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**WATER POLICY REVIEW AND INTEGRATION STUDY
(WORKING PAPER)**

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“The Ministry of Water Resources and Irrigation is presently decentralizing decision-making to the field offices, transferring certain O&M activities to the private sector and encouraging stakeholder input into decision-making. One possible result of the continuation of these activities is that the Ministry will transition into an organization that is responsible for planning water allocation strategies at the macro scale, O&M of the main water conveyance system and enforcement of laws and regulations that deal with water quality protection. If this scenario is accepted, then the Ministry must prepare an appropriate strategy for dealing with this transition and remaking itself to the future vision.”

Statement made by H.E. Minister Mahmoud Abu-Zeid at the 35th Egyptian-Dutch Panel Meeting.

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List of Abbreviations and Acronyms

| | |
|---------|--|
| APRP | Agricultural Policy Reform Program |
| BCWUA | Branch Canal Water User Association |
| CIDA | Canadian International Development Agency |
| EPADP | (MWRI) Egyptian Public Authority for Drainage Projects |
| EPIQ | Environmental Policy and Institutional Strengthening Indefinite Quantity Contract |
| FWMP | Fayoum Water Management Project |
| GOE | Government of Egypt |
| GWS | The Groundwater Sector |
| GWSP | The Groundwater Sector Project |
| HCDWI | Head of the Central Directorate for Water Resources & Irrigation |
| IAS | Irrigation Advisory Service |
| IDOS | Institutional Development and Organizational Strengthening |
| IDS | Irrigation and drainage system |
| IIP | Irrigation Improvement Project |
| IIMP | Integrated Water Management Project |
| IIS | (MWRI) Irrigation Improvement Sector |
| INTESP | Institutional and Technical Support Project |
| IMT | Irrigation Management Transfer |
| IRG | International Resources Group, Ltd. |
| ISM | Irrigation Systems Management Project |
| IWMD | Integrated Water Management District |
| LNFDCC | Lake Nasser Flood and Drought Control Project |
| MALR | Ministry of Agriculture and Land Reclamation |
| MWRI | Ministry of Water Resources and Irrigation |
| MED | (MWRI) Mechanical & Electrical Department |
| NAWQAM | National Water Quality and Availability Project |
| NOPWASD | National Organization for Public Water Supply and Sanitary Drainage |
| NWRC | (MWRI) National Water Research Center |
| NWRP | National Water Resources Plan Project |
| O&M | Operation and Maintenance |
| PIM | Participatory Irrigation Management |
| SA | (MWRI) Surveying Authority |
| SWQU | Strengthening the Water Quality Unit Project |
| USAID | United States Agency for International Development |
| WB | Water Board |
| WBP | Water Board Project |
| WM | Water Quantity Management |
| WPAU | Water Policy Advisory Unit |
| WPRP | Water Resources Results Package |
| WQMPC | Water Quality Management and Pollution Control |
| WQU | (MWRI) Water Quality Unit |
| WUA | Water User Association |

1. Introduction

1.1 General

The statement by the Minister for Water Resources and Irrigation on the overleaf is based on a set of precepts which have generally come to be accepted in Egypt:

- The government's overall water resources management policy is aimed at sustainable economic growth through enhancing the role of the private sector in provision of various services.
- National water security demands that the main supply facilities and allocation of supply among competing uses must remain under the control of MWRI.
- Decentralization and privatization of water management to the *appropriate* level will result in increasing water use efficiency.
- Regulation and enforcement of sustainable practices in water management (both supply and demand sides) must remain as a mandate of MWRI.
- Water quality protection and pollution control is essential for sustainable water management practices.

These precepts, among others, have apparently been embraced by top management of MWRI and provide the foundation of various manifestations of MWRI's vision for the future. This is demonstrated not only by various statements made by H.E. the Minister at various meetings, but also by the policies and programs adopted by MWRI over the last five years. These reforms signal dramatic changes when taken as a whole and provide a solid basis for the Ministry and its other partners involved in the water sector to transition to a more integrated, decentralized and participatory approach to water management. However, most of the policy work has not always given adequate consideration to the interconnections among the various recent initiatives, or to integration with other existing or proposed policy reforms.

This Water Policy Review and Integration Study is meant to help bridge between these important policy and program reforms that have been developed and adopted by MWRI and its partners recently along with ongoing policy initiatives to:

- Review the present status of water policy implementation;
- Identify areas requiring clarification and overlaps among reform initiatives;
- Identify potential constraints to realizing the goals of these reforms; and
- Identify inputs required to achieve successful implementation.

It is hoped that this compilation of information on the most significant recent policy and program developments in the water sector will improve understanding of both the issues at hand and what already has been achieved. It also has been suggested that a Water Policy Integration, Prioritization and Implementation Plan be prepared to consolidate the approach, and this study should provide background and recommended next steps for the preparation of such a plan, should it move forward.

1.2 Organization of Paper

The next section discusses the major water management challenges facing the country. This is followed by a summary review of various policy and program reforms that have been, and are in process of implementation including some analysis of the implications from this experience. A brief summary of the Roundtable discussion that was conducted to discuss preliminary results is then presented. The paper's final section presents summary conclusions about progress being made and recommendations related to integration of existing policies and possible future policy directions.

2. Water Resources Challenges

2.1 Introduction

The water resources challenges summarized in this section have been recognized by MWRI for some time now. That recognition triggered a series of structural, institutional and policy reforms that MWRI has successfully instituted over the past twenty years or more. This brief review of challenges influencing water management in Egypt is presented to acquaint the reader with the Egyptian water resources context and the motivating force behind MWRI's ongoing and ambitious future policy adjustment program.

Only a very general overview of water management issues and problems is presented in this section, and the reader is referred to other recent sources for more in-depth analysis. These references include several public addresses given by H.E. Minister Mahmoud Abu-Zeid on water management challenges in the country. USAID also has commissioned several reviews including evaluations of the Agricultural Policy Reform Program and *Economic Instruments for Improved Water Management in Egypt*, the latter of which includes sections reviewing both water quantity and quality issues (e.g., see the summary in Table 10 of EPIQ Report No. 57).

2.2 Water Shortage

Egypt is located in an arid climate zone where rainfall is scarce and most of the land is desert. Its water is derived primarily from the Nile River originating outside of the country's borders. A fixed annual quota of 55.5 billion cubic meters (bcm) flows into Egypt according to the 1959 agreement with Sudan on the sharing of waters controlled by the High Aswan Dam. A second current source is the deep groundwater of the Nubian Aquifer reservoir in the Western Desert. Although these deep groundwater resources are not renewable, it is estimated that they can be mined at a rate of approximately 4 bcm/year for the next 100 years. The share of water per capita in Egypt is currently about 850 cubic meters per year (m^3/yr), which places it below the "water poverty level" (1,000 m^3/yr) accepted by the World Bank. Further, the country's water demands are in excess of available supplies—the deficit being filled by recycling wastewater and recapturing water losses. Such calculations do not take full account of minimum in-stream flow requirements in the Nile, which must be considered along with other uses. Therefore, Egypt is faced with a potential water scarcity situation due to increasing demands against a fixed supply of the resource which could limit the country's ability to implement its overall economic development plans.

2.3 Agricultural Expansion

In order to accommodate the employment requirements of a fast growing population and to face the increasing gap between domestic food production and consumption, the government is planning by 2017 to expand its cultivated area by 3.4 million feddans. Irrigation and other infrastructure for most of these new areas are already under design or construction. The ambitious plans for agricultural expansion in Nile Delta, North Sinai and Southern Egypt will

extract 10 bcm or more of the Nile's waters. This requirement is planned to be secured through: greater water reuse, especially for irrigation from intermediate drainage canals; increased groundwater use, particularly conjunctive use for irrigation; reduced water conveyance losses through irrigation system improvements; reduced cultivation of high water requirement crops such as sugar cane and rice; and introduction of new crop varieties having low water requirements. Enormous investments will be required for irrigation system improvement, water reuse pumping stations and groundwater wells. Nevertheless, there is a danger that farmers in the Nile Valley and Delta may receive less irrigation water and of lower average quality in the future if these investments are not made.

2.4 Water Pollution

A consensus is emerging in the country that identifies the need to address the deteriorating quality of the country's water supply as a matter of high national priority. A steady increase in population and continuing expansion of urbanized and industrialized areas has meant that water pollution problems are on the rise. Significant quantities of municipal and industrial wastes are presently discharged into the Nile River, canals and drains without proper treatment and cause chemical and biological pollution. Agricultural activities, especially excessive fertilizer and pesticide use and associated run-off, are another source of pollution. Over-pumpage of groundwater, particularly from coastal aquifers or from groundwater reservoirs close to geological formations carrying saline water, is increasing groundwater salinity with negative impacts on land use. The shallow groundwater reservoir of the Delta region is exposed to pollution, especially in its northern part which also faces seawater intrusion. The newly reclaimed areas north and west of the Delta region face similar problems. The aquifer in these areas receives seepage from agricultural drains which are in some cases polluted with industrial and municipal wastes. Untreated rural wastewater also percolates into the groundwater aquifer.

2.5 Stakeholder Participation

Four types of stakeholder participation in water resources management can be identified as desirable: government to government; government to public; public to government; and public to public. Despite ongoing efforts to improve inter-agency communications, coordination between MWRI and other ministries engaged in all stages of water management, from planning and policy development to monitoring and enforcement requires continued improvement to cope effectively with the impacts of rising population and industrial growth. Moreover, some overlaps remain in the policies and practices of different institutions affecting water management, such as agricultural liberalization policies freeing the choice of cropping patterns alongside the presently centralized distribution of irrigation water. Inadequate information dissemination and communication between government institutions and non-governmental stakeholders also is unduly complicating the water distribution process and constraining dialogue on water policies and programs. While the government through MWRI remains responsible for delivery of irrigation water to farmers free of a service charge, farmers have no clear roles and responsibilities for contributing to the planning and management of the irrigation system. Finally, it should eventually be possible for many water management issues to be resolved directly at the local level between organizations representing water users and without much government involvement.

2.6 Public Awareness and Economic Incentives

Awareness on the part of the public is weak regarding the current and growing water shortages and pollution problems facing Egypt. Illegal rice cultivation and unauthorized agricultural expansion and fish farming often are blamed on this poor appreciation of the adverse environmental and social impacts of such actions, but the real problems are related to the economic status of inhabitants, lack of enforcement of existing regulations and the fact that farmers are simply responding to the economic incentives they face. In cities and urban areas, there is widespread evidence of extravagant water use, including the overwatering of gardens and parks, car washing and the spraying of streets with treated municipal water. Again, efforts to address such behaviour must deal with the full range of incentives and applicable information. Where irrigation canals pass through poor villages and towns that lack wastewater treatment and solid waste disposal infrastructure, they generally become polluted from haphazardly disposed liquid and solid wastes and from their use for washing and other functions. Though weak public understanding of the adverse health and productivity consequences of these actions plays a part, improved awareness alone cannot be expected adequately to correct this behaviour. Effective responses will necessitate actions that take into account the complex interaction between economic status, enforcement of water management regulations and the need for appropriate economic incentives to affect individual and institutional behaviour.

2.7 Information Base

Operation of the irrigation network is still largely based on the monitoring of water levels and not flow volumes. Such practices rely on the use of hydraulic relationships between water levels and flows, but deterioration of the network and the changed dimensions of most watercourses over time means that these correlations no longer hold and therefore water volumes in many canals cannot be accurately estimated. MWRI recognizes the importance of volumetric water distribution and has adopted policies to require it. Much has been accomplished however the high cost of system rehabilitation is a constraint on the speed of reaching full implementation. There also are no meters for many groundwater wells, and many of the installed meters do not function properly resulting in a lack of data on groundwater withdrawals which adversely impacts rational planning. In municipal water supply networks, most meters on either the distribution network itself or at outlets do not function, and use rates are estimated based on limited information. Consequently, there is inadequate data on municipal and industrial water use and on the losses within water supply networks. The same applies to data on rainfall and flash flooding, as stations are few, and most of them are antiquated. As for water quality measurements, they too were too few in the past, even along the Nile River and main canals. The available water quality measurements for both surface water and groundwater were for a limited set of indicators/parameters. It has been reported that twenty-five agencies within seven Ministries are involved in water quality monitoring to some extent¹. Free exchange of information between these agencies/ministries does not exist at present.

¹ Recent policy adjustments have resulted in significant improvements in water quality monitoring and improvement is continuing.

2.8 Size of Agricultural Land Holdings

Holdings fragmentation is a significant factor affecting the future of Egypt's agriculture sector, particularly in the Delta region and Nile Valley. Farm size has direct impacts on agricultural production efficiency, marketing, water use efficiency and the income of farm households, who have become one of the poorest sectors nationwide. The average size of land holdings has significantly decreased during the last century. In the 1920s and 1930s average holdings were more than 6 feddan, and this roughly continued to the 1950s. After the Agricultural Reform Law, average holdings decreased to about 3.8 feddan, and present holdings at the national level average about 2.2 feddan. Income differs according to the crops cultivated, but generally the average net return is around L.E. 1,500-2,000/year per feddan. This translates into an annual net return of an average holding at the national level of about L.E. 4,000 or less than L.E. 350/month. This shows clearly that many farm families, in the absence of an ability to switch to higher valued crops, would not be able to cover their living expenses from crop production alone without supplemental income from animal husbandry and outside labour.

2.9 Legislation

As a result of expanding utilization of groundwater and water reuse practices, there is a need for new laws to regulate water uses and protect these vital resources. In addition, some existing laws require revision to reflect present day conditions. The introduction of market-based instruments as policy tools deserves careful attention in these legislative reforms. As noted above, it also is necessary to enhance enforcement of existing water-related laws to reduce their continued transgression. Some examples of current needs and constraints follow:

- There is a need to decrease violations of regulations governing the use of irrigation and drainage water and infrastructure and to make penalties harsher with strengthened governmental monitoring and enforcement.
- There is no communicated policy on groundwater well permits for abstraction from various aquifers that addresses administrative and technical procedures, renewal requirements, specifications for pumps and wells, operational limitations, environmental protection measures, water conservation, and the government's role in supervision, monitoring, program implementation and enforcement.
- Well fields should be declared as protected areas to guard against pollution and over-pumpage, especially in regions that have not yet become polluted like the New Valley, Sharq El Ewaynat and Sinai.
- Law No. 48 for 1982 should be revised and enforcement of its old and new provisions strengthened.
- To keep up with notable field-level progress in implementing programs for water reuse, environmental specifications and guidelines are needed for recycling agricultural drainage water and treated wastewater for different activities, and enforcement of associated health guidelines also needs to be strengthened.

- Despite progress on the ground with pilot activities, there is no clear legislation covering participation of the private sector in water management and services, nor is there any that defines allowable user participation.
- There is no legislation that allows the government and/or user organizations to collect fees for the provision of irrigation services.

2.10 Revenue Generation

To supply irrigation water to the newly reclaimed lands, the irrigation network has been extended eastward to Sinai, westward to the North Coast and southward to Toshqa. These expansions have required huge investments that have not been offset by revenues generated by the agriculture or water sectors as yet. MWRI is in the process of establishing holding companies in these areas to operate and maintain the water delivery system. These companies will generate income through land sales and service fees. The experience gained will provide valuable lessons for Participatory Irrigation Management organizations in future. Moreover, large investments are still required for a variety of capital improvements to the irrigation system. These include: rehabilitation and development of many large water irrigation structures along the Nile River and the main canals as well as small structures like weirs and regulators on many of the branch canals; strengthening of river and canal embankments; maintenance of canals, drains and pumping stations; and surface irrigation improvements. In recent years municipal water supplies have been greatly expanded in the country, but this has been handled through a highly subsidized approach with inadequate provisions for cost recovery. It will be difficult to continue to provide needed investments in the water sector from the government budget, especially with low municipal and industrial tariffs and the absence of a legal basis to assess fees for irrigation water service in both the old and new lands. At present, the government is using grants and loans from donor countries and organizations to complement the available local fund for the major infrastructure investments.

3. Review Of Current Policy And Institutional Reforms

The preceding review of the considerable challenges facing Egypt's water sector indicates the need for attention to the reform of water policies and programs and their associated institutions to improve the basis for sustainable management of the country's most important natural resource. A few years ago, attention was mainly given to water supply management. At present, integrated water resources management, which seeks an efficient blend of all available resources (fresh surface water, ground water, precipitation and drainage water) to meet demands of the full range of water users (including agriculture, municipalities, industry and in-stream flows) is becoming an integral part of MWRI's policy vision to meet these challenges. A more integrated management approach requires much closer coordination among concerned government institutions and the active participation of water users in planning, management and operation of water collection and distribution systems. It also necessitates the establishment/enhancement of the legal basis for water allocation, conservation and protection as well as user participation in water management. Training and capacity building of the MWRI and other stakeholders is also essential to face these challenges, and to be able to manage the ongoing, as well as the anticipated, reform activities of the water policies.

To cope with these challenges, the MWRI has developed a national policy with three major pillars of: 1) increasing water use efficiency; 2) water quality protection; and 3) pollution control and water supply augmentation. Detailed national water resources management and investment plans are now being developed by the National Water Resources Plan Project (NWRP). The MWRI has also initiated over the past few years various activities in collaboration with different donor organizations designed to revise and update water policies and to strengthen key institutions. The ten most significant of these efforts are: the Water Policy Reform Project (WPRP/USAID); the Water Board Project (WBP/Netherlands); Fayoum Water Management Project (FWMP/Netherlands); Institutional and Technical Support Project (INTESP/Netherlands) with the Drainage Authority; the Irrigation Improvement Programs (IIP/World Bank/USAID); the Groundwater Sector Project (GWSP/Netherlands); Strengthening of the Water Quality Unit Project (SWQU/Netherlands); the Institutional Reform Unit Program (IRU, Netherlands); the National Water Quality and Availability Management Project (NAWQAM/CIDA); and the Lake Nasser Flood and Drought Control Project (LNFDC/Netherlands).

Tables 1 through 4 presented in Annex A provide summaries of these policy initiatives classified into four categories: Participatory Irrigation Management (PIM); Institutional Development and Organizational Strengthening (IDOS); Water Quantity Management (WM); and Water Quality Management and Pollution Control (WQMPC). The tables present status, support required and potential constraints to implementation in a simplified format. The current status and main achievements of the various activities are summarized below.

3.1 Participatory Irrigation Management

3.1.1 Recent and Ongoing Policy and Program Reforms

The activities summarized below are also listed in Table 1. Taken together they give a good indication of the significant degree of experimentation underway at present with operationalizing the concepts of participatory irrigation management.

a. **Formation of Water User Associations (WUAs) at the *mesqa* level for operation and maintenance (O&M) of improved *mesqas*** (IIP/USAID/World Bank). According to Law 213 of 1994, users are required to pay for O&M as well as improvement costs. This program is presently underway, and a new program (Integrated Irrigation Management Project, IIMP) covering an additional 500,000 feddan has been approved and will start in early 2003. The new program has a wider technical and institutional scope, as it includes among other activities land drainage improvement, water quality management and formation of water user organizations at the branch canal level (the command area of a branch canal is approximately 8,000-10,000 feddan).

b. **Formation of branch canal water user associations (BCWUAs) in four pilot areas in Salhia, Dakahlia, Behaira and Qena to participate in the management of these canals** (WPRP/USAID). These four associations are basically to act as spokespersons for the farmers and to provide MWRI with suggestions regarding water issues in the area. They are not responsible for the O&M of the system.

c. **Formation of three WUAs for management of deep groundwater wells in the Western Desert** (WPRP/USAID). The government is establishing more WUAs for the management of similar wells, however, there is no legal basis supporting these organizations.

d. **Pilot study to transfer operation, maintenance and management of branch canals to the BCWUAs and/or the private sector** (WPRP/USAID). Four BCWUAs have been formed (different from those mentioned in b above) and a Memorandum of Understanding (MOU) has been signed between the MWRI and the BCWUAs, but transfer is presently waiting for system rehabilitation.

e. **Introduction of Drainage Committees for maintenance of the collectors and to participate in the planning of field drainage systems** (INTESP/Netherlands). The Drainage Committees are regarded as a transitional step prior to establishing Water Boards in the study areas.

f. **Formation of eight pilots Water Boards at the secondary (branch) canal level in the Governorates of Sharkia, Kafr El-Sheikh, Qena and Alexandria** (WBP/Netherlands). The Water Boards are formed from the farmers using these canals to operate and maintain the canals. The Boards are not fully functional yet, as no legal basis for their formation and management exists and no financing mechanism is available for their operation. Farmers' participation in providing O&M costs is not explicitly addressed. The project in collaboration with MWRI is in the process of establishing two more Water Boards, and expansion of the concept to the district level is in the planning stage.

g. **Formation of thirty-two Water Boards at the secondary canal level in Fayoum (FWMP/Netherlands).** The boards are partially functioning particularly for weed control and small rehabilitation works as they are financed from the project. A federation of twenty-two of these water boards is established at a feeding canal level. There is no governmental representation in either the Boards or in the federation, and there is still no legal basis for Water Boards and their operation.

In addition, the different programs of IIP, WPRP, WBP and FWMP for both the water users as well as the MWRI employees have carried out intensive training and capacity building activities.

WPRP prepared a draft amendment to the irrigation and drainage Law 12 of 1982 to allow establishment of water user organizations to participate in the O&M of the irrigation and drainage networks. The draft allows also private companies to participate in water resources management, where the associated cost is to be charged to the end users. The draft is at the People Assembly for review and discussion.

3.1.2 Analysis of Recent Experience with Participatory Irrigation Management

The ministry programs have successfully introduced the concept of water users participation at different levels of the irrigation network starting with the *mesqa* and up to the branch canal. The procedures for forming these organizations has become known to ministry staff, the MOU format between the ministry and these organizations is about to be standardized, and training packages for users organizations and the ministry staff are well formulated.

Still, the level of water users participation remains limited. The average size of a branch canal command area is about 8,000-10,000 feddan. Most of the user organizations still are not functioning, as intended as they do not have a legal standing, and no clear strategy exists regarding their long-term financing. The revision to Law 12 will provide the required legal basis. Due to the nature of this law, MWRI is proceeding cautiously. The proposed revision is under review by the Irrigation Committee of the Peoples Assembly at present and MWRI officials provide clarifications and briefings to the committee periodically. MWRI also continues to meet with stakeholders to explain the revision and to build a consensus.

There also continues to be some confusion over the differences in approach and composition of BCWUAs and Water Boards, with some advocating that the titles and concepts simply be unified. Another alternative is to use the different titles for different levels of the system, for example: WUA (for *mesqa* level), BCWUA, FCWUA (feeding canal WUA), and Water Board at the District level. The Board at this level may include representatives of government institutions and other stakeholders besides farmers. Some of the user organization concepts currently being tested also include water quality. Financing arrangements under consideration include: transfer of part of the MWRI budget; and allowing user organizations to collect land, or other taxes. Only limited consideration has been given thus far to the organization of non-irrigation water users such as municipalities, boat operators, industries and fishing communities. Duplication exists among different donor-supported activities such as WPRP, WBP and FWMP and coordination of efforts could save time and money. This

coordination may be managed through the already existing steering committee in MWRI, which is responsible for coordinating the donors programs and activities.

3.2 Institutional Development and Organizational Strengthening

3.2.1 Recent and Ongoing Policy and Program Reforms

The activities summarized below are also listed in Table 2. this is a more disparate group of undertakings than those associated with participatory irrigation management, but the common theme is reforming government organizational structures to keep up with the changing times. Some related restructuring activities are not listed here but instead are under one of the other reform headings. Though not included here, in some cases the changes underway are more subtle-having to do with altering traditional relationships among key institutions rather than simply the restructuring of organizations.

a. **Public Participation in Decision Making** (WPRP/USAID). According to WPRP recommendations, MWRI issued Ministerial Decree 432 of 2001 to allow public participation in the decision making process. This step was followed with formation of a steering committee in the MWRI headquarters to facilitate public participation, and a series of awareness workshops on public participation have been organized for Ministry staff.

b. **Integrating water management functions at the District level** (WPRP/USAID). MWRI with support from WPRP selected two districts in the Governorates of Sharqia and Gharbia, to implement the District-level integrated water management concept.

c. **Transformation of the Irrigation Advisory Service (IAS) from an extension unit of IIP to a Central Directorate under the MWRI Irrigation Department** (WPRP/USAID).

d. **Institutional Reform Unit** (IRU/Netherlands). This program creates a new unit within the Ministers' Office with four main objectives as follows: 1) coordinate institutional reform at strategic and operational levels; 2) increase awareness and acceptance of institutional reform within, and outside of MWRI; 3) assess effects of institutional reform on irrigated agriculture and on the national economy; and 4) support, monitor and evaluate decentralization efforts and private sector participation initiatives. This program is presently in the startup stage but is expected to result in significant benefits to MWRI's objective of restructuring to meet future challenges.

e. **Legal Review and Revisions to Law 12** (WPRP/USAID). This review of the basic water law covers user and public participation as well as a range of other issues.

f. **Strengthening the Water Quality Unit** (SWQU/Netherlands) Establishment a water quality unit which will be developing and implementing a national policy for water quality management in cooperation with the other relevant institutions inside and outside the ministry.

g. **Groundwater Sector Project** (GWSP/Netherlands) Establishment of the Ground Water Sector (GWS) which is in charge of ground water planning, management and protection activities.

h. **Lake Nasser Flood and Drought Control Project** (LNFDC/Netherlands). The Nile Forecasting Center will be enhanced through new equipment, upgraded software, and training and capacity building for the staff.

In addition to the above, transformation of the (MWRI) Surveying Authority into an economic unit to be self-autonomous and privatization of the drainage pipe factories of EPADP are also underway and represent major institutional changes.

NAWQAM also organized several workshops, attended by MWRI senior staff and other stakeholders, to improve communications and coordination among them regarding several issues including water quality management, water resources planning, guidelines for water reuse practices, water distribution and allocation.

In addition, FWMP introduced the integrated water management concept in Fayoum through a workshop attended by the senior officials of MWRI. The concept is comprehensive and clearly addresses the roles of MWRI, the local government, Water Boards, and the other stakeholders and related governmental institutions. The concept is awaiting implementation, as its implementation requires budget, close coordination between the governmental institutions, public participation and fully functional water boards.

3.2.2 Analysis of Institutional and Organizational Reforms

Establishment of a Central Directorate for Irrigation Advisory Service, the Institutional Reform Unit, the Ground Water sector and the Water Quality Unit represent major future-oriented enhancements of the MWRI organizational structure. These organizational improvements are necessary for the Ministry to face emerging challenges, particularly water shortages and pollution. Among other mandates, the IAS is now overseeing the formation of WUAs, Water Boards and BCWUAs. Also, transformation of the Surveying Authority into an economic unit and ongoing privatization of the drainage pipe factories show the government future trend that is heading toward privatization and revenue generation.

The selection of two new pilot areas with no Water Boards or BCWUAs to implement integrated water management schemes indicates that efforts are still required to cross the gap between what is being practiced at present, which is mainly *integrated water supply management* (i.e., management of canal waters, drainage reuse and groundwater) to what is planned for future which is *integrated water resources management*. Water user participation and close coordination with other governmental and private institutions should be addressed in these pilot areas.

Based on a ministerial decree, the titles of these two pilot districts have changed from “Irrigation District” to “Water Resources and Irrigation District,” and their organizational structure also has been altered to allow all ministry activities that exist in the district (GW,

reuse stations, irrigation and drainage canals, etc) to be overseen by the District manager. The water resources engineers and the other staff indicated in the new organizational chart have been appointed, and both districts are in operation at present. It is also planned to expand this experience under the INTESP in collaboration with the WBP in order to expand Water Boards involvement in integrated management practices.

Public participation should occur at all levels, and permanent forums need to exist at each level to ensure that two-way communication channels are open between the public and government organizations involved in water management. WBs and BCWUAs cannot function efficiently without full coordination with all concerned governmental institutions. The same also applies to integrated water management districts, in which all available resources are to be utilized for satisfying the water needs of the different use sectors. Without full cross-sectoral cooperation, major problems will be faced in allocating the appropriate water quantity and quality for different uses, especially under the anticipated forthcoming conditions of water shortage.

A number of issues and suggested improvements discussed above will be addressed by the IRU when it becomes fully operational. In addition, it is expected that the IRU will initiate a number of efficiency enhancing measures related to policy integration and implementation.

3.3 Improved Water Quantity Management

3.3.1 Recent and Ongoing Policy and Program Reforms

The activities summarized below are also listed in Table 3. They represent the most notable recent efforts to improve the efficiency of water use, especially in the agriculture sector and also indicate the increasing attention being given to conjunctive use of surface and groundwater resources.

a. Matching irrigation water deliveries with water demands by crop (WPRP/USAID). WPRP helped MWRI establish a system to improve the exchange of real-time information with MALR with respect to irrigation demands and supplies. The system requires agricultural cooperatives and administrations to collect real data from farmers on cropping pattern and calendar, and to deliver this information, on a biweekly basis, to the district irrigation engineers. The district engineers are to compute the corresponding water requirements and request the General Director of Irrigation to provide the required amounts of water. This system is helping the government to avoid shortages in water delivery or releasing irrigation water in excess of actual needs and it already has been established in about 70 irrigation districts distributed all over Egypt.

b. Substituting short-duration for long-duration rice varieties to save irrigation water (WPRP/USAID). WPRP helped MWRI in cooperation with MALR to save a considerable amount of irrigation water through substitution of short duration rice varieties for long duration rice varieties among private commercial growers. Short duration rice varieties have been introduced in all governorates that are permitted to grow rice. New irrigation rotations

were developed and adapted for these varieties, which remain in the land for only 120 days instead of 160 days for the long duration varieties.

c. **Increased sugar cane irrigation efficiency (WPRP/USAID).** WPRP helped MWRI in cooperation with MALR to arrive at a strategy to optimize water use in sugarcane through improved irrigation practices.

d. **Transition from water level-based to volume-based irrigation water management (WPRP/USAID).** Based on advice from WPRP/USAID, MWRI agreed that allocation, distribution and control of water would change from a canal level basis to volumetric at the directorate and inspectorate levels. Two ministerial decrees were issued to establish this policy, which requires volumetric flow distribution and measurement at all water control structures dividing directorates (first decree) and at points separating inspectorates and districts (second decree). At present, volume-based water distribution is taking place at all locations that separate directorates, while 2 out of 22 directorates are using volume-based distribution. The remaining directorates are at different stages of implementing the new policy.

e. **Increasing the reuse of water from intermediate drains to augment irrigation supplies (WPRP/USAID).** WPRP helped MWRI in establishing the basis for a new policy to promote drainage water reuse through appropriate incentives and technical support. The associated reforms included: adapting intermediate drainage reuse (IDR) to cope with the pollution problems of the main drains; recovery of drainage operation and maintenance cost; and encouraging the involvement of private sector in drainage services. MWRI is currently formulating a plan for implementing IDR nation-wide, and as a pilot phase, MWRI has recently funded a program to construct 51 IDR pump stations in 10 irrigation directorates.

f. The draft amendment of law 12 (WPRP/USAID) covered various water quantity management issues such as expanding the use of ground water, improvement and modernization of surface irrigation system on the old lands and harsher penalties for low violations.

In addition, WPRP/USAID assisted the MWRI in developing a management scheme to optimize utilization of the free flowing ground water in the Western desert. The free flowing ground water wells in Farafra area have been controlled and storage facilities for excess flow were provided. The newly established Ground Water Sector will lead to better management of the ground water resources. The LNFDC/Netherlands also will help MWRI with developing strategies and policies for flood and drought management under different scenarios for climate change. The IIP succeeded in supporting the MWRI efforts to remove the water supply constraints through the rehabilitation of the physical system for reducing the conveyance losses, and through the integration of the water resources with each other and with drainage.

3.3.2 Analysis of Water Quantity Management Efforts

Improved collaboration between MWRI and MALR to increase water distribution efficiency utilizing up-to-date information transfer technology represents a significant improvement in both ministry's operations. However, there should be a plan to include the water users organizations in this process in future. These organizations will be doing the planning for the cropping pattern in coordination with MWRI and according to the water availability conditions, and tapping into the WUAs of WBs for cropping information is a desirable next step in this effort.

Volumetric water allocation will improve efficiency as well as reliability of the water distribution process. However, limitations on the rate of application of the new policy at the inspectorate level are reducing its potential impacts on irrigation network operations. On the other hand, if water users organizations are to manage the branch canals/feeding canals in the near future, then the pace of implementing volumetric water allocation to these canals should be accelerated.

Intermediate Drainage Reuse (IDR) is useful in expanding drainage reuse practices as a way of bypassing the problems previously encountered in trying to tap into the polluted main drains. IDR however, may be difficult to manage, monitor and control. The new policy also has not yet addressed the role of water user organizations in managing these reuse stations, and who will bear the capital as well as O&M costs.

It is not clear from the sugar cane policy how implementation will be sustained and who will bear the cost of irrigation improvements at the field level and the role of water user organizations as well as other related stakeholders.

The expected outcomes of the GWSP and LNFDC should improve the overall management of the water resource system in Egypt. It is necessary, however, to speed up development of the needed legislation for GW protection and conservation as noted above. Most of these legislations are included in the draft amendment of law 12, which is presently under review at the Peoples Assembly.

3.4 Water Quality Management and Pollution Control

3.4.1 Recent and Ongoing Policy and Program Reforms

The activities summarized below are also listed in Table 4. There is little question that concern over and steps being taken to address water quality problems is the most significant recent shift in policy thinking within the water sector. The activities listed below show that a widening effort is now underway to fully incorporate water quality considerations into both water sector and broader economic development policies.

a. **Ensure legal basis for effective water quality management** (WPRP/USAID). WPRP Prepared a draft amendment of Law 48 of 1982 to clearly define the roles of the relevant ministries with respect to licensing procedure, amend effluent discharge standards, and ensure more effective water quality control on irrigation and drainage water courses. There are still concerns among governmental institutions regarding the proposed effluent discharge standards.

b. **Including environmental considerations in all MWRI activities** (WPRP/USAID). To improve environmental management of water resources, WPRP helped MWRI formulating a multi-phase policy for strengthening and integrating the environmental dimension in the ministry activities. The policy implementation has started in January 2002. MWRI is establishing the infrastructure to facilitate implementation of this policy.

c. **Improved management of urban wastewater** (WPRP/USAID). WPRP helped MWRI formulating a policy for improved management of discharge and reuse of urban wastewater in agricultural drains. The policy addresses priorities for wastewater treatment, recommendations for controlling pollution of the waterways, and mechanisms for improving coordination among concerned authorities. Priorities for investments in wastewater treatment plants were developed and adopted by MWRI and NOPWASD in El-Salam canal pilot area.

d. **Improving the water quality information management system** (NAWQAM/Canada; MADWQ/Netherlands). NAWQAM has helped the ministry in expanding the water quality-monitoring network, and in developing guidelines for reuse of drainage water. These guidelines are still under review and discussion.

The newly established Water Quality unit is expected to contribute to refining and implementing the national policy for water quality management in cooperation with the other relevant institutions inside and outside MWRI. The unit, as supported by SWQU, will also develop an inter-ministrial coordination mechanism and provide coordination and integration of all MWRI water quality activities.

3.4.2 Analysis

The achievements made through these recent initiatives reflect the growing attention being given to the water pollution problem, particularly the concern over agricultural drains. One of the greatest difficulties in addressing the water quality issue is that multiple ministries and institutions are involved. Coordination among these institutions is essential for managing and/or control of water pollution. Another constraint is the huge public and private investment required for the reduction/minimization and/or treatment of waste disposal. WPRP succeeded in assisting the ministry to coordinate with NOPWASD to identify priorities for construction of wastewater treatment plants, which helped MWRI to proceed with its plans of expanding drainage water reuse practices and securing the required irrigation water supply for El-Salam Canal mega project.

The financial side of the water quality control issue has not been addressed, though a recent WPRP/USAID-sponsored analysis of potential applications for market-based instruments (EPIQ Report No. 57) gives some hope for simultaneously improving incentive structures

and generating revenues. The appropriate division of public and private cost burden for municipal wastewater treatment also demands resolution.

The draft amendment of Law 48 of 1984 has not yet been submitted to the Cabinet or People's Assembly for approval due to the present concern that exists among stakeholders on the amended standards of the effluent discharges. SWQU can help in this regard by reviewing this law in coordination with the stakeholders to arrive at a mutual agreement on the quality standards as well as on the institutional arrangements and responsibilities for water quality control and management.

There are several in depth studies ongoing related to public and stakeholder participation in water resources planning and management (FWMP, NAWQAM, SWQU, and INTESP), and the WPRP has initiated efforts to improve public participation in environmental dimensions of water resources planning (including environmental impact assessment procedures). Enhanced coordination among these projects should achieve improved results.

The guidelines for drainage water reuse will be very useful to the country, given that the ministry plan is to annually reuse up to 9 bcm of this resource.

4. Roundtable Discussion

4.1 Background

Following the submission of the draft report of this study, a roundtable was held in Cairo on Thursday the twenty sixth of September to discuss the study's preliminary findings and conclusions. H.E. the Minister of Water Resources and Irrigation, the Chairman of the Steering Committee of WPRP, representatives of USAID, senior officials of MWRI, and the study team attended the roundtable. The team leader of WPRP moderated the roundtable discussions. A list of attendees is provided in Annex B along with the agenda and copies of the presentations. The roundtable consisted of five sessions; namely the opening session and four plenary sessions for the discussions of the study findings in the four policy areas of the ministry policy initiative programs and projects. The opening session consisted of three opening statements by: the Chairman of the Steering Committee of WPRP, USAID and H.E. the Minister. These statements were followed by a brief overview of the study methodology and results by Dr. Mohamed Nasr Allam. The four policy areas, as stated earlier in the report, are: Participatory Irrigation Management; Institutional Development and Organizational Strengthening; Water Quantity Management; and Water Quality Management and Pollution Control. The main comments, conclusions and recommendations addressed at each session, are presented below.

4.2 The Opening Session

The statement of the Chairman of the Steering Committee was focused on the objectives of the study and the roundtable discussions as well as on the next steps to follow. The objectives were identified as assessment of the implementation status of the policy adjustment programs in the ministry, issues and potential constraints; and the need to integrate, prioritize and develop integrated implementation of approved policies. As next steps, the statement emphasized the urgent need to begin a process of serious thinking and discussion on how the ministry should proceed in the future, and to identify the best models tested in the pilot areas to proceed with implementation nationwide.

USAID statement emphasized the importance of this study as a first step toward integration of the ministry's policy programs and activities. It also addressed the next USAID program with MWRI, which will be focusing on water policy integration across ministries.

H.E. Dr. Abu Zeid, the Minister of Water Resources and Irrigations, emphasized the importance of the study in reviewing the ministry progress in the policy area, identifying gaps and issues and provision of guidance for the future implementation of the policy initiatives nationwide. H.E. addressed several issues and recommendations, which may be summarized as follows:

- The ministry at present is in a transition stage, which will continue for several more years. During this period however, pilot and national scale implementation for some policy areas can be carried out.

- The next step is to integrate the ongoing policy programs into one package at the ministry and/or the water sector level.
- It is important to have another roundtable in the near future to include other donors and stakeholders to participate in a similar discussion.
- Capacity building, human resources development, and training are critically important for the ministry staff to cope with the ongoing as well as the anticipated policy and institutional reform programs.

Beside several clarification questions, there were a number of comments on the overview presentation. These comments may be itemized as follows:

- The Institutional Reform Unit (IRU) should be added to the other ministry policy initiatives that are addressed in the study (this comment has been incorporated in this paper).
- The policy programs should place more emphasis on the desert areas, which have different water issues and socio-economic and environmental conditions.
- The study could benefit from the results of a similar analysis that was carried out by the Advisory Panel Project (APP), few years ago.
- How the ministry may proceed from here regarding the development of the integrated water resources management policy package is important.

4.3 The Participatory Irrigation Management Plenary Session

In this session, there was a lengthy discussion on the different models the ministry initiated for PIM, overlapping, financial sustainability and legislation. The major comments and recommendations that were addressed in this session may be summarized as follows:

- Different participatory irrigation management models are needed to reflect the essential differences between: the old land, new land and mega projects. These models could be different in the level of participation, stakeholders, and financing sources and mechanisms.
- Formation of water user organizations for drainage is not feasible, and farmers' participation should be through one of the already piloted and tested associations (WB and BCWUA).
- PIM organizations should not be governmental but private, and should be self financing and responsible for the O&M of their systems.
- Water allocations and water trade concepts are questionable for the Egyptian conditions and need further study.
- PIM is accepted by GOE and therefore is a national policy, but still more time is needed to arrive at the adequate models which suits the local conditions. The recommended models may be tested in two governorates, one in the old valley and the other in the new valley (HE the minister).
- The delay in amending law 12 is due to the submission of the draft amendment for comments to several related governmental institutions and universities, and to the irrigation and agricultural committee in the people assembly. To date, several institutions have not sent their comments. This participatory approach

will facilitate approval of the law when it is taken up in the Peoples Assembly (H.E. the minister).

- It was suggested that the term Participatory Irrigation Management be changed to Participatory Water Management (although this suggestion has merit, it was not adopted within this paper).

4.4 The Institutional Development & Organizational Strengthening Plenary Session

Most of the discussions in this session were on the required capacity building and human resources development for the ministry staff. A summary of these comments is as follows:

- The training packages associated with most of the policy programs are small and not adequate for the ministry's long-term needs.
- The ministry had prepared a training needs assessment that was submitted to USAID one year ago with no response to date.
- The ministry should investigate the Utah State University training modules for training of the engineers as well as the technicians. These modules are available on the Internet in English and in Arabic (USAID).
- The ministry should dialog with universities to discuss curriculum and the need to update to match the ongoing evolution of water resources management concepts and policies.
- Coordination of the donors programs and activities is required to avoid overlapping and maximize the benefits.
- H.E. the minister will form an internal committee to update the needs assessment, to be used for developing a training plan, which will be submitted to the donors for possible funding.

4.5 Water Quantity Management Plenary Session

Most of the discussion in this session was on the management problems of the irrigation network. Problems addressed are:

- Users violations and the harsher penalties proposed in the draft amendment of law 12.
- The increasing banana cultivated areas along Cairo-Alexandria road (estimated as 30,000 feddans). High fees are considered for such activity to encourage the investors to grow less water intensive crops.
- Modern irrigation methods are used in the newly developed land, but still there are some violations that need to be stopped.
- Most of the farmers are intensifying their cropped areas; two or more cultivations per year and growing crops between the fruit trees. This intensification increases the agricultural water consumption.

On the other hand, there were some comments and recommendations regarding water allocation, which may be summarized as:

- MWRI should only allocate water among sectors and among regions, where local allocation should be left to the water user organizations. MWRI however, should be monitoring and supervising the local allocation and management.
- Allocation should reflect the economic value of water use.
- Agriculture production for meeting the household need, should have a high priority in water allocation.
- Utilization of the brackish groundwater for fish farms in the north coast and in the desert areas need to be encouraged. A high consideration should be given to the mitigation of the environmental impacts of such activity.
- Prohibition of using fresh water for fish farms should be revisited and evaluated. Recently, a private investor in the western Delta, has tried using the groundwater in fish farms before being delivered for irrigation. It was found that irrigation with the discharge from fish farms increases agricultural productivity (H.E. the minister).

4.6 Water Quality Management and Pollution Control

Most of the discussion in this session was on the importance of having better coordination among the different institutions and stakeholders involved in the water quality management. It is hoped that the newly established Water Quality Unit will help in this regard, for better monitoring, and law enforcement. Other comments are:

- Impose fees on the effluent discharge to the watercourses.
- Add the cost of treatment and quality improvement of the water supply, to the nominal price of the new land.
- The need to finalize the drainage reuses guidelines.
- Intensive training in enforcement of Law 48 is needed for MWRI field staff

5. Conclusions and Recommendations

5.1 Conclusions

There is little doubt that the new MWRI policies and programs of the past few years have successfully introduced several improved management concepts and approaches which will enhance the overall performance of the country's water resources management system. These concepts include: participatory irrigation management; stakeholder engagement and public participation; integration of environmental considerations into water resources planning and management; improved coordination approaches between institutions utilizing modern information technology; market-based instruments for improved water use efficiency and water quality management. Other significant achievements have been the establishment of the Irrigation Advisory Service, the Groundwater Sector, the Institutional Reform Unit and the Water Quality Unit.

Apparently there are some overlaps and duplication among some of these programs, particularly in the areas of stakeholders' participation, water user organizations, and water quality management. Also, the introduced policies and concepts have not been effectively coordinated or linked to each other. This probably is due to the nature of these programs, as most of them are focusing only on few issues and are designed in a way that they cannot easily be linked to each other.

Though there has been considerable experimentation with and acceptance of approaches to improve water users' participation in water policies and programs, no clear consensus has yet emerged on how best to operationalize these concepts. Also, most of the discussion about user organizations has been those in the agriculture sector, with fishers, cruise ships, urban users, industries and others not yet fully considered. As higher levels such as district or directorate levels are included, a much wider range of users will need to be involved.

An intensive capacity building program is required to prepare MWRI staff to function effectively as the ministry's role and responsibilities change in the future. Management leadership, social sciences and strategic planning training is required in addition to technical and research skills.

5.2 Recommendation

The recommendations provided below are related to: 1) Policy overlaps, constraints and conflicts between policies; 2) actions that will improve implementation of policies adopted recently; and 3) suggested new policies. The recommendations are the result of the study and from feedback obtained at the MWRI/USAID Roundtable discussion held at the conclusion of the study. The following were considered as "givens" when framing the recommendations:

- ◆ Participatory Irrigation Management is sanctioned as a national policy.
- ◆ Participatory Irrigation Management organizations should be self-financing within a reasonable timeframe after their formation.

- ◆ MWRI's responsibilities and role will be quite different in future from today and therefore capacity building requirements are different than in the past.
- ◆ Changes in water quantity and quality management will be required that will significantly impact the various water use sectors.
- ◆ The next step is to develop a detailed strategy for integrated water resources management that integrates the ministry's policy programs, fills the policy gaps and prioritizes policy implementation activities.

The recommendations resulting from the study and considering the above mentioned "givens" are:

1. Water Boards (Dutch program) are practicing the integrated district concept and two pilot Integrated Water Management Districts (USAID Program) are ongoing. It is recommended that an information sharing and exchange mechanism be established to integrate these two policy efforts.
2. Both the Water Boards and Irrigation Management Transfer programs have pilot programs in old lands, new-old lands and new lands. It is recommended that these two programs exchange information and coordinate more closely on common issues in future. It is further recommended that a pilot program be established in one of the mega projects.
3. The INTESP (Dutch program) should better coordinate with the Water Board project to establish WBs instead of the Drainage Committees in the piloted areas.
4. Prepare a comprehensive capacity building Needs Assessment including, where possible, preferred sources of training (H.E. Minister Abu-Zeid announced at the Roundtable that this would be done).
5. Assign a Task Force to assess the Utah State University Internet training modules for relevance and applicability to meet a part of the MWRI's capacity building needs.
6. Conduct a study to identify feasible scenarios by which Participatory Irrigation Management organizations may become self-financing within a reasonable timeframe after assuming responsibility for O&M of the system within their geographic area of responsibility.
7. Public awareness is an issue that cuts across all policy initiatives and is very much needed. It is recommended that MWRI prioritize issues and develop an integrated public awareness program to meet the priority needs within available resources.
8. It is recommended that MWRI study and define a near-term water quality enforcement strategy and plan including a capacity building plan.
9. Accelerate implementation of the Stakeholder Participation in Decision-Making policy with emphasis on issues related to implementation of existing policies and formulation of new policies.
10. It is recommended that MWRI consider studying the following issues for possible inclusion in future policy adjustment efforts:
 - ◆ How to treat new requests for non-traditional water uses such as aquaculture, new crops on new lands, and new industries with high water demands. Impacts on present water users; appropriate fee structure if considered appropriate (similar to the fees charged in the mega projects) and impact on the environment are all factors requiring study.

- ◆ Establishment of a water allocation system that is consistent with the law, the national policy and the needs of Participatory Irrigation Management organizations presently being formed.
- ◆ Industrial wastewater discharge fees (polluter pays).
- ◆ Cost reimbursement by users for treatment of reuse water used to supply their needs.

ANNEX A

ANNEX B

APRP Water Policy Reform Program
Policy Study Roundtable - 26 September, Cairo

Participant List

H.E. DR. MAHMOUD ABU-ZEID, MINISTER OF MWRI

STEERING COMMITTEE

1. Eng. Gamil Mahmoud.
2. Dr. Mona El Kady.
3. Eng. Mohamed El-Amir Osman.
4. Dr. Fatma Abdel Rahman
5. Eng. Adel Hashem
6. Dr. Hussien El Atfy
7. Eng. Mostafa Nada
8. Dr. Ross Hagan
9. Mr. Andrew Tczap

WPAU/EPIQ

10. Eng. Sarwat Fahmy
11. Eng. Nasser Ezzat
12. Dr. Mohamed Allam, consultant

USAID

13. Mr. Anthony Vance
14. Ms. Dawn Thomas
15. Dr. Wadie Fahim Mankarious
16. Mr. Ron Daniel

MWRI

17. Eng. Nabil Fawzy
18. Eng. Abdel Rahman Shalaby
19. Eng. Yehia Abdel Aziz
20. Dr. Shaden Abdel-Gawad
21. Eng. Hussien Elwan
22. Dr. Hassan Amer
23. Dr. Samia El Guindy
24. Dr. Hesham Kandil
25. Dr. Mohamed Abd El Khalek

MWRI POLICY INTEGRATION STUDY
ROUNDTABLE DISCUSSION AGENDA

- 8:30 – 9:00** **ARRIVAL (REFRESHMENTS AVAILABLE)**
- 9:00 – 9:30** **WELCOMING REMARKS**
- Mr. Andrew Tczap, Moderator
Eng. Gamil Mahmoud, Chairman WPRP Steering Committee
H.E. Minister Mahmoud Abu-Zeid
- 9:30 – 10:30** **STUDY OVERVIEW**
- Dr. Ross Hagan - Study Objective
Dr. Mohamed Allam - Study Overview
- 10:30 – 11:00** **BREAK**
- 11:00 – 12:00** **PARTICIPATORY IRRIGATION MANAGEMENT (PIM)**
- A. Tczap - Analysis & Moderator
Plenary Discussion
Summary of Discussion
- 12:00 – 13:00** **INSTITUTIONAL STRENGTHENING**
- A. Tczap - Analysis & Moderator
Plenary Discussion
Summary of discussion
- 13:00 – 14:30** **LUNCH**
- 14:30 – 15:30** **WATER QUANTITY MANAGEMENT**
- A. Tczap - Analysis & Moderator
Plenary Discussion
Summary of Discussion
- 15:30 – 16:30** **WATER QUALITY MANAGEMENT**
- A. Tczap - Analysis & Moderator
Plenary Discussion
Summary of Discussion
- 16:30** **CLOSING**