represent a share of the cost of the unit, and should be provided after an in-depth assessment by the local administrations or agencies in charge of water and/or environment. Otherwise, fiscal incentives or rebates could be introduced (i.e. reduction of the pollution tax or reduction of water tariffs and charges).

In **Syria** there is no general plan for the relocation of specific industries to especially designated areas, where common facilities for wastewater treatment can be developed. However, it is widely recognized that there is need to take specific action for tanneries, the most water-consuming and polluting industrial sector. The proposal is to transfer all units, presently located in the city of Damascus to the industrial city of Adra. Additional proposals have been developed for relocating engineering and chemical industries from Koudsaya and Zabadni to Dimas. With regard to tanning industries, daily water requirements amount to at least 5,000 m^3/d. The administration of the Adra Industrial City has

promised to ensure delivery of this amount; however, up till now the amount of water delivered is not enough. The corresponding wastewater treatment costs are estimated at 21 S.P./m³. It has not been made clear who will bear the cost for the construction of the common wastewater treatment plant. If funding remains in the responsibility of the tanning industry, this would pose an additional economic burden, affecting the competitiveness of the sector. It should be noted that tanneries are facing financial difficulties in meeting their relocation costs to Adra (purchase of new land, equipment transfer, equipment renewal etc.). In this regard, it is considered that the Government should have a more active role in the development of the industrial city and ensure that the competitiveness of the sector is maintained. At the same time, the continued presence of tanneries in the city of Damascus, where it is extremely difficult to ensure control over the disposal of industrial effluents, generates environmental degradation of a very high indirect cost borne by citizens and the Government. On the other hand, and with regard to the relocation issue, the Government argues that relocation costs can be covered by the industries themselves, if they sell their properties in Damascus city, where land prices are higher than in Adra. To further facilitate relocation, the Damascus Governorate authorities have agreed to fund the required wastewater treatment facilities, which will be implemented by a Turkish company.

In **Morocco**, the FODEP subsidizes eligible projects, at the following rates: 40% for wastewater treatment and 20% for water saving.

5.2 Agricultural sector

In **Egypt**, there is no form of financial assistance (e.g. grants, compensation payments, tax reduction) for those who adopt environmental friendly agricultural practices. Intensive cultivation on a relatively small agricultural area corresponded with a traditionally high rate of pesticide and fertilizer use. Problems with this have been stimulating a rising interest in organic production. Today Egypt has a well-developed and still rapidly growing organic sector. About 24,548 hectares of land are under organic management, accounting for 0.72% of the country's total agricultural area. Organic production concentrates on about 500 farming enterprises. Many of these farms are 'desert' farms, using irrigation water from the Nile. Egyptian organic farmers grow a variety of crops, including fruits (notably grapes, citrus, dates mangoes and strawberries), vegetables, cereals and spices as well as non-food crops as cotton and medical plants. While much produce is exported, primarily to Europe, Egypt is also one of the few African countries that enjoy domestic demand for a number of organic products. The ongoing expansion of the domestic market continues to diminish the local producers' reliance on export sales, thereby encouraging buoyant investment activity in the sector. The main obstacle that farmers encounter in deciding to shift towards organic farming is the scarcity of isolated lands.

In **Lebanon**, most of obstacles that farmers encounter in deciding to shift towards water-saving techniques are economic. However, many farmers refuse to change irrigation methods, because they are accustomed to conventional techniques. Water reuse is not practiced in the Damour River Basin and there are no subsidies available for implementing reuse schemes.

In **Syria**, a non-interest loan is targeted to farmers for shifting to modern, water saving, irrigation systems. The main obstacles are financial; however there are other issues associated with lack of knowledge and awareness. Currently, a National Programme by the Ministry of Agriculture and Agrarian Reform is under implementation. It includes up procedures for modernizing irrigation methods and systems in an area of 1.2 million hectares. The programme was initiated in 2006, and will span a period of 10 years, at a total cost 52 billion 985 million S.P. The Prime Minister has approved

the implementation of the programme, and a new Directorate has been established in the Ministry of Agriculture to monitor project implementation. Furthermore, a Higher Committee chaired by the Prime Minister

In **Tunisia,** there are forms of financial assistance provided to those who install water saving equipments. Grants range between 40 and 60% of the equipment and installation cost, corresponding to an overall amount of 700 €/ha. Extension services are provided by CRDAs and UNAP (National Union of Agriculture and Fishing). In addition, there is a reduction of 10% of custom taxes on the equipment and tax exoneration on consumption and added value (TVA), and an increase of 50 to 60% of the allowance granted to GDAs (Agriculture Development Groups). Presently, the share of irrigated land equipped with modern irrigation systems is estimated at 70% of the public irrigation schemes.

Furthermore, subsidies are granted to farmers for drilling boreholes with more than 50 m depth:

- For small farmers: 25% of the cost for drilling one meter, which amounts to 250 TD or 35 €/m.
- For medium farmers: 15% equivalent at 20 €/m.
- For big farmers: 7% equivalent at 10 €/m.

The shift towards less- water intensive crops, such as strategic crops (cereals) is promoted through subsidies in irrigation prices: farmers can obtain 1500m³ per ha free from the CRDA. Taking into consideration the increasing prices of cereals in the international market, farmers are gradually convinced to shift to the above crops. Furthermore, the government doubled the prices of wheat starting from the 2008 production, but farmers still need training. Additionally, incentives are provided towards the wider use of treated wastewater. In more detail, water is provided to farmers at 0,02 TD/m³ compared to 0,05 TD/m³ for groundwater and 0,1 TD/m³ for surface water. The implementation of reuse schemes is fully financed by the Government. Equipment and seeds of fodder crops are also subsidised. Quality control is undertaken by the veterinary service of the CRDA and the Ministry of Health. Furthermore, in some Governorates land is granted free to young farmers. However, most farmers are not willing to shift to treated wastewater because of its odour and its quality. The limited acceptance of the public to consume products irrigated with treated wastewater is also a very important obstacle.

In **Morocco** there are forms of financial assistance (e.g. grants, compensation payments, tax reduction) for those who install water saving equipment. However, these practices are not widely applied (only 10% of the basin surface). Obstacles that farmers encounter in deciding to shift towards water-saving techniques are:

- Requirements for infrastructure outside the field, which entails high costs;
- Small size of farms, which render installation costs particularly important;
- Lack of technical training.

In **Cyprus**, the promotion of efficient irrigation methods (micro-irrigation), started as early as 1965, through the "Improved on-Farm Irrigation Systems" Project. Incentives, such as subsidies and long-term low interest loans towards the purchase and installation of improved irrigation systems encouraged farmers to adopt such systems. The grant amounted up to 15% of the total cost of the on farm irrigation system with the remaining given as a soft loan. Farmers were convinced to use improved irrigation systems through extensive field demonstrations. As a result of a successfully implemented program (subsidies, long-term low interest loans and effective extension/demonstration

program), the flood-irrigated area declined from 13,400 ha in 1974 to 2,000 ha by 1995. Over the same period, micro-irrigation cover has increased from 2,700 ha to 35,600 ha. There are few margins for further improvement in water application technology. The success of this project was such that almost all irrigation water is currently applied through modern on-farming irrigation systems. The on-farm irrigation systems comprise 90% micro-irrigation, 5% sprinkler irrigation and 5% surface irrigation.

In **Morocco**, the State provides the following subsidies/incentives:

- 60% for projects for water saving;
- Exoneration of the agricultural sector, as the corresponding recovery of costs is not systematically ensured. Irrigation water charges in the basin do not exceed 3MAD/m³, this being the best case;

5.3 Domestic sector (households, tourism)

In Cyprus, and in order to ensure conservation and rational use of water, the WDD embarked on a Strategic Plan, providing financial incentives for the promotion of technological adjustments aiming to water conservation. These include subsidies for:

- Borehole drilling for garden irrigation (680 €);
- Installation of reuse systems of the grey water in the lavatories and the irrigation of gardens of houses (1,700 € for households and 60% of the cost for the rest of the cases)
- The connection of borehole with lavatories(€680);
- Introduction of hot water recirculators (290 €).

The estimated potential water savings can reach 50% of drinking water demand. The annual budget allocated for these incentives is 2.0 mill € (1.5 mill € for subsidies and 0.5 mill € for accompanying awareness and promoting campaigns) for 2008 and 2.0 mill € (1.5 mill € for subsidies and 0.5 mill € for accompanying awareness and promoting campaigns) for 2009. The impact of the measures undertaken is summarized in the following paragraphs.

Subsidies for borehole drilling are provided if water is to be used for the irrigation of the gardens of households connected to the water distribution networks for all municipalities and villages (subject to well permit and inspection of site after permit and before drilling). Table 8 summarizes the budget allocated for the implementation of the option and the corresponding total water savings to date.

Table 8: The implementation of subsidies for borehole drilling in Cyprus

	1997-2002	2003	2004	2005	2006	2007
No. of installations	240	95	170	250	545	1058
Budget allocated (€)	70,000	30,000	55,000	85,000	215,000	620,000
Water savings (m³)	300,000	100,000	200,000	300,000	700,000	1,300,000

For the *installation of grey water reuse systems* in lavatories and for garden irrigation, the subsidy covers installation of a system for the treatment of grey water and its reuse in lavatories and garden irrigation of a household, school, playing grounds, swimming pools, gyms, hotels, industries, etc., connected with distribution networks of all municipalities and villages. The measure has been applied since 1999. Results are summarized in Table 9.

Table 9: The implementation of subsidies for grey water reuse in Cyprus

	1999-2002	2003	2004	2005	2006
No. of installations	20	15	20	10	35
Budget allocated (€)	25,000	20,000	35,000	20,000	60,000
Water savings (m³)	650,000	450,000	600,000	400,000	1,350,000

Concerning the *connection of boreholes with lavatories*, the subsidy covers connection of wells with home lavatories, schools, offices, shops, institutes etc. connected with distribution networks of all municipalities and villages for the purpose of conserving drinking water that is used for lavatories (subject to application, inspection and provision of technical advise by WDD). The results from the implementation of the measure are summarized in Table 10.

Table 10: The implementation of subsidies for connecting existing boreholes to lavatories in Cyprus

	1997-2002	2003	2004	2005	2006	2007
No. of installations	70	20	50	60	175	535
Budget allocated (€)	30,000	20,000	35,000	40,000	110,000	365,000
Water savings (m³)	300,000	100,000	200,000	300,000	700,000	1,200,000

No subsidies to provide incentives for leakage reduction programmes are currently applied in the Pegeia or in other areas of the island.

In Lebanon, no financial assistance is provided by the State to municipalities for implementing leakage reduction programmes. Similarly, there is no form of financial assistance for those who install water saving equipments. There are exceptional examples only of subsidies/funding for water saving practices. There are no subsidies/funding directly addressed to the hotel sector and the industry. Only some isolated cases of tax exemption have been applied in the past.

6. Market-based instruments

In **Lebanon** and **Cyprus** tradable emission or abstraction permits are not introducible given the current legislation.

Similar is the case in **Syria**. The Environmental Inspectors of the "Ministry of Local Administration and the Environment", and the water police could be responsible for the monitoring of such a system but their role still limited in terms of experience and enforcement of the law. The current role of water police is to cease the operation of illegal wells and identify environmental violations, mostly in terms of discharge of untreated industrial effluents in the sewerage network.

In **Algeria**, where there is significant lack of information on the current status of water bodies and on the actual pollution hotspots, the introduction of tradable permits cannot be considered.

In **Tunisia** water is a patrimony defined in the water code (law n° 75-16 of 31 March 1975) where the first chapter considers water as a hydraulic public domain and as an offered natural resource and in which its use should respect the rational management of this national natural patrimony. Thus, tradable markets are not introducible. However, the Ministry of Agriculture and Hydraulic Resources is the main authority responsible of water resources management. Its institutions can trade water and undertake interbasin transfers, e.g.:

- Transferring surface water from region to region: DG/RE (General Direction of Water Resources).
- Water selling to SONEDE by SECARDE-NORD (company for transferring water from the North).
- Selling potable water to GDAs: CRDA, DG/ GREE (General Direction of Rural Engineering and water exploitation).
- Selling of treated wastewater to farmers: ONAS.

Furthermore, groundwater resources are not allocated, their management is realised through the water tables. However some conflicts are encountered by farmers of neighbouring governorates, in the case of shared groundwater resources, which cannot be exploited by one governorate only. The legislation exists, but it can be revised and a specific text for quota allocation is needed.

7. Broader considerations

7.1 Cost recovery, affordability and equity

In **Cyprus**, currently the average per capita expenditure for water services is approximately 120 €. The average size of a household in Pegeia is 2.76 persons (according to the last Population Census 2001), which means that the average annual water bill is approximately 360 €. Taking into account that a 30% increase in the average volumetric price for domestic use is estimated to be sufficient to apply the full cost recovery principle, the annual water bill will rise to almost 500 €, which is not considered to be unaffordable. Bulk drinking water tariffs are reviewed periodically in order to recover full operating costs, depreciation, working capital and debt servicing in excess of depreciation. Changes to water tariffs by the Water Boards, Municipalities and Village communities, especially uniform domestic water tariffs, are difficult, since these depend on local structures. In agriculture, current irrigation tariffs encourage cultivation of high water consuming crops. Increasing the tariffs to cover the full average unit costs would make many crops, such as citrus, unprofitable (direct effect). Furthermore, expensive surface water could lead to excessive use of local groundwater supplies. This would result to saline intrusion and further degradation of the aquifer reserves causing larger inequities between farmers depending on government and those on non-government schemes (indirect effect). The Parliament is reluctant to raise tariffs of irrigation water for political and economic reasons since this might discourage irrigated agriculture and lead to further urbanization with all its associated social problems. On the other hand, a number of hotels and other tourism developments (tourist villages, golf courses, etc.) are shifted towards the installation of private desalination units (RO units) that could lead to a substantial increase of electricity consumption.

In **Tunisia**, a study has been undertaken for irrigation water supply in the Governorate of Nabeul, concerning potential impacts arising from the implementation of the full cost recovery principle. Its main results were the following:

- Water charges do not have major impact in the majority of exploitations.
- The value of water in irrigated agriculture has decreased by 12%.
- For the time being, the structure of water tariffs does not consider resource costs. Only components linked to financial costs are included. Future reforms should also consider recovery of costs for rehabilitation and capital costs for equipment, estimated through the amortization of capital investment.

- A programme to adjust irrigation water prices was applied since the beginning of 1990's, aimed at reaching cost recovery, and eliminating subsidies. Since 2000, water is provided at a relatively high price, which however incorporates only the costs that are directly associated with water exploitation.

However, the implementation of the National Agricultural Policy for the wider cultivation of cereals and fodder crops is also based on the introduction of preferential tariffs, which can generate a subsidy of about 50% on the currently applied tariffs, depending on the irrigation practices.

Presently, the comparison of water costs vs. other farm inputs varies between 7% (fruit trees) to 19% (citrus), corresponding to an average of 10%. This is currently considered acceptable, however it also depends on the overall economic conditions, as there is a continuous increase in the cost of other agricultural inputs, and the market price of strategic crops, such as potatoes, remains constant. However, farmers react strongly vis-à-vis tariff increases, because the decisions are made at the local level and are not dependent of international conditions. In this regard, policy makers try to effect pricing reforms when the social and political conditions allow.

Especially with regard to groundwater, and taking into account the degradation of water quality in water tables, 85% of the farmers think that surface water is cheap, although groundwater exploitation costs are currently 40% less than surface water.

In **Syria**, the overall policy goal is to reach by the end of 2010 a 95% recovery of operational and maintenance costs (according to estimates, presently almost 90% of operation and maintenance costs are recovered). With regard to distribution network replacements and rehabilitation it should be noted that losses have been reduced from 39% in 1999 to 21% in 2007. Projects are still ongoing and the target is to achieve a yearly 1% reduction until an acceptable loss factor (in technical and economic terms) is reached. Previous water pricing reforms led to a decrease in water consumption; however, the individual impact of the increase cannot be quantified, as these were combined with intensive awareness campaigns on water saving and the water stress issues experienced at that time. Currently, water tariffs correspond to a 2% of the per-capita income, the maximum being 4%. In case of water pricing reform, it can be expected that an increase above a certain threshold would lead to reduced water waste (e.g. by eliminating hose street cleaning and car washing). However, as agriculture is the largest water consumer (about 80% of the total water use), it would be better to place more emphasis on the implementation of efficient irrigation systems than in the domestic sector. Given the fact that there is strong intervention by the State on the authorization of borehole drilling, it can be argued that it would be difficult to resort to individual groundwater exploitation in case of substantial tariff increase.

In **Lebanon**, a potential application of the full cost recovery principle would mean a 4 or 5-time increase of current water tariffs. Due to affordability issues, especially with regard to low-income users, the tariffs should not be increased more than two-fold. In case that water prices become higher than a certain threshold, it is evident that some uses will be phased out or search for alternative water supply sources, in case that collective supply becomes too costly. It should be noted that the drilling of individual boreholes is a common practice, because most of the time the Government and the municipal authorities cannot secure sufficient water quantities or quality. It is expected that the problem will be exacerbated in the near future. In the Damour River Basin only, it is estimated that around 50,000 meters should be installed. The main reason why water metering has not been yet implemented is lack of funds. Overall, a reform of water pricing policies faces some opposition from particular user groups.

In **Algeria**, the most significant problems originate from the lack of legislation on water pricing issues, and pollution/abstractions. Along the same line, for the industrial sector in the Seybouse area it is estimated that for consumption metering, approximately 200 meters would need to be installed. Lack of sufficient financial resources is the main problem.

7.2 Change of policies for water allocation

The reform of the water allocation system towards demand management would be an ideal strategy for **Tunisia**. Furthermore, it is necessary that the country introduces appropriate pricing policies to gradually reach the recovery of total costs associated with the provision of water services, investment costs included.

In a context of increasing demand and decreasing availability it becomes significant to base water allocation on solid economic and objective criteria, introducing social or environmental constraints where relevant. It therefore becomes evident that the State should mostly concentrate on inter-regional and inter-sectorial water allocation and disengage from the intra sectorial water allocation, allocating such responsibility to the local Agricultural Development Groups. Furthermore, it is necessary to proceed to the restructuring of SONEDE and ONAS, targeting financial autonomy, decentralisation of activities and privatization of some responsibilities. It is believed that decentralised management in water allocation will lead to two important innovations:

- Define use rights and share these, according to historical rights and actual prices.
- Firstly, allow the exchange of use rights inside irrigation perimeters; then gradually also shift to “water trading” between perimeters, when technical conditions allow;
- In case of low water availability (e.g. droughts), allow even inter-sectorial “trading”.

This policy would probably be capable of providing incentives to use water resources in an optimal way, leading mainly to water conservation.

Considering that close to 70% of all water resources on **Cyprus** are used by agriculture, a sector that contributes only a minor part (less than 5%) to national wealth and struggles with labour scarcity problems and marketability of produce, a close scrutiny of water allocation policy appears to be in order. The water policy for the agricultural sector may consider a number of incentives and disincentives to conciliate water availability with demand and to ensure that adequate food security and rural targets are achieved in exchange for the substantial subsidy the sector is receiving. The matter is complicated by the traditional two-tiered nature of water rights: users of government owned water systems pay the established tariff, while owners of wells do not pay. Under these circumstances, an increase in water tariffs in the public systems is bound to encourage further overexploitation and mismanagement of groundwater. The concept of equity among farmers depending on surface water distribution to those on groundwater does not exist. Realizing a policy of uniform water rates over the island remains a difficult problem. Citrus, which takes 32% of all irrigation water, shows a low value-in-use of water and modest net benefits and invites to closer scrutiny in agricultural water policy. Water use efficiency, in terms of water used per ton of crop, is reasonably good. However, use of water in the services and light industries sector bears a potential to generate more and better renumerated employment. A review of water allocation criteria should be in order.

The reform of the water allocation system will be very difficult as a result of social, political, environmental and economic pressures. Farmers have invested heavily in farming, and so even if

Government legally retains all water rights, it is not politically feasible to unilaterally reallocate water away from agriculture.