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Junier S. (ed.), El Moujabber M. (ed.), Trisorio-Liuzzi G. (ed.), Tigrek S. (ed.), Serneguet M. (ed.), Choukr-Allah R. (ed.), Shatanawi M. (ed.), Rodríguez R. (ed.).
Dialogues on Mediterranean water challenges: Rational water use, water price versus value and lessons learned from the European Water Framework Directive

Bari : CIHEAM
Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 98

2011
pages 169-179

Comparative analysis of Egyptian Water Policy and Water Framework Directive

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Abstract. Water is a finite resource and it is imperative that all nations have sound policies and plans for its exploration, development and use, to meet the requirements of all users. There are two categories of water policies in Egypt; water development policies and water allocation policies. The objectives of this paper are to highlight the main issues considered in the Egyptian Water Policy (EWP), and the water notes addressed by the Water Framework Directive (WFD). Moreover, the paper presents a comparative analysis of the similarities and differences between the EWP and the WFD adopted by the European Union. The analysis shows that protection of water bodies from pollution, as well as water quality monitoring programs are the main similarities between the EWP and the WFD. Specific similarities and differences are listed in the paper. In general the Egyptian Water Policy addresses the same issues as the WFD although some, for instance cost recovery, are dealt with in a different way. A recommendation is that more attention should be devoted to climate change issues in any new water policy.

Keywords: Water management – Water availability – Water use – Policies

Analyse comparative de la politique égyptienne de l'eau et de la directive-cadre sur l'eau

Résumé. *L'eau est une ressource limitée et il est impératif que tous les pays appliquent des politiques et des planifications rigoureuses en matière d'exploration, de développement et d'utilisation de l'eau, afin de pouvoir répondre aux demandes de tous les utilisateurs. L'Egypte connaît deux catégories de politiques de l'eau : les politiques de développement de l'eau et les politiques de répartition des ressources en eau. L'objectif de ce document de réflexion est de mettre en avant les principales problématiques qui ressortent de la politique égyptienne de l'eau (PEE) et des notes abordées par la directive-cadre sur l'eau (DCE). Ce document de réflexion présente également une analyse comparative des similitudes et des différences entre la PEE et la DCE adoptée par l'Union européenne. L'analyse montre que la protection des plans d'eau contre la pollution ainsi que les programmes de surveillance de la qualité de l'eau constituent les principaux points communs entre la PEE et la DCE. Des similitudes et différences spécifiques figurent dans le document de réflexion. De façon générale, la politique égyptienne de l'eau aborde les mêmes problématiques que la DCE, bien que certains aspects, tels que le recouvrement des coûts, se caractérisent par une approche différente. Une recommandation est que les problématiques du changement climatique devraient faire l'objet d'une attention plus soutenue dans toute nouvelle politique en matière de ressources en eau.*

Mots clés: *Gestion des eaux – Eau disponible – Utilisation de l'eau – Politique*

I – Introduction

Water resources in Egypt are becoming scarce. Surface-water resources originating from the Nile are already fully exploited and groundwater sources are being brought into full production. Egypt is facing increasing water needs, caused by a rapidly growing population, an increased urbanization, higher standards of living, and by an agricultural policy which focuses on increasing production in order to feed the growing population. Improved planning and management procedures to develop, allocate and use water are key measures generally prescribed to make the optimum use of available water. Dr. Abu-Zeid, chairman of Egypt's Water Research Centre points out that 'satisfying future demands in Egypt depends on better utilization and efficient use of present water resources. Optimal water management is an essential prerequisite for sustainable development of Egypt' (Hvidt 1995).

Life in Egypt is based on Nile water. Availability of water, in both quantitative and qualitative terms, is a basic human right and sound planning is necessary to ensure it. Without any water policy, all our activities would be conducted on the basis of our experience and expediency. However, we have come to realize that water is not an infinite bounty of nature. Rather it is a finite resource and it is imperative that we have sound policies and plans for its exploration, development and use to meet the requirements of all users (MWR-Bangladesh 1999). The objectives of this paper are to highlight the main issues considered in the Egyptian Water Policy (EWP), and the water notes addressed by the Water Framework Directive (2000/60/EC; WFD) that has been adopted by the European Union. Moreover, the paper presents a comparative analysis of the EWP and the WFD.

II – Review of the Egyptian water policy

There are two categories of water policies in Egypt, Water Development Policy which is an action affecting the increase of quantities of water available for distribution and use; and Water Allocation Policy that is defined as action affecting the distribution of given quantities of water among different uses and users (Abdin and Gafaar, 2008).

Historically several policies have been formulated in Egypt to manage the water resources. Following is a list of these polices from 1975 till 2002.

1. Water Policy for the year 1975
2. Water Policy for the year 1980
3. The Egyptian Water Master Plan, year, 1982
4. Water Policy for the year 1986
5. Water Policy for the year 1990
6. Water Security Project, 1993
7. Water Policy for the year 1999
8. The National Water Resources Policy (NWRP 2005)

Those polices have lead to many important projects such as:

1. The construction of new barrages at Isna, Nag-Hammadi and Assiut along the course of the Nile with the purpose of expanding its cultivated area and to increase the cropping intensity.
2. the Aswan Dam and its rehabilitation, and the construction of Gabal Awlia Dam in Sudan which increases water storage capacity to enable the country to convert more than half a million feddan (a feddan is 0.42 hectare) in the Upper Egypt from basin to perennial irrigation.
3. Financing the rehabilitation of the Owen Falls Dam in Uganda to make use of the additional quantities of water to increase the cultivated area.

Recent water resources policies include different structural measures such as rehabilitation of irrigation structures, improvement of the irrigation system, installation of water level monitoring devices linked to telemetry systems, improvement of the drainage system, etc. Several non-structural measures have also been implemented, including the establishment of the irrigation advisory service and the expansion of the water users association (WUAs) for ditches and mesqas[1], the establishment of water boards on branch canals, the promotion of public awareness programs as well as the involvement of stakeholders. Laws and legislation are also considered to be non-structural measures.

III – The National Water Resources Plan (NWRP)

This section describes in some detail the latest water policy (1997-2017) emerged from the NWRP project. The planning horizon covers a period of 20 years until the year 2017. A more integrated management approach is adopted herein, which requires a much closer coordination among the concerned government institutions and the active participation of water users in planning, management and operation of the water distribution system. It also necessitates the establishment/enhancement of the legal basis for water allocation, conservation and protection as well as user participation in water management (ICID, 2005). The main objectives of this policy are to improve the utilization efficiency, water productivity, and protection of water resources in Egypt. The new water policy considers both water quality and water availability to achieve a match between water supply and demand, both spatial and temporal, (NWRP, 2005).

The NWRP describes how Egypt will use its water resources in a sustainable and responsible way from a socio-economic and environmental point of view. With the rapid growth of population and new land development for agriculture, there is a threat of more pollution. There is a need therefore to (i) reduce water use (demand management), (ii) optimize the supply (supply management), and (iii) abate water pollution (pollution control). The drafted plan also comprises of an investment plan, completed in March 2004. The plan addresses all water related activities and considers both the technical, managerial and institutional interventions. Important decisions on allocation of resources and priority setting of interventions are indicated.

1. Water Pollution

The Egyptian Water Policy (EWP) strives towards enhancing water quality that is threatened by the steady increase in population and the continuing expansion of urbanized and industrialized areas. Also, 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. In addition, agricultural activities, especially excessive fertilizer and pesticide use and associated run-off, are a source of pollution (Fahmy *et al.,* 2002). The EWP suggests a number of protection measures for water quality that will mainly focus on keeping poor quality waters separated from good quality waters, which will maximize the localized drainage water reuse. Tremendous efforts are required to prevent untreated domestic water and industrial water from discharging into drainage networks, as it is recommended to apply intermediate drainage reuse (Elwan, 2006).

Over-pumping 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.

As a result, the Egyptian government has been increasingly concerned about the protection of the Nile and other water bodies. Laws and legislation have been passed to ensure the sustainability of water resources development and use, including the definition of suitability of water quality for each specific use, and the control of water pollution. The most important of these laws are Law 48/1982, relating to the protection of the Nile and other waterways from various sources of pollution, and Law 4/1994 on protection of the environment. Pollution control is also being achieved by establishing the water quality-monitoring network (NAWQAM, 1998) along the irrigation and drainage systems, as well as in groundwater wells.

2. Water Allocation

A number of policy measures and considerations that affect overall water use efficiency, water allocation, and its effect on quality can be stated as follows (NWRP, 2005):

- Improvement of irrigation efficiencies and drainage conditions in prioritized areas (i.e. areas overlying or adjacent to salt sinks, and where reuse of drainage water is not recommended).
- Gradually introduce modern irrigation techniques to replace traditional irrigation methods.
- Prioritization of drainage water reuse in areas where;
- drainage water would otherwise flow to sink,
- the least harm is done to other downstream users, and
- Groundwater is least vulnerable to pollution.
- Local reuse of drainage water in the upstream stretches will result in less accumulation of salt and pollutant concentration at the downstream ends.
- Reuse of drainage water policy should be reviewed, considering the application of intermediate reuse at appropriate locations.
- Water allocation should be de-centralized based on equal opportunities for farmers within the same region, and be based on a set annual amount per feddan.
- Improvement of the infrastructures for proper water distribution, and installation of upstream discharge regulators and control structures at key points of the irrigation system.
- Promoting the use of non-conventional salt tolerant crops and fish farming.
- Separating return flows of low quality water from fresh water, and forcing municipal and industrial users to treat effluent before discharging into the drainage system.

Within the 1997-2017 policy the water savings were assumed to come from the following interventions:

- Change of cropping pattern (mainly reduction of rice area).
- Increased reuse of drainage water.
- Increase of the area covered by irrigation improvement projects.
- Reduced amount of drainage water flowing to the Mediterranean Sea.
- Increased exploitation of deep groundwater.
- Increased reuse of treated sanitary sewage and treated industrial effluent.
- Increased production of desalinated water.

IV – Review of the Water Framework Directive

This section gives an introduction and overview of key aspects of the implementation of the Water Framework Directive (WFD). It is a European Union directive which commits European Union member states to achieve good qualitative and quantitative status of all water bodies (including marine waters up to a kilometer from shore) by 2015. It is a framework in the sense that it prescribes steps to reach the common goal rather than adopting the more traditional limit value approach. To achieve good water status both the ecological status and the chemical status of a water body need to be at least good (WFD).

The European Commission, division Environment, published twelve "Water Notes" (http://ec.europa.eu/environment/water/participation/notes_en.htm) to inform about the key aspects of WFD implementation. We use these notes as the basis of our discussion of WFD and the comparison with water policy in Egypt.

Water note 1: Joining forces for Europe's shared waters - Coordination in International River Basin Districts (IRBD)

After setting up administrative structures, the next step in implementing the directive was the environmental and economic analysis of river basins, to be completed in 2005. In many IRBD, this meant bridging different national traditions in water management. For example, while some countries already used a river basin approach, others did not.

Water note 2: Cleaning up Europe's waters - Identifying and assessing surface water bodies at risk

By designating separate water bodies along the course of a river, Member States can focus their monitoring activities on problems affecting specific water bodies. They can then tailor measures to improve conditions in the water bodies at risk. Governments, stakeholders and the public will be able to track the progress of these measures to improve the status of the bodies at risk. This strategy assures rational applications of effort on urgent water qualities.

Water note 3: Groundwater at Risk - Managing the water under us

Groundwater provides the steady, base flow of rivers. Maintaining this flow and keeping it free from pollution is vital for surface water ecosystems. Groundwater is also a crucial source of drinking water, supplying the water systems used by three out of four EU citizens. In order to delineate individual groundwater bodies, Member States share monitoring data and scientific knowledge to analyze underground geology.

Water note 4: Reservoirs, Canals and Ports - Managing artificial and heavily modified water bodies

The directive allows Member States to designate some of their surface waters as heavily modified water bodies or artificial water bodies whereby they will not need to meet the same quality criteria required of other surface waters. An artificial water body is defined as a body of water created by human activity, while a heavily modified body is a water body that has undergone man-made alterations that have substantially changed its character.

Water note 5: Economics in Water Policy - The value of Europe's waters

Two key economic principles have been introduced, first, WFD requires water users – such as industries, farmers and households – to pay for the full costs of the water services they receive; second, the directive calls on Member States to use economic analysis in the management of their water resources and to assess both the cost-effectiveness and the overall costs of alternatives when making key decisions. Other benefits of clean water are more difficult to measure.

Water note 6: Monitoring programs - taking the pulse on Europe's waters

Monitoring is the main tool used by Member States to classify the status of each water body (a water body is a section of a river or other surface water or a distinct volume of groundwater). The directive sets a five-class scale - high, good, moderate, poor and bad status - and it requires Member States to achieve good status in all waters by 2015. The directive sets a common approach for monitoring water quality across all Member States, but does not specify the methods to be used. It is up to Member States to decide on the best method based on local conditions and existing national approaches.

Water note 7: Inter-calibration - a common scale for Europe's waters

To ensure that national assessment methods to measure good ecological status deliver comparable results and are consistent with the directive, an inter-calibration exercise is required between Member States with the assistance of European Commission. The directive also specifies a five-point scale for surface water quality, from high to bad (see the following figure). The work focuses on defining the upper and lower boundaries of good status. The line between "good" and "moderate" status is particularly important, as it defines whether or not a water body will meet the directive's 2015 goal of good status.

Water note 8: Pollution - Reducing dangerous chemicals in Europe's waters

Chemicals find their ways into European waters from point sources, such as waste waters from industrial installations, and from diffuse sources, such as pesticide runoff into water from agricultural lands. Chemicals from consumer products and other products can leach into water from unprotected landfills, another diffuse source. In designing measures to control the chemical pollution from these many sources, the Water Framework Directive takes a combined approach. It considers pollution in terms of what is released into the environment and the resilience of the receiving waters.

Water note 9: Integrating water policy - linking all EU Water legislation within a single framework

This note invests in infrastructure for collecting and treating sewage in urban areas, while the Nitrates Directive requires farmers to control the amounts of nitrogen fertilizers applied to fields. The Directive on Integrated Pollution Prevention and Control (IPPC), adopted a few years later, aims to minimize pollutants discharged from large industrial installations.

Water note 10: Climate change - Addressing floods, droughts and changing aquatic ecosystems

Preparing for climate change is a major challenge for water management in the European Union. Climate impacts will in turn affect aquatic ecosystems. Hotter temperatures and reduced water flows will increase the risks of eutrophication in many rivers, lakes, and coastal waters. This will particularly be the case in southern Europe where wetlands and other protected areas may disappear. Likewise, climate change will also harm water quality in northern Europe with warmer temperatures potentially increasing eutrophication in the Baltic Sea. Climate change is also expected to bring sea-level rise, which will erode coastlines and, together with strong storm surges, will put low-lying coastal cities and towns at greater risk from flooding. Sea-level rise will also harm coastal wetlands.

Water note 11: From rivers to the sea - Linking with the new Marine Strategy Framework Directive

The new Marine Strategy Framework Directive extends EU water legislation to the marine environment and constitutes the environmental component of Europe's new cross-sector Integrated Maritime Policy. The new directive calls on EU Member States to ensure the "good environmental status" of all of Europe's marine regions and sub-regions. The new directive states that fishing and other activities should not push the populations of commercially exploited fish and shellfish beyond their safe limits and that non-indigenous species should not affect ecosystems. Good environmental status also requires physical, chemical and acoustic conditions that support healthy ecosystems.

Water note 12: A common task - Public participation in River Basin Management Planning

The directive calls for the public to be informed and involved in the preparation of river basin management plans, which identify measures to improve water quality. Participation occurs via consultation mechanisms that government bodies use to consult people and interested organizations (stakeholders) to gain from their knowledge and experience and to jointly develop solutions to problems. To ensure public participation, the directive recognizes that it is necessary to provide proper information to the public of planned measures before final decisions on the measures are adopted. Public participation extends to all water users and non-governmental organizations, such as local and national environmental groups.

V – Comparison between the WFD and EWP

Protection and preservation of the natural environment is essential for sustainable development. As most of the countries' environmental resources are linked to water resources, continuous protection of water bodies from pollution, as well as water quality monitoring programs are the main similarities between the EWP and the WFD. In the following paragraphs comparisons are made between the water notes of the WFD and main policy items of the EWP. Some of the water notes will not be discussed because they are not relevant, such as note 7, a common scale, which is specific for EU countries and does not apply to Egypt because we do not manage our system, or develop a common scale, together with other countries.

The following similarities between EWP and WFD are discerned:

1. ***Cleaning up polluted waters,*** water note 2, was tackled by the NWRP. Treated agricultural drainage water was considered a non-conventional water resource. The NWRP includes considerable attention towards the increased use of treated wastewater. Additional attention is required to protect sensitive areas, such as groundwater wells and intakes of public water supply. Hence, major programs are already being implemented to treat domestic and industrial sewage water and desalination of sea water (until now 55 million m3 was desalinated). Still, those programs are not sufficient yet and water quality in many areas is below the standard, and thus public awareness programs are strongly encouraged, see figure (1), (NWRP, 2005).
2. ***Groundwater,*** water note 3, is given a lot of attention in the EWP in order to achieve an optimum utilization of the different aquifers. To achieve this objective, many studies were done to estimate available water quantities within each aquifer, and to estimate suitable abstraction rates of it. Also, unlicensed wells (37,500 wells) were identified (Fahmy *et al.,* 2002).
3. ***Reuse of treated water.*** Treated sewage and industrial effluent reuse are increased with the increase of the construction of wastewater treatment plants. However in Egypt, the rate of construction of new treatment facilities (e.g. figure 2) lags behind the planned rates due to budget constraints. Sea and brackish water desalination is taking place at a modest rate, as the rocketing prices of oil cause the desalination cost to be a major constraint. In order to bridge the gap between supply and demand, drainage water is heavily used unofficially by individual farmers whenever they experience shortage in fresh irrigation water. This situation is causing severe uncontrolled water pollution especially in the most northern part of the country.

Figure 1: Water pollution and need of public awareness.

Figure 2: Water treatment plant.

Stakeholders participation is taken care of by enhancing the participation of the public and private sectors with other civil society groups and organizations. The EWP is elaborating on the institutional reform policy in water management that aims at an improvement of the performance of the irrigation and drainage system by transferring public responsibilities to the private sector. The present vision is that the government should remain fully responsible for the main infrastructures of the irrigation and drainage system. Meanwhile, the private sector should be more involved in the operation and maintenance of the lower infrastructures of the system, such as the branch canals and the district canals. This new policy advocates some further steps towards such an involvement. Examples of the Egyptian experience with these steps are the establishment of water users associations at mesqas' level, (see figure 3), and water boards at branch canals or district's level.

Figure 3: Farmers' participation in an improved irrigation system.

4. ***Finally, the integration of water management with related socio-economic policies*** requires co-operation between representatives of different groups, i.e. stakeholder involvement. These stakeholders are not to be restricted to organizations of public administration, such as other ministries and governorates. The private sector and civil societies have their own responsibilities as water users. This sector should also have a task and role in an efficient use of water resources, the development of new water resources and the protection of water quality. The new strategy contains proposals to enhance the involvement of representatives from all stakeholders.

The following differences between EWP and WFD can be discerned:

1. ***Water pricing and economics*** in the water policies, as in water note 5 where the WFD calls on water users - such as industries, farmers and households - to pay for the full costs of the water services they receive. However, in EWP adopts different cost recovery concepts for different water users. Not all users pay the full costs: farmers may pay only for the operation and maintenance costs for the water delivery system. Other users such as industries and domestic users may pay differently and may share the full costs. This difference results from a different cultural perspective (water is essentially free, only services related to it are charged) and different socio-economic circumstances (some people are so poor that if they would have to pay the full costs they could not buy water).
2. ***Linking with marine and coastal water,*** the new WFD calls on EU Member States to ensure the "good environmental status" of all of Europe's marine regions to achieve ambitious environmental objectives for aquatic ecosystems. In contrast, the EWP calls on adopting the concepts of Integrated Coastal Zone Management (ICZM) within the context of Integrated Water Resources Management (IWRM) policy. Such linking of ICZM and IWRM would allow achieving ambitious goals of protecting both coastal and transitional water such as the Northern Lakes of Egypt. Demonstration of such a comparison is presented in figures 4 and 5. So this a broader objective than the WFD has.

Figure 4: Pollution risk of coastal water and marine environment, Red Sea, Egypt.

Figure 5: Wind power turbines at Denmark's coasts.

3. ***Shared waters and coordination in international river basins.*** The Nile basin is a unique case, in which Egypt has taken the lead and signed a number of agreements with the Nile Basin countries. The most important ones are the 1929 and 1959 agreements. Initiated by the importance of cooperation among the Nile river basin countries, Egypt has participated in certain projects in the upper Nile counties. Examples of such projects are: (a) The Hydromet project to study the Equatorial lakes basin (mid 1960s), (b) The Nile basin cooperation framework (1992), and (c) the Nile basin initiative program (1999). So Egypt is well aware of the responsibilities connected to belonging to an international basin. Cooperation between Egypt and the other Nile Basin countries is going on and will continue to ensure the supply of sufficient water to all basin countries needed for development.

4. ***Regarding Public participation in River Basin Management Planning,*** WFD calls for the public to be informed and involved in all steps required for the preparation of River Basin Management Plans (RBMP). EWP has adopted the concepts of stakeholder's participation and users' involvement in water management at different scales of the river basin by, for example, the establishment of the irrigation advisory service, the expansion of the water users association (WUAs) for ditches and mesqas and the establishment of the water boards on branch canals. So whereas WFD requires public participation to be part of the planning process, EWP adopts participation in the domain of operational management and planning.

VI – Conclusions and recommendations

The latest water policy in Egypt has taken into account all the relevant issues addressed in the water notes, based on the European Commission's water framework directive, as well as all the international experiences that could help in improving water sector in Egypt. In general the Egyptian Water Policy addresses the same issues as the WFD although some, such as cost recovery, are dealt with in a different way. The new water policy measures will address various kinds of governmental objectives. It is impossible to achieve all objectives at the same time, either due to financial limitations or because different objectives may require contradictory measures. This implies that choices have to be made with respect to the strategy orientation and the related measures. The new policy will address the trade-offs involved and put them forward in the discussions with the stakeholders. In additions, the climate change issues (such as seal level rise, floods, and droughts), which are strongly related to coastal zone management and water resources have to be taken care of seriously in drafting any new water policy for Egypt.

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(1) Mesqas are very small channels within the end user farm