PUTTING INTEGRATED WATER RESOURCE MANAGEMENT (IWRM) INTO PRACTICE IN EGYPT

USING CONTINUAL PERFORMANCE MONITORING AND BENCHMARKING APPROACH

By

Shakeb Afsah

Chris Wolz

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Shakeb Afsah of Performeks (www.performeks.com), and Chris Wolz from Forum One Communications (www.forumone.com) prepared this report for the World Bank's water initiative in Egypt. All the views expressed in this report should be attributed only to the authors.

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Executive Summary

The objective of this report is to present an actionable plan for water quality monitoring and management in Egypt. The implementation strategy recommended in this report applies the Integrated Water Resource Management framework (IWRM), an approach that has all the fundamental elements for creating an effective water governance structure. IWRM principles will be propagated and institutionalized in small steps because of challenges such as the diverse range of stakeholders, potentials for conflict and the complexities of coordination among stakeholders.

Though the significance of IWRM concept has been common knowledge for a long time, its adoption in the water quality management projects and activities has remained limited. The most crucial question therefore, is why a concept such as the IWRM which has the potential to alleviate the problem of poor water quality, has failed to get comprehensively utilized by public agencies. This report suggests that helping organizations develop the capacity to monitor water quality performance, and a results-oriented culture will create the incentive for adopting the principles recommended by the IWRM framework.

Water sector organizations can be motivated to become performance and results oriented through the practice of Continual Performance Monitoring and Benchmarking (CPMB). CPMB initiatives strengthen accountability, foster participation of stakeholders and reward results-oriented organizations through public recognition and improved access to finance.

This report describes the strategy and work plan for instituting CPMB initiatives for water quality management. This report is structured into four parts. The first two parts describe the rationale, the international experience and strategy for implementing CPMB initiatives in Egypt. The third part of the report provides detailed guidelines for a CPMB initiative for water quality management pertaining to the domestic non-point sources in the rural areas of Egypt. The fourth part of the report provides guidelines for implementing a CPMB initiative for managing water pollution from industries.

In conclusion the report suggests that IWRM can be put into practice in Egypt with the help of two pilot CPMB initiatives. The CPMB initiative for domestic non-point sources of water pollution should be initiated at one Water Board under the overall supervision of the MWRI. For industries, a CPMB initiative can be implemented for around fifty priority industries, with EEAA as the main coordinator. Both these initiatives are possible to implement within a period of six months.

PART 1: INTRODUCTION TO PERFORMANCE MONITORING AND BENCHMARKING

1.1 Introduction

A major policy concern for the Egyptian Government has been the deteriorating quality of water in the Nile River and its associated irrigation and drainage canals. In continued efforts during the past two decades to finding a solution to this problem the government has spent around E£18 billion in wastewater management projects[1]. However, the continual decline of the water quality in the Nile River and the drains shows that the impact of polluting sources has outpaced the water quality management efforts. Urgent actions are needed now to reverse this trend of worsening water quality because of the critical nature of water resources for the entire Egyptian population.

Water quality management is an important policy goal for the Egyptian Government because the supply of water is limited while the demand for water is continually increasing. The Nile is the primary source of water in Egypt (some 55 billion cubic meters a year of inflow from Sudan) for human consumption, industrial use and for irrigating several million acres of agricultural land. In the scenario that the supply of water remains fixed and the water quality in the Nile River is polluted, it can have a negative cascading effect on the national economy and public health. Poor water quality in the main water supply system of the country can have serious human health consequences, reduce agricultural productivity, and considerably increase the cost for treatment of polluted water. Therefore the case for a strong policy focus on improving the quality of water in the Nile River and the drains is obvious.

There are several factors that cumulatively explain the deteriorating quality of water in Egypt. Issues like the limited coverage of wastewater treatment plants (WWTP), weak performance of WWTPs, growing industrial discharges, and various non-point sources at

[1] Gaber, Ahmad, "Stock-Taking of Existing Rural Sanitation Systems", Egypt Sector Work on Rural Sanitation, Consultant, World Bank, 2004.

the agricultural and household levels add up to seriously damage the national water resources base.

Poor water quality at the rural level deserves particular attention because it is a difficult problem to solve, and potential solutions go considerably beyond investments in centralized wastewater treatment systems. Outside of urban areas, the water quality is affected by several factors. Some of these factors are:

1. **Incoming water quality**: The quality of the inflowing irrigation water from the main canal is not publicly unknown and is probably poor.
2. **Domestic factors**: Household latrines are prevalent, but sewerage is directly or indirectly dumped to canals or drains because:
    - 2.1 High water table precludes leaching tanks;
    - 2.2 Household water use is higher now than recent past due to availability of piped water in the homes; and
    - 2.3 No central sewage collection system or treatment facility
3. **Household solid waste**: Waste is often dumped on banks of canals, the only strip of "public" land in villages, and it slides into the canal. There are no central collection services, land is expensive, and transporting of waste for disposal is expensive for households.
4. **Canal water usage**: Village women often use canal water to wash clothes and dishes, exposing them to unhealthy water.
5. **Agriculture**: Canal water quality is a health concern for livestock and for certain vegetable crops (i.e. canal water used to wash agricultural produce that will be eaten fresh from the market.)
6. **Public awareness**: Water quality is widely acknowledged as a health concern, but localities and households have few options for local-level sewage or solid waste management.
7. **Accountability**: The issues affecting canal water quality and its public health consequences touch on a range of issues – and bureaucratic organizations – and there is no clear advocate for village-level sanitation and health.

The Egyptian Government has taken several measures to deliver water of a healthy quality to its population. There are currently more than two hundred wastewater treatment plants, and several research institutes that focus on water quality issues. Also, Egypt has developed a strong technical skill base for water resource management. Yet, we find that worsening water quality has remained an unsolved problem.

In the last two decades water quality management projects have focused on seeking finances to build WWTPs. National and international agencies have provided financial support in the hope that water quality goals will be met. Unfortunately, the results of the investment approach have fallen short of the expectations of the policy makers and the donor community for a number of reasons. One key reason is that these WWTPs reach only a share of the Egyptian population– with large numbers of communities still lacking any wastewater collection and treatment systems. Further, the WWTPs that have been built are perhaps failing to provide consistently adequate treatment performance.

Underlying these technological, financial and human resource factors – there is a need for effective water quality governance. Even more funding and technical assistance are required but these alone will not be sufficient to create a sustainable and lasting solution to the water quality issues. What is needed is to transform the organizations and the people who are responsible for water quality to become performance and results oriented, and accountable to stakeholders. Simply put, without effective water governance, investments and technical expertise will fail to reverse the current water quality trend in Egypt.

To reach the water quality goals by pollution management, it is necessary to maintain and operate the wastewater treatment systems as efficiently as possible. If the incentive for continual performance of wastewater treatment system is missing or is weak, even the best technology and the most qualified personnel will fail to achieve the water quality goals. At the same time, relying solely on the end-of-the-pipe treatment can lead to overburdened treatment systems that fail to provide consistently high quality treatment. Therefore, water conservation and pollution prevention is essential for proper functioning of wastewater treatment systems.

Water quality issues cut across various sectors, spatial units and administrative organizations. This automatically brings in a very diverse group of stakeholders. As a result, the decision making process can become cumbersome, and apparent solutions

often end up creating conflicts. In such a complex situation, building a governance structure that will steadily grow into a coordinated national strategy for water quality management is a real challenge. This report recommends that a small-step approach based on Integrated Water Resource Management (IWRM) framework be applied to creating a viable water governance structure in Egypt.

In Egypt, even though the IWRM concept has existed for a long time, in practice it remains limited. Often too much effort is spent in planning and designing an extensive IWRM strategy that fails at the stage of execution. Therefore, this report takes an action-oriented approach to putting IWRM into practice. To make IWRM programs results driven, this report recommends the application of continual performance monitoring and benchmarking (CPMB) as the basis for building an effective water governance structure. A CPMB initiative has the following features:

1. The focus is on results, not just the means of getting to results
2. It recognizes that an assessment and discussion process involving various stakeholders is essential for transforming measurement of results into actions for continual improvement.
3. In addition to measuring results, it is essential to embed performance results information into the critical management level decision making processes of appropriate organizations.
4. Performance must be measured continually to ensure that a performance driven culture is institutionalized
5. Promotes the value of information and transparency, and that the data and information will assist prioritizing and planning of local and non-local efforts.

CPMB will aim to strengthen the incentives for optimal management and operation of the wastewater treatment systems, and for motivating communities to participate and contribute in the water quality management effort at the local level.

This report concludes that Egypt is ready to apply the CPMB approach for water quality management, but introducing these CPMB programs in small steps makes them more effective. This is so because such small-steps give the pilot organizations enough time to develop the necessary comfort level and confidence in performance analysis and

information dissemination. This approach gives an organization time to gradually get prepared for and develop a culture of wider information dissemination and stakeholder participation.

There are potentially many options for starting a CPMB initiative, but based on the data on the poor water quality in the drains, the report recommends that the drainage basins be the initiating focal point. The main advantage of the focusing on drains is that it will be possible to trace the root causes of water pollution to households, industries and agriculture and therefore corrective actions can be identified, implemented and monitored for results. Accordingly, this report presents a step-wise strategy for instituting CPMB based programs for water quality management in Egypt. The first section provides a brief history of CPMB and how it has been applied as a policy tool in several countries including Egypt. The second section discusses the design and implementation of a CPMB initiative for water quality management at the rural level. The final section describes the CPMB initiative for managing water pollution from industrial sources in Egypt.

1.2 Conceptual Framework and Implementation Steps

Monitoring and benchmarking are well-known management practices that originated as tools devised by the private sector. The basic idea in such practices is that the information (on the relative performance level of a private company or an enterprise within a peer group) can be a strong motivator for an under-performing company or an enterprise to undertake actions to improve its performance. The primary driver of performance incentives is the inevitable need for a private company to remain competitive otherwise it will cease to exist. Unfortunately, when evaluating performance of public agencies, such a threat is moot. Therefore, the conventional monitoring and benchmarking models that have worked in the private sector are not going to work in the public sector.

The proposed CPMB approach is fundamentally different from the traditional concept of monitoring and benchmarking. The traditional benchmarking in the private sector aims

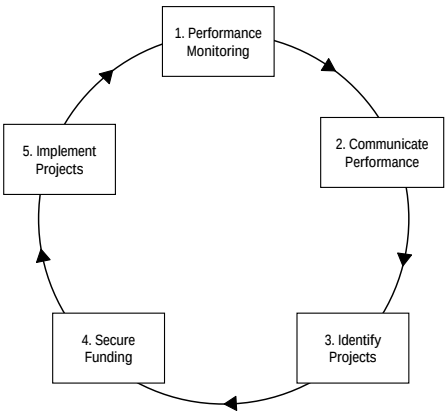
to improve the competitive assets of a company, while the CPMB proposed in this report aims to build the necessary political assets that public agencies require to fulfill their mandate. When the conventional monitoring and benchmarking is mechanically applied to measure performance of a public agency, it merely ends with generating data tables, comparative charts and attractive reports, but fails to adequately transform the information into incentives for performance improvement. The CPMB approach developed in this report will correct this limitation and transform information into an incentive by linking performance to public recognition and access to funding for water quality improvement projects. Therefore, the CPMB initiative proposed here is designed to be a program for building institutional capacity which requires technical competence as well as political acumen.

The CPMB approach is a well-tested policy tool and is not specific to the water sector. CPMB offers a generic framework of governance that can be applied to a wide range of public policy goals including environment, energy, and water and infrastructure sectors. The most salient and differentiating feature of CPMB is its focus on behavior and incentives rather than techniques and methodologies.

This system also offers a way to overcoming political constraints to institutional performance. By explicitly demonstrating results and progress, organizations can gather valuable support from its stakeholders and the general public, and in the process convert good performance into a useful political asset. When political factors begin to support persons and organizations that successfully deliver public goods, they are bound to have a cascading effect on other similar organizations. Over time, the CPMB approach can be expected to spread to other organizations, and a performance-oriented culture will get institutionalized on a wider scale.

Initiating the first CPMB strategy is always a challenge. Therefore, it will be critical to start at a small scale with one or two organizations that have the leadership and stakeholder relationships that will fully support the CPMB effort.

Figure 1: CPMB Implementation Mechanism



A System of Continual Performance Measurement—Key to Accountability and Transparency

Step 1:

Assess performance using agreed upon indicators and targets, conduct root cause analysis and identify actions for improvement

Step 2:

Inform stakeholders about performance and strategy for progress

Step 3:

Identify projects that can be implemented by local resources; prepare projects that require external funding

Step 4:

Seek funding for projects; these must be capacity building and investment activities

Step 5:

Implement projects in accordance with goals and targets; Go back to Step 1.

As shown in Figure 1, the implementation of CPMB is a five-step process. The first step is the development of a methodology for performance evaluation. This step has several sub-steps consisting of identification of indicators, development of evaluation methodology, data collection and analysis. Once the analysis is done, it should be subjected to a rigorous review process to ensure accuracy and build consensus about the findings.

The second step in the implementation process is the communication of results to the stakeholders. This communications strategy is essential to encourage local-level understanding of water quality issues and to enable local-level planning and action into addressing water quality. The communications strategy will also provide stakeholders at the district and national level with information and incentives to contribute to local-level priorities. Organizations may find the disclosure process somewhat threatening but often such fears are over-assessed. Based on the experience of disclosure-based CMPB programs of several other countries, we find that stakeholders and the general public tend to reward good performance as much as the bad baseline performance as long as they show an improvement trend. Therefore, it is desirable to focus on disclosing positive

improvements in the first period, and to provide time for all other participants to improve. In the second year, there could be a more expanded disclosure, which can gradually expand to full disclosure over a period of two to three years. Planning a phase-wise communication strategy is essential for diffusing the perception of the threatening nature of full disclosure. The added advantage of a phase-wise disclosure is that it gives an opportunity to observe the reactions of stakeholders and how it influences performance-oriented behavior in organizations. Key stakeholders that the communications strategy will target include: local-level residents and civic leaders, regional-level government managers, and national level government managers, NGOs and project donors.

The third step of the CPMB program involves identification and development of strategies and projects that will help reach the performance goals. Some projects may need only local resources while in other cases external funding or technical assistance may be needed. Based on the feasibility of undertaking different corrective actions, organizations will establish future performance targets.

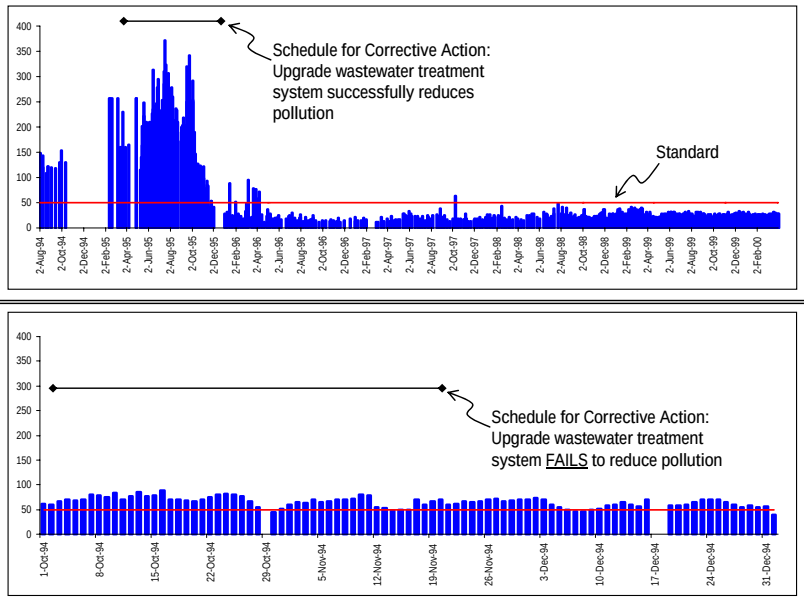
The fourth step involves securing funding for projects that require investments and technical assistance that are not available locally. As discussed earlier, a common pre-condition for financial assistance is an effective governance and management capacity. Organizations that are well managed and show credible progress are more likely to succeed in securing finances. It is likely that under the CPMB initiative, organizations would be required to show that they have maximized performance utilizing their local resources and community efforts. This way an organization can provide credible evidence of its commitment to performance goals and its implementation and management capabilities.

The final step consists of implementing corrective actions with the objective of meeting the established performance targets. This is a very critical step and will be the ultimate determinant of an organization's commitment and management capabilities.

Completing the cycle, the process of performance analysis restarts with a fresh focus on monitoring and analysis and on measuring whether or not corrective actions produced the desirable results. Explicitly linking corrective actions to performance results will provide insights into the management's capacity and help establish a culture of accountability. Continual monitoring of results will ensure that such a process gets entrenched in the managerial system of the agency. For this, it is critical that Steps 1-5 are implemented on a continual basis. To ensure that this process of continual monitoring and performance evaluation is conducted regularly, appropriate procedures and business processes need to be established at the very outset.

It is important to emphasize that performance monitoring must link corrective actions to planned performance targets. Figures 2a and 2b utilize data from two actual cases where corrective actions were undertaken to upgrade the wastewater treatment systems so that BOD concentration could comply with the regulatory standard. Using the principles of performance monitoring, corrective actions were taken to successfully reduced pollution in accordance with the planned target. In the other case, the corrective action did not produce the desired result. Such an analysis provides the necessary information needed for discussions within an organization in a way that accountability and results oriented

Figure 2a and 2b: Impact of Corrective Action on Pollution



behavior can be encouraged.

1.3 International Experience of CPMB

Policymakers have been quick to see the benefits of the CPMB approach as a compliment to more traditional command and control regulatory approaches. CPMB shifts the focus of an agency from measuring and enforcing compliance through procedural and bureaucratic goals to performance-based results that directly reflect the welfare of the public. Even though the CPMB approach is relatively new, there are several cases of its effective success over the last decade and therefore it can now be considered as a well-tested and a reliable system.

The CPMB approach has been successfully applied in several countries in the environmental, water and energy sectors. In the environmental sector, the Government of Indonesia pioneered the CPMB approach under their brand name PROPER (Program for Pollution Control Evaluation and Rating). Under PROPER, regulators assess the performance of industries based on the quality of their efforts towards controlling water pollution. Using a simple color-coded scheme, aggregate performance of companies was shared with various stakeholders on an annual basis. At the same time, a detailed performance and benchmarking report were privately mailed to participating factories. This structured performance measurement scheme accompanied by strategic communication resulted in reducing water pollution from industrial sources by nearly 40% in less than eighteen months. This model of water pollution management from industrial sources is now practiced in many countries including China, India and the Philippines, and currently a pilot program is underway in Ghana.

While privatizing its water supply and sanitation services in Manila, the CPMB approach was applied by the Government of the Philippines as a regulatory tool. Under the brand name PPA (Public Performance Audit System), the CPMB framework provided the primary channel for the government to monitor the performance of water concessionaires.

Most recently, the CPMB approach was adopted by the Egyptian Electric Utility and Consumer Protection Regulatory Agency (EEUCPRA), an independent agency that was created as part of the electricity sector reform process[2]. A performance measurement and a benchmarking system was operationlised at EEUCPRA that assists the agency to prepare performance agreements and manage licenses in a way that will create incentives for improvements in production efficiency of generating companies, promote reliable and equitable supply of electricity, and enable companies to remain financially competitive in the capital markets. The performance measurement system has enabled EEUCPRA to prepare the baseline performance report for individual companies as well as generating stations and units. Where applicable, regulators can also analyze the performance of the Egyptian companies relative to international benchmarks. Currently the benchmarking and performance analysis is entirely carried out by Egyptian staff at EEUCPRA. Drawing parallels between the two utility sectors in Egypt, namely the energy and the water sector, it shows that the CPMB approach maybe a very viable proposition for the water sector as well.

PART 2: APPLICATION OF CPMB TO EGYPT'S WATER QUALITY PROBLEM

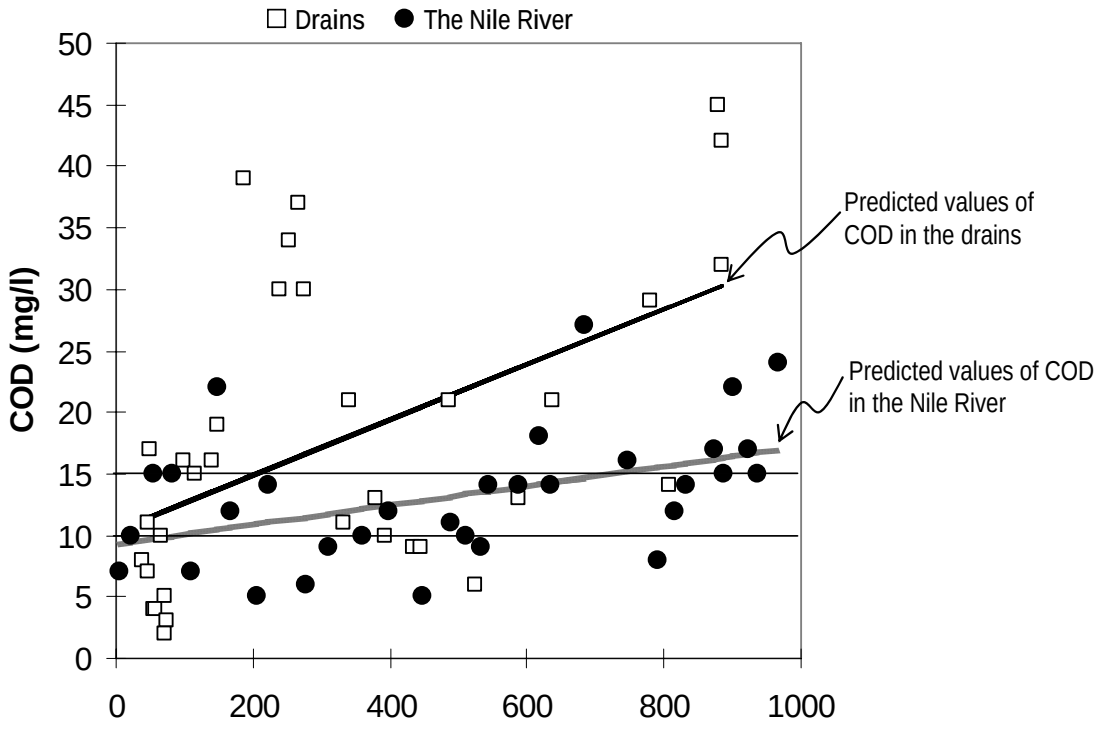
2.1 Water Quality in Egypt-The Critical Role of Drains

The quality of Nile River water is of primary importance to Egypt and that quality in inextricably linked with the quality of drain water. The Nile is the primary source of water in Egypt – some 55 billion cubic meters a year of inflow from Sudan. The Nile is the sole source of water for human consumption, industrial use and for irrigating several million acres of agricultural land. A considerable amount of this water is discharged back into drainage canals and then into the Nile River from various point and non-point sources. According to the National Water Resources Plan for Egypt (NWRP 2001), there are 67 outlets of agricultural drains and 57 discharge points from industries. If the rate of discharge of various pollutants in the Nile River exceeds the cleansing ability of the Nile River, we observe a deterioration of water quality between Aswan and the Delta Barrage.

[2] For more information on this program, contact Shakeb Afsah (ShakebAfsah@aol.com)

To get some insight into the water quality profile in the Nile River and the agricultural drains between Aswan and the Delta Barrage, and the potential influence of drain water quality on the Nile River, the data on water quality sampled from various monitoring

Figure 3: Pollution Profile in the Nile River and Agricultural Drains



point is plotted in Figure 3. The x-axis shows the distance of monitoring points from Aswan and the y-axis shows the values of COD concentration, an important indicator of organic waste. Using simple regression analysis, we find that every 100 km from Aswan the COD concentration worsens by around 0.8 mg/l in the Nile River, and by around 2 mg/l in the agricultural drains, nearly two times faster than in the Nile River. By the time water is in the vicinity of Cairo, the water quality in the agricultural drains is two times worse than the water quality in the Nile.

Naturally, with increased population, the demand for water is expected to increase in the future, but the supply of water is limited in this region. Therefore reusing water must be a

critical part of the water resource management strategy in Egypt. In fact the Egyptian authorities already reuse a considerable amount of drainage water. But mixing drain water with the water from the Nile is feasible only if water in the drains is not too polluted. If the drain water gets too polluted, mixing will worsen the quality of water supplied to farmers, households and industries, and will impose considerable costs on users. As shown in Figure 3, water quality in the drains violates the water quality standard for COD at several outfalls. If the pollution trend in the drains continues, there could be severe consequences for the availability of potable water, for human health generally, and for agricultural productivity. It is clear that a very critical starting point for water quality management using the CPMB approach should be to address water quality of the drains. CPMB programs should therefore be developed to target the main cause of pollution in the drains.

2.2 Sources of Pollution in Drains

This section draws from a study on pollution in drains by Kassem and Abdel-Gawad (2002). This report categorizes sources of water pollution in drains into four categories. These include domestic point and non-point sources, industrial wastewater and non-point agricultural discharges. Domestic point sources include discharge outlets of municipal or public wastewater treatment plants. Domestic non-point sources include sewerage from households that are not connected to a public wastewater treatment plant but those that are discharged directly into drains or from septic tanks into groundwater flows into drains.

Based on the data on pollution load and volume from industrial and the domestic sources in the Fayoum and the Nile Delta drains, it appears that three sources are quite comparable in terms of their share of BOD and COD. However for TSS, domestic non-point sources account for nearly half of the total pollution load. In terms of the effluent volume, the domestic non-point sources accounts for nearly 60% while industrial sources account for only 5% (Figure 4). Even though industrial sources account for only 5% of effluent volume, more than 30% of COD load is generated by industries. This implies that the concentration of organic pollution and particularly COD must be very high for

industrial wastes. This finding is confirmed in Figure 5, which shows that the average COD concentration for industrial wastewater is around 3732 mg/l compared to 429 mg/l for domestic point sources. If the findings of the pollution source characteristics in the Fayoum and the Nile Delta drains are representative of the broader situation in Egypt, then it is evident that the treatment strategies for industrial and domestic point sources have to be entirely different. To treat the high concentration levels of pollutants in industrial wastewater, it is likely that treatment systems will require chemical and secondary treatment based on activated sludge. For the domestic waste, the organic waste removal rate will be lower compared to the industrial wastewater but the treatment plants will require a high capacity to meet the requirements.

Figure 4: Organic Waste Generation by Source

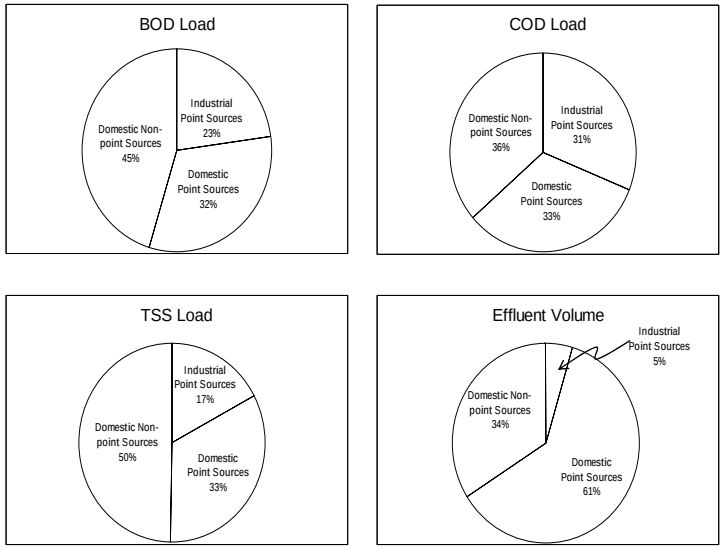
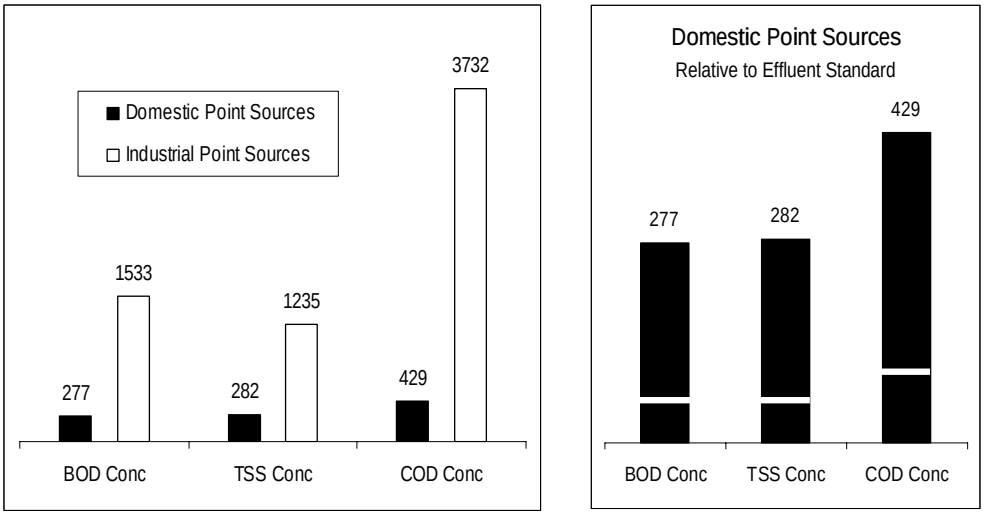


Figure 5: Average Concentration Level (mg/l)

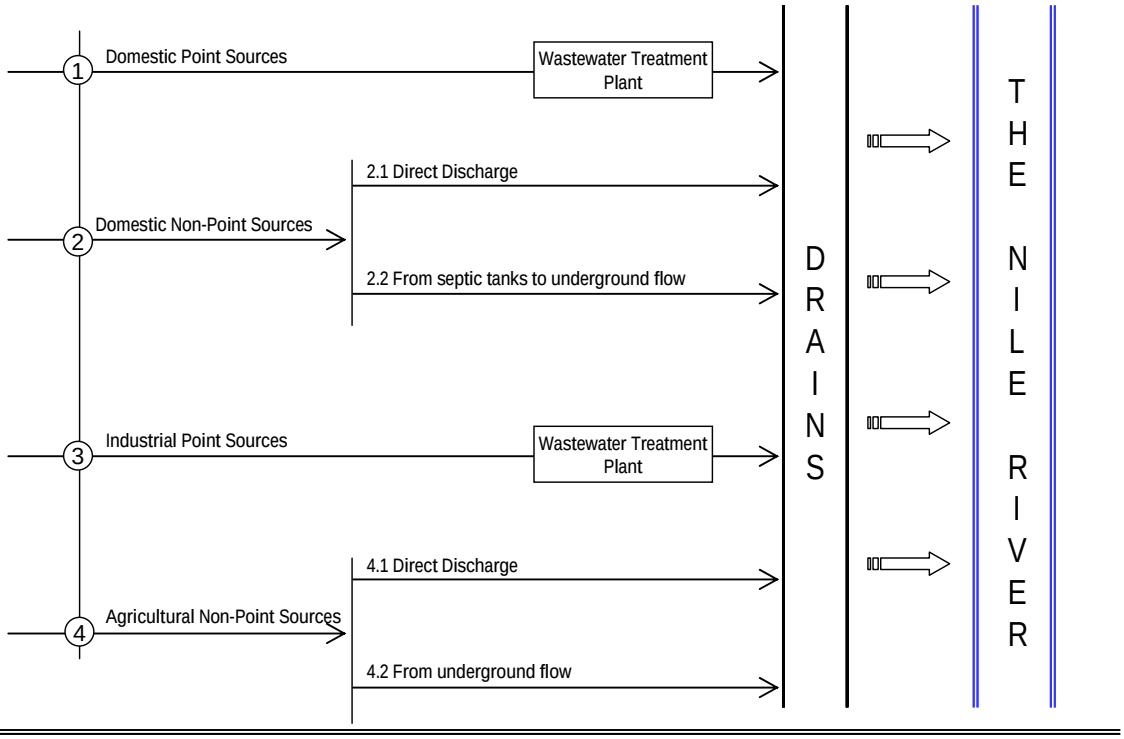


PART 3: CPMB PROGRAM FOR DOMESTIC NON-POINT SOURCES IN THE RURAL AREAS OF EGYPT

3.1 Background

Based on the above discussion on water quality in the Nile River, its drains and various discharging sources, it is clear that a comprehensive water quality management strategy based on the CPMB approach will need four components- a separate one for each pollution source. The four water quality factors are schematically illustrated in Figure 6. To improve water quality, CPMB initiatives must be planned at the levels of individual households, municipal treatment plants, industries and agricultural farms. This section describes the implementation plan for a CPMB initiative for water quality management pertaining to the domestic non-point sources in the rural areas of Egypt.

Figure 6: Schematic Layout of Pollution Sources

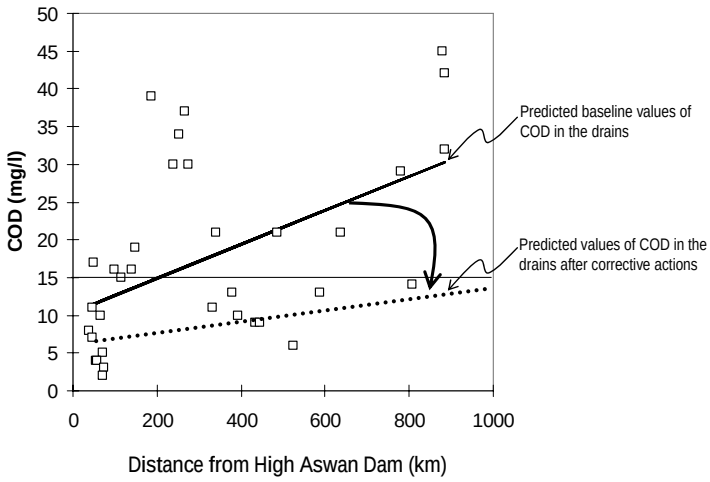


3.1 General Guidelines for CPMB Initiative

The primary goal of CPMB initiatives will be to improve the quality of water in the drains. The ultimate success of the CPMB program will be evaluated by comparing the

baseline water quality levels at critical monitoring points in drains to the observed water quality values after corrective actions have been undertaken. The inventory of corrective actions for the four pollution sources will be carefully documented and correlated to the observed changes in water quality. Figure 7 is representaitve of the kind of change that will be seen when ultimately the CPMB initiative becomes a nation-wide program. As shown in Figure 7, the predicted values of pollution (using the example of COD) will shift inwards as shown by the dotted line. This stylized graph is meant to emphasize that it will be essential to keep the focus of all CPMB initiatives on the ultimate goal of water quality.

Figure 7: Stylized Pollution Profile in the Agricultural Drains if Corrective Actions are Successful



Before delving into the details of the CPMB initiative for domestic non-point sources, this report recognizes that the management and oversight of CPMB initiatives at the national level should be with the Ministry of Water Resources and Irrigation (MWRI).

An important dimension of CPMB initiatives will be to support the ongoing national institutional reform effort that aims at decentralizing and strengthening local participation in water management. Consistent with the ongoing decentralization effort of the Egyptian Government, this report recommends that CPMB initiatives for non-point domestic and agricultural sources be implemented by the Water Boards. The long-term strategy of CPMB initiatives is to build local capacity for water quality management by empowering the Water Boards with the necessary management support and training.

Finally regarding the data on water quality and use, a considerable amount of information on water quality is collected through the existing monitoring activities. However, data collected by different agencies will need to be combined to get a comprehensive picture of water quality as well ass root causes of pollution. This kind of data unification will not replace the existing systems. On the contrary, CPMB will leverage the existing monitoring mechanisms to convert data into performance information so that the impact of multiple projects can be assessed at the national level.

The remainder of the report provides the details of the proposed CPMB initiative.

3.2 Implementation Steps for a CPMB for Domestic Non-point Sources

The CPMB initiative for domestic non-point sources should target the rural communities in Egypt. There are around 27,000 villages in Egypt and virtually no village has access to any public wastewater treatment system. This report recommends that the first phase of CPMB initiative should attempt to target one Water Board with the aim to operationalizing the CPMB program in around six months.

The problem of wastewater management in the rural areas is a very serious concern. Rural households discharge their waste either on-site through a leaching pit behind their houses or into drains through vacuum trucks. Both these disposal methods transfer pollutants to drains. The lack of proper collection and treatment is due to: the lack of centralized wastewater collection and treatment facilities for households and/or waste handlers to use; high water tables that make leaching system impracticable; increased household wastewater drainage volumes since piped drinking water has become prevalent; and the high cost to households to have sewerage waste pumped and removed.
Inadequate solid waste management is also a major contributor to poor water quality. As shown in Figure 7, inadequate solid waste management is one of a number of other major contributors to the poor water quality. At the village level, often some of the most visible pollution in the water bodies is the waste that is carelessly dumped by individuals or households.

It is clear that the solution to the existing water quality issues will involve external funding as well as local commitment and community motivation. As discussed earlier in this report, the CPMB initiative will attempt to improve the water quality by first maximizing the application of the local resources. Though local resources will not be enough to eliminate all the pollution discharged in drains, they may be enough to demonstrate a commitment and managerial capacity—a critical first step in securing external financing for capital-intensive water quality projects.

Figure 7: Local Factors that Affect Water Quality

This report recommends that the first CPMB program should be operationlised at one Water Board with the objective of benchmarking villages based on their level of effort on water quality management, and publicly recognize and reward the best performing villages. This initiative will set into motion a unique model for participatory management, which will strengthen household and community level incentives for keeping their village clean. The best performing villages will receive public recognition and will become a likely candidate for future technical assistance and funding support. This approach in essence will also measure the performance of the Water Board and will signal to various stakeholders as to what is their management capability.

This CPMB initiative can be operationalized within a period of six months. The main implementation steps needed for this CPMB effort will include:

1. Identification and selection of a Water Board where the first CPMB initiative will be initiated.
2. Creation of a CPMB team and its placement in the overall management structure of the Water Board.
3. Baseline water quality assessment in the area within the jurisdiction of the Water Board. This activity will involve the following sub steps:
    - 3.1. Selection of performance indicators – indicators that provide some measure of water quality and its potential impact on human health and agriculture.
    - 3.2. Development of performance evaluation methodology. Experts in Performance Evaluation methodologies will work to insure that the methodology is designed to be simple and transparent. The methodology should utilize quantitative, qualitative, and visual information and seek inputs of experts in the review process.
    - 3.3. Evaluation of data needs and format.
    - 3.4. Identification of critical monitoring points and sites for data collection. The data collection points will cover villages, drains and canals, and other points that are considered necessary by the Water Board.
    - 3.5. Development of a viable data collection system.
    - 3.6. The first round of data collection. This will require creating and training data collection teams. It is strongly suggested that local staff and skills be utilized for this task. Where necessary technical support from the Governorate and National level resources could be obtained.
    - 3.7. Analysis of performance using the data collected from various sources and applying the methodology agreed upon.
    - 3.8. Discussion and review of results.
4. Communication strategy development and implementation
    - 4.1. Audience identification: Identify key audiences for the communications strategy – their involvement and interest in improving water quality, the CPBM's objectives for the actions these audiences will take; and tactics to reach and engage the audiences in the long-term.
    - 4.2. Communications vehicles: define a set of vehicles to communicate to stakeholders at the local, the Governorate, and the national level. These vehicles will likely include some mix of relying on local-level civic leaders and volunteers (oral communication), local-level printed materials, local/regional TV-radio, email and Web for regional and national communication, etc.
    - 4.3. Communications infrastructure: develop infrastructure to use the collected data to communicate with stakeholders at the local, the Governorate and the national level. Infrastructure will include a system to post local-level data to a central Web-based based data store, to generate local-level data sheets and flyers, etc.

4.4. Communications messages: develop format for information/messages to distribute at the local, the Governorate and the national level. Messages will likely involve: initial baseline report for a village, regular (i.e. monthly) data updates; periodic (i.e. quarterly) analyses of project activities and accomplishments, data analysis, other news; periodic email updates on project status and results, etc.

4.5. Communication of results to various stakeholders.

This CPMB initiative will produce the following strategic benefits:

1. Generate a baseline water quality management report for each village to serve as the reference point for measuring progress over time.
2. Set up a system of continual performance measurement and will enable project proponents and Water Boards to measure progress continually and assess the results of their actions and investments.
3. Build a community-level awareness of water quality issues and local practices that impact water quality.
4. Enable villages and Water Boards to evaluate and define priorities for investment initiatives to improve water quality.
5. Create a transparent water quality management mechanism at the level of Water Boards.
6. Motivate donors and the national government to create a common fund for rural water quality management based on the principles of "show results and get funds".

3.3 Sample Performance Indicators

Performance indicators for the projects on water and sanitation services are fairly well developed. However, the performance indicators that are appropriate for a CPMB initiative will require some adaptation of the conventional indicators. Performance indicators should be easy to measure and communicate, and must support the decisions on training and investments, and for tracking performance on a continual basis. Additionally, there should be a strong consensus among stakeholders on the choice indicators and its target values.

For illustrative purposes, a few performance indicators that have been applied in the ongoing rural sanitation services related activities around the world are shown in the table

below[3]. Such a list will serve as a good starting point for initiating the process of identifying performance indicators that will be appropriate for a CPMB program at a

Sample Performance Indicators for the Proposed CPMB Initiative	
1	**Water Quantity**
1.a	Average daily consumption per capita or per household
1.b	Percentage of household satisfied with the quantity of water available
1.c	Percentage of water demand that are met
2	**Water Quality**
2.a	Percent of samples that meet the national water quality standard
2.b	Number of times water quality was sampled per quarter
2.c	Number of households satisfied with water quality
2.d	No. of monitoring points for outflow that meet the national standards
2.e	No. of monitoring points for water inflow that meet the national standards
3	**Solid Waste Management**
3.a	Is there a proper area for disposing off waste?
3.b	Is there a garbage collection system?
3.c	Is there visible evidence of waste disposed off in water bodies?
3.d	Quantity of solid waste generated per household
4	**Financial Indicators**
4.1	*Access to Sanitation Services*
4.1.a	Total amount spent on operation and repairs related to household sanitation needs
4. 1.b	Total amount of unpaid time spent in maintenance
4. 1.c	Amount spent to use public or private latrines
4.2	*Drinking Water*
4.2.a	Amount paid to water vendors
5	**School Sanitation**
5.a	Adequacy of school latrines
5.b	Cleanliness of school latrines
6	**Sanitation Services Infrastructure**
6.a	Percentage of villages with caretakers/operators available

[3] Billig, P., Bendahmane, D. and Swindale, A., "Water and Sanitation Indicators Measurement Guide", Food and Nutrition Technical Assistance Project, USAID, June 1999; Ministry of Water, Lands and Environment, "Measuring Performance for Improved Service Delivery, Water and Sanitation in Uganda", 2003; and WHO, Geneva, "Tool 7: Performance Indicators for Water Supply and Sanitation", Tool for Assessing the O&M Status of Water Supply and Sanitation in Developing Countries, 2000.

Sample Performance Indicators for the Proposed CPMB Initiative	
6.b	Percentage of villages with functioning committee
6.c	Percentage of villages who have adequate funds for maintenance of facilities
7	**Health Indicators**
7.a	Incidence of diarrhea among children
7.b	Percent of households with hygienic sanitation facilities

Water Board in Egypt. While it is easy to draw up a long list of performance indicators, it becomes equally difficult to collect data on all those indicators. Therefore, the selection of performance indicators should be closely tied to the ability to monitor and manage the information.

3.4 Implementation Issues: Data and Communications

To implement a CPMB initiatives for managing the quality of water affected by the domestic non-point sources in the rural areas of Egypt, there are two critical aspects that must be addressed upfront—data availability and communication among various stakeholders. As part of this study, detailed data and communication assessment were conducted in order to evaluate the readiness level for CPMB initiatives in Egypt.

This report concludes that considerable effort has gone into database development and communication across stakeholders. However, the current data systems and communication approaches are not accessible or integrated to support CPMB initiatives. Therefore, consistent with the suggestion made earlier in the report, CPMB initiatives must start at a small scale with possibly one Water Board and around fifty industries. The experience of implementing these CPMB initiatives will prepare the rest of the Egyptian agencies to coordinate data and communications for a broader nationwide implementation. In this section, we present our findings on these two topics, and their implications for the proposed CPMB initiatives.

3.5 Detailed Data Assessment

Typically, data assessment involves a research of the software and hardware systems that are used by different organizations to collect data. Such an approach to data assessment merely states who is collecting what, and whether or not the technology is old or modern.

Such a finding can give us insights into where the data reside and the efficiency at which data can be retrieved. From a CPMB perspective, data assessment is less of a technical and organizational analysis, and more about understanding the data sharing behavior among various stakeholders.

The data needs of CPMB initiatives are not very demanding, and most often data already exist but they are not organized to readily support the types of analyses required for performance measurement and benchmarking on a continual basis. From a CPMB perspective, the key issue is not if the data exist as hardcopy or in electronic form, but whether or not the data are shared among various stakeholders to support policy analysis and performance evaluation that support national water quality objectives. In this context there are four key questions:

1. Can the data that are currently collected by various agencies be readily analyzed to assess the current water quality levels and long term trends in the Nile River, main and branch canals, and various drains?
2. Is it possible to apply the current data to identify the root causes of deteriorating water quality in the Nile River, and various canals and drains in sufficient details such that targeted corrective actions can be planned at the level of municipalities, rural communities, agricultural farms and industries?
3. Are the data organized to assess the impact of various ongoing projects on changes in the water quality in the Nile River, main and branch canals, and various drains?
4. What is the level of coordination between the various agencies involved in the data collection efforts?
5. Can the data be accessed and used by local-level stakeholders to understand the water quality level/status, and to plan/prioritize actions and investments?

3.6 Existing Data Collection System

The current picture of data collection for water quality management is not very encouraging. The primary reasons for this bleak assessment are not technical but organizational and political. Considerable resources are used every year for collecting water quality data in the Nile River, canals, drains and underground resources but the resulting databases are extremely compartmentalized, and are organized in a way that can not support the IWRM framework effectively. Indeed, there are concerns about the software and hardware aspects of the existing database systems, but this report stresses

that the existing data situation is not due to the lack of database systems but due to the absence of a coherent national strategy to utilize data for comprehensive water quality assessment that can link the poor water quality to the root causes of pollution.

The data collection task of the Government of Egypt is well reviewed in the report "Survey of Nile System Pollution Sources", September 2002. Drawing from this report, a brief review of the data collection infrastructure of Egypt is presented in the Table 3. Water quality has many dimensions, so often the task of data collection is spread across multiple agencies. In the case of Egypt, there are around five groups within MWRI, two in EEAA, and three groups in MOHP, that are currently involved in collection and

Table 3: Organizational Structure and Responsibilities for Water Quality Related Data Collection

1. Ministry of Water Resources and Irrigation (MWRI)
1.1 National Water Research Center (NWRC)
1.1.1 Nile Research Institute (NRI)
- Monitors water quality of 43 agricultural drain discharging into the Nile between Aswan and Delta Barrage, 43 designated monitoring points in the Nile River and 12 sampling points in irrigation canals in Upper Egypt
1.1.2 Drainage Research Institute (DRI)
- Monitors the impact of municipal, industrial and agricultural wastewater on the drain so than drainage water reuse can be managed. The distribution of sampling points is as follows: Area — Drains — Canals 1. Fayoum — 8 — 4 2. West Delta — 39 — 7 3. Middle Delta — 41 — 10 4. East Delta — 43 — 16
1.1.3 Research Institute of Ground Water (RIGW)
- Monitors groundwater quality at around 200 locations
1.1.4 Mechanical and Electrical Department (MED)
- Monitors water quality at priority pumping stations
1.1.5 Egyptian Public Authority for Drainage Projects (EPADP)
- Maintains a record of discharge sources to the agricultural drain network
2. Egyptian Environmental Affairs Agency (EEAA)
2.1 Environmental Quality Section
- Monitors water quality in the Nile River. In 2001, there were 31 monitoring points. However, the correspondence between the water quality data collected by the NRI and by EEAA is not well understood.
2.2 Environmental Inspection Unit (EIU)

- Monitors effluent quality of around 550 industries. This data collection system could easily be expanded to meet the needs of the CPMB program for industries.
3. Ministry of Health and Population (MOHP)
3.1 Nile River Program
- Monitors water quality in the Nile River to assess its suitability for drinking purposes. There are 103 water points that monitored on monthly basis.
3.2 Industrial Discharge Program
- Licensed industrial dischargers are monitored on quarterly basis. The correspondence between this data and the information collected by the EIU at EEAA is not clear.
3.3 Wastewater Treatment Plant Program
- Monitors the effluent discharged from around 86 treatment plants all over Egypt.

compilation of water quality related data. In this kind of an institutional set up, data coordination can be a real challenge for any IWRM initiative. There is no doubt that very cost effective technologies exist for building bridges across different databases, but it is not clear if currently the willingness to undertake such an effort exists.

3.7 Data Readiness for CPMB Initiative by Water Board

The nature of data needed for implementing the CPMB initiative that will benchmark villages for their water quality management efforts is very local. Such grassroots level data are not collected by any agency now. Therefore, this CPMB initiative will establish a new data collection and compilation system at the level of the Water Board. This will be an essential element of the overall capacity building strategy for Water Boards and for decentralizing the water quality management effort to local agencies in the long term.

3.8 Detailed Communications Assessment

Our initial research and the detailed research of others[4] indicate that poor quality of surface water in irrigation canals and drains is a known concern of farmers and village-level residents in Egypt. In general, there is awareness of the problem of poor water quality – that there are adverse health consequences from exposure to unhygienic water, in terms of acute and chronic health problems, impacts on agricultural productivity, etc. Despite that knowledge, some local-level practices that degrade water quality persist – such as direct (or indirect) dumping of household sewerage into canals, improper management of livestock waste, dumping of solid waste along canals, use of

[4] Egypt Water Quality: Management Action Plan: Phase II, Robert A. Kelly and James Welsh, July 1992, Submitted by PRIDE to USAID, USAID Contract Number ANE-0178-Q-00-1047-00

contaminated canal water for washing, etc. The practices persist for a variety of reasons, reasons which this project will seek to understand and mitigate – but which may include: high cost to change practices, lack of viable alternatives for sewerage disposal because of high ground-water tables and the high cost of land, lack of viable alternatives for solid waste collection and disposal, etc.

The communications strategy will be a key factor in this performance monitoring approach – providing local level stakeholders with information and understanding to inspire local-level changes in practice, enabling them to evaluate and prioritize initiatives to improve the quality of water, and giving them the tools they need to work with donors and Governorate-level officials to plan new initiatives.

Overall, the communication component of the project will help improve water quality and sanitation by helping to convey to local, District and National level players:

- What is the **status** of local-level water quality and sanitation – what do data show about how severe is the problem and where?
- What are the **options and solutions** to addressing problems with water quality – what can be done to address the problem through changes in local practices, through local-level initiatives, and through outside investments?
- What are **local-level priorities** for addressing water quality problems – what are the key solutions that the local-level stakeholders, through the Water Boards, identify as their top priorities?
- What **progress** is being achieved – showing the changes in water quality?

3.8.1 Objective

The key objectives for the communication strategy are to:

- Change **local-level practices** that degrade water quality
- Inspire and guide **local-level initiatives** to improve water quality
- Inform **local-level planning and prioritizing** of initiative to improve water quality.

- Facilitate the delivery of **outside (non-local) capital investments** to improve the water quality
- Serve **donor interests** in showing the performance of water quality investments

3.8.2 COMMUNICATION STRATEGY – "Phase 1 – Assessment"

We present here a draft plan for the communications strategy based on initial research and best practices. The first step of the initial 6-month project will need to be an inclusive review with key stakeholders about target audiences, audience interests and needs, communications vehicles and tactics, etc.

3.8.2.1 Target Audience

In Phase 1 we will develop a careful definition of the target audiences who play a role in water quality and sanitation, and their roles, needs, and perspectives. The various players affected by and affecting the local-level water quality are likely to have very heterogeneous characteristics, which must be considered in the detailed communications planning.

The primary target audiences are the local-level stakeholders who are most affected by poor water quality and sanitation. These include:

- Farmers: their agricultural productivity and the health of their workers and families is directly affected by water quality
- Village households: water and sanitation consumers
- Women, mothers and wives in villages, responsible for household sanitation, food preparation and childcare
- Children: affected by water quality, and also able to influence household practices
- Business owners: business practices can affect water quality, and also can be decision leaders.
- Community leaders: can influence local-level opinions and actions

We also define a number of secondary audiences whose involvement and actions are also needed to realize improved performance:

- District level government staff– of MWRI, Ministry of Health, etc: oversee programs that do (or should) improve local-level water quality
- National level government staff

- National level NGOs and donors

3.8.2.2 Communications Vehicles

Communications vehicles will be implemented to reach each of the key audiences at the local, Governorate and national level. A range of different vehicles will be needed to serve the diverse needs of these audiences. The specific approaches to be used will be defined in Phase 1, but might include:

- **Baseline context (one time):** use local civic leaders, printed materials for local distribution, and volunteers to disseminate messages about the program's approach, possibilities for local actions and outside investments. May require integration with hygiene education messages from sanitation/education partner organization, as available, using radio/TV and other media as available.
- **Baseline data and situation (one time):** use local civic leaders, printed materials for local distribution and volunteers to disseminate messages about water quality baseline data, priorities for local-level changes in practices and local-level actions, as well as a planned approach for outside investments. Email and the Web will be used to reach Governorate and national-level stakeholders, conveying messages about general project approach.
- **Water quality progress (monthly or quarterly):** the results of initial local-level actions will be the basis for awarding targeted funding, and so a good opportunity for local-level civic leader communication, public events, TV/radio coverage, etc. Progress will also be reported to Governorate and national level stakeholders by email and the Web.
- **Water quality updates (quarterly):** Governorate and national level audiences of government, NGO and donor staff will be the target of periodic (quarterly) updates.
- **Communications** about program actions and accomplishments. This outreach will serve to heighten awareness of the CPBM, to focus attention on locally identified efforts that may require outside funding and support, and to focus attention on the accountability where responsibilities are already clearly defined.

Communications Vehicles								
Communications Vehicles >	**"Trusted voices"**	**Local visibility**	**Direct household messages**	**Direct household persuasion**	**Local/ regional media - print**	**Local/ regional media – radio/TV**	**Email**	**Web**
	Enlist Civic leaders, teachers, Imams, youth leaders for oral comm.	Publicly visible posters, pamphlets, "give-aways"…	Printed "Updates" delivered to households	Household visits by volunteer promoters	Newspaper reports on progress, performance, activities	News reports, "call-in" shows, entertainment-focused programs	Progress updates, project news	Project data, approach, tools, contact information.
Target audiences >								
Local-level residents	✓	✓	✓	✓	✓	✓	✓**?**	
Governorate level staff, NGOs					✓	✓	✓	✓
National Ministry staff							✓	✓
National NGOs							✓	✓

3.8.2.3 Communications Infrastructure

The "hub" for all the information and data for the project will be an Internet-based information infrastructure – bridging local and national level stakeholders, and also connecting together stakeholders across project locales. While many of the local-level stakeholders will not (soon) use email or Web services, this Internet-based information infrastructure will support the project at the local and the national level.

Local-level project participants will collect data about water quality performance – including numbers, text descriptions, photos, etc. It can also include a background of the project approach, project plans and schedules, and allow for comparison of project data across different locales. This information will be periodically uploaded to an Internet-based data management system. A key function of the online system will be to support project staff – providing them with a central infrastructure for accessing and sharing project data and communications products (e.g. flyers, posters). The system will be developed to allow access to all the data and materials by email alone – as well as via the Web - to support staff with limited Internet access. Thus, while local-level stakeholders may not go online, project staff will to download project materials for local-level usage.

The online system will also make the project scalable – allowing additional project locations to tie into the program, contribute data and information, and re-use information developed for the other project sites.

Finally, the online system will give the project a national visibility - which will be key to helping marshal the investment support that most locals will need. This visibility will also be important to attract other potential project partners.

3.8.2.4 Communications Staffing

Phase 1 Assessment: Phase 1 will involve intensive local-level consultation to identify problems, local-level priorities for action, key audiences and characteristics, communications messages, and communications tactics and vehicles. For a period of weeks or a few months a number of communications/social marketing experts will be needed.

Phase 2 Implementation: Initial communications training will be important for local level staff, community leaders, outreach volunteers, and Water Boards. Regular consultations and project visits will be essential for the first year of the project, followed by more periodic consultations. Communications support will be needed to develop products for print, radio and TV.

3.8.2.5 Communications Partners

To accomplish changes in local practices, the project information about the water quality status and the improvements needs to be coupled with information about health and sanitation education.

The project should seek out established partners who can provide local-level hygiene and health communication and education. Groups such as UNICEF, Egyptian Water Partnership, USAID, numerous NGOs and others have experience in local level sanitation and health education.

3.8.2.6 Communications: Measures of Success

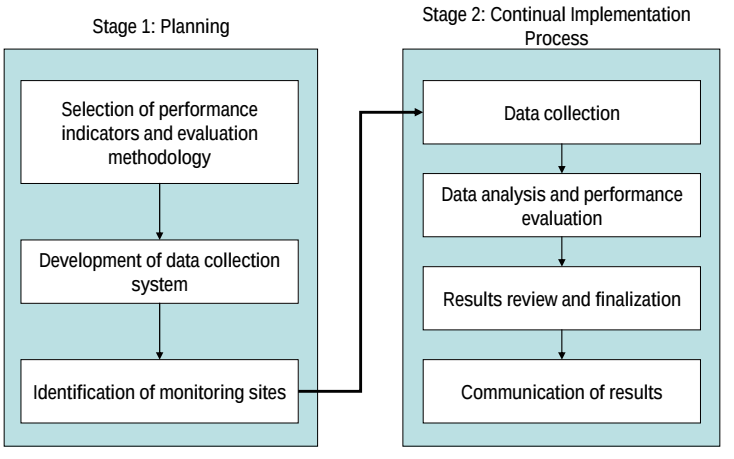
The Communications component of the project will be successful if the communications objectives are satisfied:

- Change **local-level practices** that degrade water quality: actual project data demonstrates that actions have been taken at the household-level that have improved water quality and water use practices.
- Inspire and guide **local-level initiatives** to improve water quality: the project data and related education has led to the completion of local initiatives to improve water quality and sanitation.
- Facilitate the delivery of **outside (non-local) capital investments** to improve water quality: The project data and communications training has enabled local-level leaders (Water Board) to prioritize and to seek the outside investments needed to improve water quality and sanitation.
- Serve **donor interests** in showing the performance of water quality investments: donor interest in the project has grown, because of effective communications vehicles about project objectives and results.

3.9 Long Term Vision

A major challenge for the Egyptian government is to address the water services and quality needs of nearly 27,000 villages. Over the last two decades the efforts of the

Figure 8: Implementation Steps for CPMB Initiative for Non-point Domestic Sources



Egyptian government have focused on the water sector in the urban areas of Egypt. As in most countries, urban and rural areas have very different characteristics, and the water sector strategies used in urban areas are unlikely to work in the rural setting. The Egyptian government recognizes the needs of the rural populations and has accordingly encouraged the use of different technologies, promoted decentralized decision making and the use of participatory approaches. There are now several local level organizations that are beginning to get established and initiate water quality management efforts. A critical organization in the effort is the Water Boards operating around the branch canal level. Empowering Water Boards for water quality management is an essential strategy for reaching the rural populations in the 27,000 villages.

The CPMB initiative for non-point domestic sources that is described above will start at the level of one Water Board that may consist of around 10-15 villages. This may be a small number of villages, but it is critical to start small at this stage. However, this first CPMB initiative is actually a part of the long-term strategy to cover most of the villages. If implemented carefully, this CPMB initiative will be able to reach nearly 90% of the villages in ten years. The 1-year, 5-year and 10-year implementation plan for CPMB is shown below.

Table 1: Water Board Level CPMB Initiative for Domestic Non-point Sources

1-Year Plan

1. Work with one water board and operationalize the benchmarking program by Dec 2004. Key Milestones for this initiative will include:
   - Baseline report on water quality for the selected water board
   - Identification and agreement on performance indicators and methodology
   - Identify key stakeholders, their roles and needs, and communications tactics
   - Training local teams on data collection, monitoring and analysis
   - Operationalzing a performance management system at water board (train staff, establish procedures and transfer computer tools)
   - Develop communications infrastructure to leverage data collection for dissemination to local, Governorate and national level.
   - Develop and implement initial baseline water quality communications messages.
   - Institute a high visibility event for public recognition and reward for best performing village, with corresponding Regional and national-level communications tactics.
5. Based on data compiled, analyze and understand capacity building and investment needs to achieve water quality goals
6. Establish annual, medium and long term targets
7. Develop expansion plan

5-Year Plan

1. Operationalize benchmarking system in fifty water boards
2. Create investment and capacity building support fund tied to performance and benchmarking ranking
3. Institute a system of annual benchmarking report for water boards
4. Create an Egyptian team and appropriate organization for disseminating the performance based management system to other water boards
5. Selectively introduce a system of user fee to strengthen local revenue generating capacity
6. Create Water Board clusters to support integrated water resource management

10-Year Plan

1. Expand the coverage of performance based and benchmarking program to 90% of the villages in Egypt by 2015.

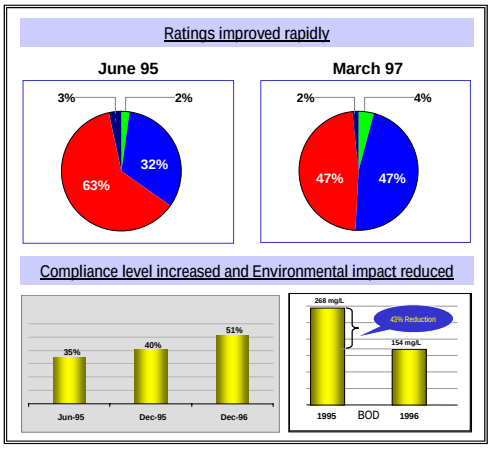
PART 4: CPMB PROGRAM FOR INDUSTRIES

4.1 Design Issues and Implementation Steps

Over the last ten years, CPMB initiatives for industrial wastewater management have been actively adopted by many environmental agencies. The primary model of CPMB for industrial wastewater is the well-known Indonesian program called PROPER (will provide web references). Under PROPER, industrial enterprises that discharge wastewater are reviewed for compliance and over-compliance relative to the water pollution standards, and are rated using a five-color scheme as shown in Figure 10. This program led to a reduction in water pollution by more than 40% within a period of eighteen months. With some modifications, this CPMB model can be easily transferred to the Egyptian context.

Figure 10: CPMB Initiative for Industrial Wastewater Management-Indonesia's Experience

PERFORMANCE LEVELS	PERFORMANCE CRITERIA	POLICY OBJECTIVES
GOLD	•Clean technology, waste minimization, pollution prevention, conservation, etc.	Promote Adoption of Clean Technology and EMS
GREEN	•Above standards & good maintenance, housekeeping, sludge management, etc.	
BLUE	•Efforts meet minimum standards	Create Incentive for Compliance
RED	•Efforts don't meet standards	
BLACK	•No pollution control effort, •Serious environmental damages	



The design and implementation of an Egyptian version of PROPER will require the following key activities:

Development of Performance Evaluation Methodology: The methodology for evaluating performance of water pollution control effort is well developed and it will be easy to modify the existing models for the Egyptian industries. However, the consensus building aspect of a performance evaluation methodology will require some time. To provide some insight into the content of a performance evaluation methodology and for

illustrative purposes only, the criteria for water quality management that are applied in the Indonesian program are presented below. It must be stressed that the development of a performance methodology is not solely a technical issue, but the process through which agreeable performance methodology and criteria evolve are very crucial.

Table 2: Criteria for Water Quality Management Applied by the Indonesia's PROPER Program for Rating Industries	
1. Wastewater Treatment system	Criteria For:
a. *Is there a wastewater treatment system installed in the factory?*	Black
b. *Is the treatment system adequate and in good condition?*	Blue/Red
2. Flow meter Quality and Operation	
c. *Is there a flow meter for measuring discharge volume?*	Blue/Red
d. *Is the flow meter operational and in good condition?*	Green
e. *Is the volume discharged per unit output (or input in some cases) in compliance with applicable discharge standard?*	Blue/Red
f. *Is the flow rate measured on all days of production?*	Blue/Red
3. Self monitoring	
a. *Are all required effluent parameters sampled and tested at least once every month?*	Blue/Red
b. *Is the sample tested by a certified laboratory?*	Blue/Red
c. *Has the company sampled all applicable effluent parameters?*	Blue/Red
d. *Has the company reported 20 complete self monitoring results per month?*	Green
4. Effluent Quality	
a. *Is effluent concentration in compliance with all regulatory standards?*	Blue/Red
b. *Is effluent load in compliance with all regulatory standards?*	Blue/Red
c. *Is effluent concentration level for any parameter worse than applicable regulatory standards by more than 50%?*	Black
d. *Is effluent concentration level for all parameters better than applicable regulatory standards by 50%?*	Green
e. *Is effluent concentration level only 5% of the standards for all applicable effluent parameters?*	Gold
5. Water Use	
a. *Is the total water consumption better than the industry average?*	Green
b. *Has the water consumption level declined from previous year?*	Green
c. *Is the rate of water reuse and recycling (%) better than industry average?*	Green
d. *Is the factory located in an area that has concerns about underground aquifers?*	Green
e. *Is there an increasing trend of water withdrawal from groundwater sources?*	Green

1. Coverage of the Program: There are around 700 industrial enterprises that discharge their wastewater into drains (Kassem and Abdel-Gawad, 2002). Using the existing information from MWRI and EEAA, it is feasible to rank the industries on the basis of the quantity of water pollution they generate. This report recommends that around 100 industrial units should be included in the first round of the CPMB initiative.

2. Data Collection and Compilation Strategy: It is important to ensure that the data needs are kept to a minimum and that industries are required to supply only the data necessary for the performance methodology. Often data collection efforts become an extensive operation and companies are required to collect and report lots of redundant information. Also, it will be desirable to apply those data that industries are familiar with and collect as part of their routine operations.

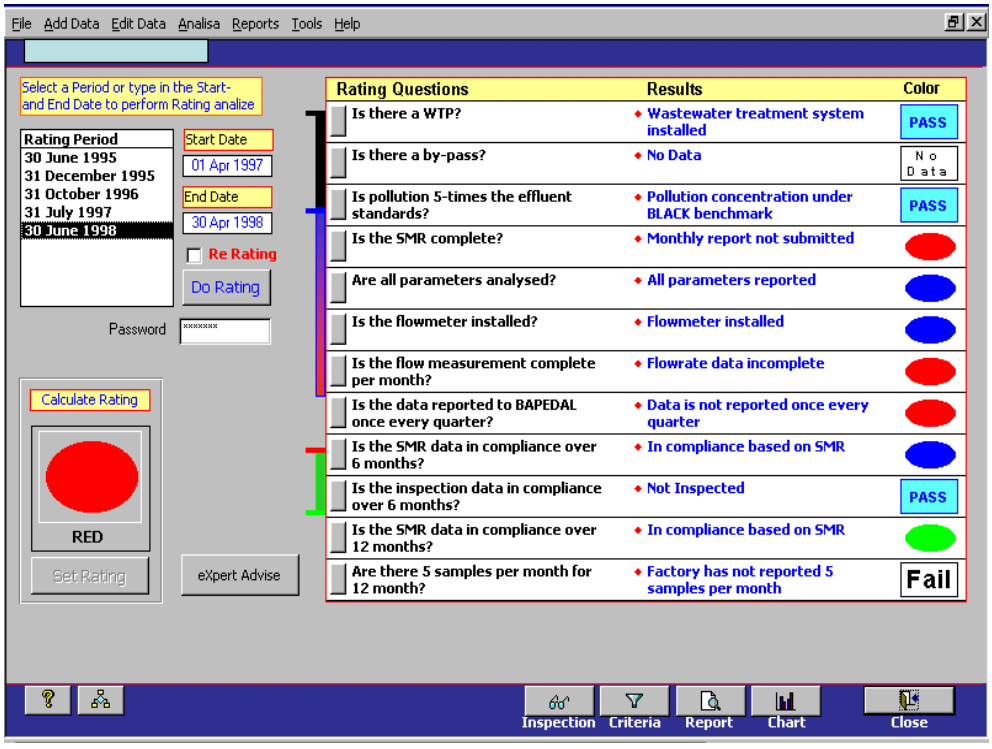
   It is likely that some of the data needed for performance analysis may already be available from MWRI and EEAA. Some data are collected on an annual basis, some on a monthly basis and there are a few parameters that must be recorded on a daily basis. Also, some data must be audited using either internal auditing procedure or through a third party. Finally, most of the data applied in performance evaluation should be based on self-monitoring by companies. However, the MWRI or the EEAA may selectively conduct inspections to verify the data.

   Data collection could appear to be cumbersome but in reality it is not. Based on the experience of CPMB initiatives all over the world, it is an unambiguous finding that companies are willing to put in some effort on data collection if they are convinced that the data they report will be analyzed and converted into valuable performance information and business intelligence. Therefore, a sound performance evaluation methodology is a fundamental pre-condition for the successful data collection system.

3. Performance Evaluation: At this stage of implementation, there are three key considerations. These include the accuracy of analysis, the review and discussion process, and the preparation of a compact performance evaluation and benchmarking report.

For an accurate assessment of performance, the CPMB team will be required to combine quantitative, qualitative and visual information in the performance evaluation process. Also, all quantitative indicators will be computed from the primary data. There will be at least twenty performance indicators that would require calculations and quality checks. At this stage, computerized techniques would be essential. Fortunately, the advances in software and hardware now make it possible to apply complex performance methodologies using standard computers and the commonly used software, Microsoft Office. As an example, the screenshot below is from the computer model used in Indonesia, which has the

Figure 11: Computerized Performance Evaluation



ability to evaluate more than five hundred industries within an hour. However, even with the best computer model for performance evaluation it is essential to have a structured process for reviewing the results. Generally, it is desirable to have an advisory committee consisting of members from appropriate public agencies, industries and NGOs. The performance results should be discussed and if new information becomes available or if new insights are provided by experts, be accordingly revised.

At this stage it is important to emphasize that a good computerized system and a transparent review process are a necessary part of the implementation system that will ensure expediency and accuracy, but it is not the end. The ultimate result of the CPMB initiative is to induce water quality improvement behavior among industries, which is not dependent much on the computer system, but on how the information produced by the computerized systems is communicated to industries and other stakeholders. This makes the second element of performance evaluation—compact reports—very critical.

Performance evaluation reports should be compact, and clearly should explain the performance levels. An example of such a report is show in Appendix 1. It shows a one-page report which is patterned on widely used financial performance reports of companies. This report shows the performance on each criterion, and enables industries to focus on specific areas for further improvements. When industries receive clear guidance on improvements, they are more likely to undertake corrective actions.

4. Communication of Results: Once performance evaluation is completed and reports are ready, strategic communication of results is crucial. At this stage, the implementing agency will need a phase-wise strategy for sharing information. Communication of information should organized in the following steps:

a. First the performance report should be shared with industries. Enough time should be given to receive their feedback and to incorporate it in the final performance report.

b. Once industry feedback has been incorporated, summary statistics should be prepared for a general press release. The summary statistics reported to the press should include the following information:

    - The share of industries in different performance categories
    - The average values for critical water pollution parameters like BOD, COD and TSS
    - A brief review of reasons for the existing performance level
    - Some presentation on future targets
    - And finally, a tentative date for the next press release

c. At this stage it may be desirable to announce the names of those industries that have demonstrated a good performance because in policy implementation often positive incentives prove to be stronger motivators than threats of penalty or other such negative incentives. In addition, this kind of positive incentive and public recognition will help the government get support for the CPMB program from the segment of the industries that have demonstrated good environmental performance.

d. Finally, over time this phase-wise approach to communication will prepare the rest of the industries for information sharing.

e. A communication infrastructure will support the Program Manager's need for data collection and management and also provide a means for disseminating results to wider audiences. A Web-based database system will allow multiple levels of access, allowing, for example: Program Managers and monitored industries can post and review information for a specific facility and benchmark it against others; monitored industries can review and comment on their own data – and compare themselves to other sin their sector; the media and public can view overall trends in the monitoring data, and (when appropriate) view the information from specific facilities; email updates to targeted audience s- such as monitored

industries, the media, the public, etc, will be a key tool in expanding the impact of the program.

5. Post-Disclosure Readiness of the Government: Once information has been communicated to industries, the press and other stakeholders, the agency managing the program must be prepared for the reaction of the industries. Based on the experience of such CPMB initiative in other countries, the most common feedback from industries is a request for guidance from the environmental agency on how to undertake improvements. In this situation, it is critical that the implementing agency has clear recommendations to offer.

   Very often environmental agencies have pre-existing programs for technical and financial assistance. In such cases, the implementing agency should attempt to link access to technical and financial assistance to the performance in the CPMB program.

4.2 Data Readiness for CPMB Initiative for Industries

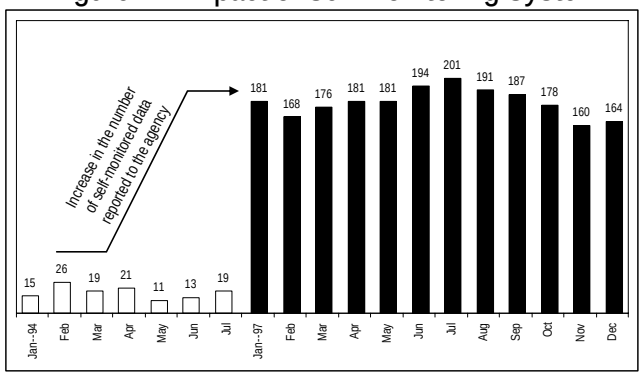
The nature of the data needed for implementing the CPMB initiative for industries is presented in Table 1. At least some of these data are currently collected by the Environmental Inspection Unit (EIU) at EEAA. Other data that may be needed could be collected by the EIU because of a pre-existing data collection mechanism. However, expanding the current scope of inspection to collect extra information may require further discussions with industries.

Data on industrial discharges are also collected by the Ministry of Health and Population. This leads us to believe that although there maybe a potential for a conflict between agencies, the focus on the data requirement for a CPMB initiative is on environmental aspects and therefore, closer to the mandate of EEAA.

4.3 Recommendations for Strengthening Data Collection from Industries

In most environmental agencies, pollution related information on industries is collected through two sources. First is the inspection mechanism, which is currently used by the EIU at the EEAA. The second equally important channel is the self-reported data by industries. Currently, the practice of reporting self-monitored data to EEAA does not exist. It is strongly recommended that the system of reporting self-monitored data be instituted, perhaps to start with on a voluntary basis. As shown in Figure 12, the experience of Indonesia shows that the amount of data the environmental agency had on industries increased by nearly ten times between 1994 and 1997 because of improvements in the self-reporting system.

Figure 12: Impact of Self-Monitoring System



4.4 Status of Data Sharing and Public Availability

Authors of this report attempted to collect data from various agencies, but the experience was not very successful. This experience is consistent with the findings of others (Reference __). Therefore, this report recommends that before any further investment is made in any new or expanded database system, it is essential to initiate CPMB initiatives at a very small scale that will utilize existing data for performance evaluation and in the process of establishing mechanisms for data sharing, identify new data needs and decentralize some of the data collection responsibilities so that local monitoring points and causes of water pollution can be correlated.

5. Conclusion

In conclusion the report suggests that IWRM can be put into practice in Egypt with the help of two pilot CPMB initiatives. The CPMB initiative for domestic non-point sources of water pollution should be initiated at one Water Board under the overall supervision of

the MWRI. For industries, a CPMB initiative can be implemented for around fifty priority industries, with EEAA as the main coordinator. It is possible to implement both these initiatives within a period of six months.

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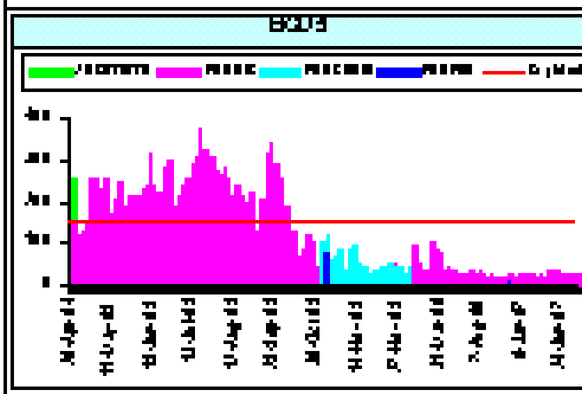
Appendix 1: Sample of a Compact Environmental Performance Report

Rating Period: June/ 1998

Final Rating: BLUE   Previous Rating: BLUE

Criteria for a BLACK Rating: If the answer to any of the questions 1-4 is a "Yes", the factory gets a BLACK rating	
1. Any portion of the wastewater discharged without treatment?	✗
2. Is there a bypass for wastewater?	✗
3. Is the effluent concentration greater than five times the standard based on the last three month's data?	✗
4. Is the pollution load per unit product more than five times the standard based on the last three month's data?	✗
Criteria for a BLUE or RED Rating: If the answer to any of the questions 5-11 is a "No", the factory gets a RED rating. If all the answers are "Yes" the factory gets a BLUE rating	
5. Does the factory analyze the wastewater regularly at least once every month?	✓
6. Is there an operational flowmeter in place?	✓
7. Is the flowmeter measured at least for 20 days per month?	✗
8. Is the data reporting to BAPEDAL once every quarter?	✓
9. If applicable, does the factory have a liquid waste application permit?	Not Applicable
10. Is the last 3 months data for effluent concentration in compliance with the standard?	✓
11. Is the last 3 months data for pollution load per unit product in compliance with the standard?	✓
Criteria for a GREEN Rating: The factory gets a GREEN rating only if all the answers for questions 12-16 are "Yes"	
12. There is no ongoing enforcement action against the factory	✓
13. Is the last 12 months data for effluent concentration in compliance with the standard?	✗
14. Is the last 6 months data for pollution load per unit output better than the standard by a factor of 50%?	✗
15. Is the factory in full compliance with the hazardous waste regulation?	✗
16. Is the factory in compliance with the AMDAL regulations (Environmental Impact Assessment)?	✓

✗ No   ✓ Yes



Wastewater Treatment Plant Information

WWTP Capacity (m3/day):	[illegible]
Primary Treatment (PTS):	INSTALLED
Year of installation of PTS:	[illegible]
Secondary Treatment (STS):	AEROBIC TREATMENT
Year of installation of STS:	[illegible]
Type of Flowmeter:	Magnetic Flow Meter

Comment: Phenol Total and Oil and Grease were not reported in 1997, [illegible] TSS above the standard.