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ARAB REPUBLIC OF EGYPT

Second Pollution Abatement Project

Report No. 113565
MARCH 23, 2017

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Report No.: 113565

PROJECT PERFORMANCE ASSESSMENT REPORT

ARAB REPUBLIC OF EGYPT

SECOND POLLUTION ABATEMENT PROJECT

(IBRD-73720)

Financial, Private Sector, and Sustainable Development
Independent Evaluation Group

Currency Equivalents (annual average)

Currency Unit = Egyptian Pound (LE)

2016	US$1.00	LE14.5

All dollar amounts are U.S. dollars unless otherwise indicated.

Abbreviations and Acronyms

AFD	French Development Agency
BOD	biological oxygen demand
CCP	commercial competitive practice
CER	Certified Emission Reduction
CIB	Commercial International Bank
CDM	Clean Development Mechanism
CO	carbon monoxide
CO_2	carbon dioxide
COD	chemical oxygen demand
CPF	Country Partnership Framework
EA	ethyl acetate
EAA	Equivalence and Acceptability Assessment
EEAA	Egyptian Environmental Affairs Agency
EIB	European Investment Bank
EPAP	Egypt Pollution Abatement Project
EPF	Environmental Protection Fund
GDP	gross domestic product
HF	hydrogen fluoride
ICB	international competitive bidding
ICR	Implementation, Completion, and Results Report
ICRR	Implementation, Completion, and Results Report Review
JBIC	Japan Bank for International Cooperation
M&E	monitoring and evaluation
MENA	Middle East and North Africa
MIS	management information system
MSEA	Ministry of State for Environment Affairs
NBE	National Bank of Egypt
NCB	national competitive bidding
NEAP	National Environment Action Plan
NGO	nongovernmental organization
PAD	project appraisal document
PDD	project design document
PDO	project development objective
PM	particulate matter
PM_{10}	coarse dust particles (2.5 to 10 micrometers diameter)
PMU	Project Management Unit
PPAR	Project Performance Assessment Report

QNB	Qatar National Bank
SO_X	sulfur oxides
TDS	total dissolved solids
TSP	total suspended particles
TSS	total suspended solids
UNFCCC	United Nations Framework Convention on Climate Change
WHO	World Health Organization

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This report was prepared by David Colbert (consultant), who assessed the project in November 2016. The consultant was supervised by Stephen Hutton (task team leader). The report was peer reviewed by Jack Fritz and panel reviewed by Ridley Nelson. Vibhuti Narang Khanna provided administrative support.

Principal Ratings

	ICR*	ICR Review*	PPAR
Outcome	Satisfactory	Satisfactory	Satisfactory
Risk to development outcome	Moderate	Moderate	Significant
Bank performance	Moderately satisfactory	Moderately satisfactory	Moderately satisfactory
Borrower performance	Satisfactory	Satisfactory	Satisfactory

* The Implementation Completion and Results (ICR) report is a self-evaluation by the responsible Bank department. The ICR Review is an intermediate IEG product that seeks to independently verify the findings of the ICR.

Key Staff Responsible

Project	Task Manager or Leader	Practice Director	Country Director
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IEG Mission: Improving World Bank Group development results through excellence in independent evaluation.

About this Report

The Independent Evaluation Group (IEG) assesses the programs and activities of the World Bank for two purposes: first, to ensure the integrity of the Bank's self-evaluation process and to verify that the World Bank's work is producing the expected results, and second, to help develop improved directions, policies, and procedures through the dissemination of lessons drawn from experience. As part of this work, IEG annually assesses 20-25 percent of the World Bank's lending operations through field work. In selecting operations for assessment, preference is given to those that are innovative, large, or complex; those that are relevant to upcoming studies or country evaluations; those for which executive directors or World Bank management have requested assessments; and those that are likely to generate important lessons.

To prepare a Project Performance Assessment Report (PPAR), IEG staff examine project files and other documents, visit the borrowing country to discuss the operation with the government, and other in-country stakeholders, and interview World Bank staff and other donor agency staff both at headquarters and in local offices as appropriate.

Each PPAR is subject to internal IEG peer review, panel review, and management approval. Once cleared internally, the PPAR is commented on by the responsible World Bank department. The PPAR is also sent to the borrower for review. IEG incorporates both World Bank and borrower comments as appropriate, and the borrowers' comments are attached to the document that is sent to the World Bank's Board of Executive Directors. After an assessment report has been sent to the Board, it is disclosed to the public.

About the IEG Rating System for Public Sector Evaluations

IEG's use of multiple evaluation methods offers both rigor and a necessary level of flexibility to adapt to lending instrument, project design, or sectoral approach. IEG evaluators all apply the same basic method to arrive at their project ratings. Following is the definition and rating scale used for each evaluation criterion (additional information is available on the IEG website: http://ieg.worldbankgroup.org).

Outcome: The extent to which the operation's major relevant objectives were achieved, or are expected to be achieved, efficiently. The rating has three dimensions: relevance, efficacy, and efficiency. *Relevance* includes relevance of objectives and relevance of design. Relevance of objectives is the extent to which the project's objectives are consistent with the country's current development priorities and with current World Bank country and sectoral assistance strategies and corporate goals (expressed in poverty reduction strategy papers, country assistance strategies, sector strategy papers, operational policies). Relevance of design is the extent to which the project's design is consistent with the stated objectives. *Efficacy* is the extent to which the project's objectives were achieved, or are expected to be achieved, taking into account their relative importance. *Efficiency* is the extent to which the project achieved, or is expected to achieve, a return higher than the opportunity cost of capital and benefits at least cost compared to alternatives. The efficiency dimension generally is not applied to adjustment operations. *Possible ratings for outcome:* highly satisfactory, satisfactory, moderately satisfactory, moderately unsatisfactory, unsatisfactory, highly unsatisfactory.

Risk to Development Outcome: The risk, at the time of evaluation, that development outcomes (or expected outcomes) will not be maintained (or realized). *Possible ratings for risk to development outcome:* high, significant, moderate, negligible to low, not evaluable.

World Bank Performance: The extent to which services provided by the World Bank ensured quality at entry of the operation and supported effective implementation through appropriate supervision (including ensuring adequate transition arrangements for regular operation of supported activities after loan/credit closing, toward the achievement of development outcomes. The rating has two dimensions: quality at entry and quality of supervision. *Possible ratings for World Bank performance:* highly satisfactory, satisfactory, moderately satisfactory, moderately unsatisfactory, unsatisfactory, highly unsatisfactory.

Borrower Performance: The extent to which the borrower (including the government and implementing agency or agencies) ensured quality of preparation and implementation, and complied with covenants and agreements, toward the achievement of development outcomes. The rating has two dimensions: government performance and implementing agency(ies) performance. *Possible ratings for borrower performance:* highly satisfactory, satisfactory, moderately satisfactory, moderately unsatisfactory, unsatisfactory, highly unsatisfactory.

Preface

This Project Performance Assessment Report (PPAR) is for Egypt's Second Pollution Abatement Project (EPAP II). The decision to undertake this PPAR was based on the fact that it would contribute to a forthcoming IEG thematic evaluation on pollution management, *Toward a Clean World for All* (FY18), and would provide a case study of an innovative, multi-donor-funded project in the Middle East and North Africa (MENA) region. Moreover, the PPAR would provide a better understanding of on-the-ground experience in using country systems in lieu of the World Bank's safeguards policies, EPAP II being the first project in MENA to attempt this.

EPAP II, which was implemented from 2006 to 2012, was designed as a follow-on project to the initial Egypt Pollution Abatement Project (EPAP I), which financed a number of pollution abatement sub-projects in the industrial sector in Egypt from 1998 to 2005. EPAP II was intended to build on the positive outcomes achieved by EPAP I and to scale up pollution abatement investments to improve ambient air and water quality in selected environmental hotspots in the country.

The World Bank assembled a number of co-financing institutions to augment its own financing of $20 million for EPAP II (see Appendix A for the Basic Data Sheet on the project). These institutions included the European Investment Bank, $54.13 million; the French Agency for Development, $47.74 million; the Japan Bank for International Cooperation, $40 million: and the Government of Finland, $1.1 million. As a result, the total loan/grant package for EPAP II, at $165.97 million, was much larger than that for EPAP I ($40.70 million).

The World Bank's financing for EPAP II was approved in 2006 as a six-year Financial Intermediary Loan. The project's main component was a line of credit for financing industrial pollution abatement sub-projects managed by an Apex Bank, the National Bank of Egypt, with technical assistance on the environmental issues (pollution abatement standards and appropriate technologies) provided by the Egyptian Environmental Affairs Agency. In addition, EPAP II included a separate Carbon Finance Sub-program designed to support the Government of Egypt in taking advantage of the opportunities offered by the emerging carbon market created by the Kyoto Protocol. As noted above, EPAP II was also selected as one of the pilot projects for testing the World Bank's new "country systems" approach under OP/BP 4.00.

At project closing (following two one-year extensions of the original closing date), the World Bank had disbursed its $20 million., while the co-financing partners continued until all funds were disbursed. At the government's request, several of the co-financing institutions began implementation of an EPAP III in 2014. The World Bank, however, chose not to participate in the new follow-on project.

This PPAR presents its findings and conclusions based on a review of the World Bank's project documentation, that is, the project appraisal document, loan agreement, Implementation Completion and Results Report (ICR), ICR Review, and World Bank and country project records where available. To obtain information directly from country sources, an IEG mission visited Egypt in November 2016, and met World Bank staff and

the full range of project stakeholders, including officials in the relevant government institutions, EPAP II financing partners where available, as well as representatives from the participating banks, industry beneficiaries, and nongovernmental organizations that participated in the project (see Appendix B for a complete list of stakeholders met).

The contributions of the national consultant who collaborated with the IEG mission (Dr. Abdelhamid Beshara) and all the public and private sector stakeholders the mission met in Egypt, as well as the insights offered by the current and former World Bank staff interviewed in Washington (Mr. Alaa Sarhan, Mr. Hocine Chalal, Mr. Sherif Arif), have proved invaluable to preparation of this PPAR. And, the IEG mission certainly wants to recognize the administrative and logistical support provided by the World Bank country team, particularly Ms. Ingy Awad in the Cairo office.

Following standard IEG procedures, a copy of the draft report was sent to the relevant government officials and agencies for their review and feedback. Comments were received from the borrower and are included in Appendix J of this report.

Summary

Egypt's rapid population growth (from 36 million in 1973 to 91.5 million in 2015), combined with its economic development and industrialization policies and weak environmental management, have resulted in widespread and severe pollution of Egypt's critical air, water, and soil resources. In recent decades, the government of Egypt has increasingly attempted to address the pollution threats to its public health and environmental conditions, seeking support for its efforts from international financing institutions and bilateral donors. The World Bank first investigated these threats in its "Country Environmental Analysis" (1992–2002) for Egypt, published in 2005, which recognized that the declines in air and water quality were among Egypt's four most significant environmental issues, and made recommendations for reducing pollution risks for both. In a separate study, "Cost Assessment of Environmental Degradation" (2002), the World Bank estimated the cost of this pollution in damage to the Egyptian economy in 1999 at LE10–19 billion per year, or 3.2–6.4 percent of GDP.

The Second Egypt Pollution Abatement Project (EPAP II), which was implemented from 2006 to 2012, was designed as a follow-on project to the initial Egypt Pollution Abatement Project (EPAP I). This project financed a number of pollution abatement sub-projects in the industrial sector in Egypt from 1998 to 2005. EPAP II was intended to build on the positive outcomes achieved by EPAP I and to scale up pollution abatement investments so as to improve ambient air and water quality in the two most serious environmental hotspots. The World Bank assembled a number of co-financing institutions to augment its own financing of $20 million for EPAP II; these institutions included the European Investment Bank ($54.13 million), the French Agency for Development ($47.74 million), the Japan Bank for International Cooperation ($40 million) and the Government of Finland ($1.1 million). As a result, the total loan package for EPAP II, at $165.97 m., was much larger than that for EPAP I ($40.70 million).

EPAP II's objective was "to demonstrate the applicability of market-based financial and technical approaches to achieve pollution abatement in selected areas, particularly in and around the Greater Cairo and Alexandria areas." The design of EPAP II had two components: (i) a line of credit facility managed by an Apex Bank (the National Bank of Egypt (NBE)) to extend concessionary financing to industry for pollution abatement in major hot spots in the Alexandria and Greater Cairo Governorates and (ii) technical assistance aimed at strengthening the capacity of the Egyptian Environmental Affairs Agency (EEAA) in project management and in compliance, monitoring and enforcement, and of other key stakeholders to facilitate their participation in EPAP II. It also included a Carbon Finance Sub-program intended to assist the government's efforts to set up a sustainable pollution abatement program based on the carbon finance market.

As a follow-on project to EPAP I, EPAP II built on the existing institutional arrangements established by EPAP I. Thus, EPAP II benefited from a highly-committed government counterpart, the experienced Project Management Unit (PMU) in EEAA, with its dedicated managerial and technical staff already in place. It could also count on an experienced banking sector (the NBE and other participating banks), with its nationwide institutional

structures already established and functioning. The Project Steering Committee established under EPAP I had performed its responsibilities since 1996 and remained operational. The project also enjoyed a high degree of readiness at the appraisal stage, with a solid pipeline of potential investment projects pre-identified under EPAP I.

EPAP II implementation advanced quickly in the early phase. From the outset, the PMU began reviewing requests for finance from industries from the pipeline of proposals submitted prior to project start; by June 2008 four investment sub-projects were being implemented and the total value of the sub-project pipeline had grown to $220 million. By project closing, the EPAP II model had financed preparation of 27 Compliance Action Plans, which recommended pollution abatement investments costing $245 million. Industry co-financing of EPAP II sub-projects amounted to $145 million, much above EPAP II's requirement of 10 percent self-financing. In addition, the industries undertook another $100 million in self-financed sub-projects to reach compliance.

The relevance of EPAP II's objective is rated **substantial.** The relevance of design is also rated **substantial:** the concessional credit line instrument was a reasonable approach to supporting pollution abatement investments in the political, economic, and social conditions in Egypt. The design included some elements that would support elements of technical approaches, but no significant elements to support demonstration of market-based financial approaches once the carbon finance sub-program was dropped. The efficacy of the project is considered in two parts. The project achieved substantial reductions of key pollutants for the industrial firms receiving EPAP II support, so the project's efficacy in achieving pollution abatement in selected areas is rated **substantial.** But, the project's efficacy in demonstrating technical and market-based financial approaches is rated only **modest,** as there was no demonstration of market-based approaches, and little evidence to suggest successful demonstration of technical approaches. Based on the unit costs of abatement realized and qualitative benefits identified, the project's efficiency in the use of project funds is rated **substantial.** These ratings lead to an overall outcome rating of **satisfactory.** Because of the risks to pollution abatement lending without donor financing and to the maintenance of abatement investments over the long term, the risk to the development outcome is rated **significant.**

The World Bank's performance in preparing EPAP II was generally sound. The World Bank team demonstrated due diligence in preparing the project, providing it with a diagnostic foundation, and incorporating the lessons learned from EPAP I. However, there were shortcomings in the World Bank's efforts in preparation of the associated Carbon Finance Sub-program. Quality at entry is rated **moderately satisfactory.** World Bank supervision was generally adequate, given the external financial and political disruptions that occurred during project implementation and it was responsive to the unexpected issues that arose then. The other shortcomings in World Bank supervision were the failure to revise the project objective after the Carbon Finance Sub-program was dropped, and the often-unreasonable delays in providing the World Bank's no-objection-to-procurement actions in the early phases of implementation. World Bank supervision is rated **moderately satisfactory.** These ratings lead to an overall rating for World Bank performance of **moderately satisfactory.**

The government of Egypt supported EPAP II's implementation throughout the project period, by appointing key staff members to serve in the PMU and providing critical resources so the PMU could perform its functions. Government performance is rated **satisfactory.** Assessment of implementing agency performance is divided between the technical PMU in EEAA and the financial PMU in NBE. The two-tiered PMU structure supported project implementation well, and both PMUs performed their EPAP II functions satisfactorily. Implementing agency performance is rated **satisfactory.** Based on these two ratings, overall borrower performance is rated **satisfactory.**

The design of EPAP II's monitoring systems at the industry, impact area and, institutional levels allowed the World Bank to gauge EPAP II's progress in achieving project pollution abatement outcomes, and permitted the World Bank to make the decisions necessary to keep project implementation on track. Monitoring and evaluation quality is rated **substantial.**

IEG's review of EPAP II's experience suggests the following lessons:

Though the use of concessionary financing can be effective in triggering private investments in pollution abatement, operations that rely on donor funding for such financing risk not being scaled up to the point where they can have a major impact on desired pollution outcomes, because of the inherent limitations on the availability of donor funding. The EPAP II model attracted private industrial financing, which accounted for 55 percent of total investment costs. Yet the model remains dependent on funding from international financing institutions, with no evidence that investments would occur without a substantial concessionary incentive. The challenge remains building a self-sustaining financial model, with the support and participation of the banking and industrial sectors, that would allow eventual phasing out financial support from international sources.

The "carrot and stick" approach employed by the EPAP II model suggests that the appropriate use of financial incentives (concessionary financing) backed by potential administrative/legal threats (environmental enforcement actions) can promote industrial compliance in a country where enforcement strategies alone have been insufficient to generate compliance, especially in the early stages of tackling national pollution. The traditional model for promoting environmental compliance in the industrial sector pitted industry against environmental authorities in adversarial roles. The EPAP II approach married the "carrot" of concessionary lending to industry to make pollution investments on attractive financial terms and the "stick" of EEAA monitoring, inspection, and enforcement actions to achieve compliance with Egyptian environmental standards.

The use of continuous environmental monitoring systems at industrial sites represents best practice for pollution control projects. EPAP II broke new ground in Egypt with the installation of continuous monitoring systems at industrial facilities, backed up by online monitoring at EEAA to ensure the reliability of the data. EEAA's use of continuous stack monitoring systems in its cement sector sub-projects, with their independent online connection to EEAA monitors, proved very effective in ensuring the continuous availability and reliability of data generated by participating industrial sites. Though this type of system is more easily installed for monitoring air emissions, it is equally important for monitoring wastewater discharges.

With the uncertainties surrounding the carbon finance market, World Bank operations involving carbon finance–linked projects should undergo careful preparation, delinking implementation schedules if necessary, to avoid risks that may occur during processing. At the time of EPAP II's preparation, the new area of carbon finance represented an enticing if untested opportunity. It appeared to promise a steady stream of revenue to support additional environmental financing, offering hope of establishing some financial sustainability in development projects. The lessons from the EPAP II experience, however, are that careful and realistic planning is critical and may require avoiding attempts to coordinate the carbon market project implementation with that of the associated project.

Ensuring careful alignment between project objective and project design is critical to avoiding confusion in determining whether a project has achieved its goals. In the case of EPAP II, the project objective included language with respect to "demonstrating" the applicability of "market-based" approaches to "achieve pollution abatement" in the industrial sector. The project design, however, did not follow a clear logic of demonstration (what was being demonstrated to whom?) and did not use what is traditionally considered a market-based approach. The Carbon Finance Sub-program may have been intended to address demonstrating a viable market-based approach based on the carbon market for sale of carbon emission reductions, but shortcomings in timing and preparation prevented the Sub-program from realizing its potential.

Managed carefully, the World Bank's role in organizing collaboration among its development partners can significantly enhance its ability to scale up its operations in the environmental management sector. EPAP I placed it among a number of other international financing institutions and bilateral donors already in the field. Using the apparent success of that first operation, however, the World Bank attracted, organized, and managed a larger group of co-financing partners for EPAP II, which allowed it to grow the level of investment financing available (from $35 million to $170 million) and scale up the level of industrial investment in pollution abatement in Egypt. The EPAP II model was similarly seen as sufficiently successful in supporting pollution abatement that the co-financing partners continued the model with EPAP III, without World Bank participation.

Environmental operations that rely on a credit line mechanism may be limited in their ability to target the most serious pollution issues because of requirements for creditworthiness. A credit line mechanism using private banks can have many advantages, but is likely to exclude firms with poor creditworthiness, even if they have severe pollution emissions with serious environmental health consequences. In the case of EPAP II, for example, a number of the public-sector industries, some of them among the heaviest polluters in Egypt, were unable to secure EPAP II loans because they could not meet the project's creditworthiness requirements. The project also developed but did not seem to act on screening and prioritization criteria that would have favored more polluting sectors and sub-projects likely to have greater impact on surrounding communities.

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1. Background and Context

1.1 Egypt's rapid population growth (from 36 million in 1973 to 91.5 million in 2015), combined with its economic development and industrialization policies and weak environmental management, have resulted in widespread and severe pollution of Egypt's critical air, water, and soil. In recent decades, the government of Egypt has increasingly attempted to address the threats pollution poses to the country's public health and environmental conditions, seeking support for its efforts from international financing institutions and bilateral donors.

1.2 The World Bank first investigated these threats in its 2005 *Country Environmental Analysis*[1] (1992–2002) for Egypt, which recognized that the declines in air and water quality were among Egypt's most significant environmental issues and made recommendations for reducing pollution risks in both. In a separate study, *Cost Assessment of Environmental Degradation*[2] (2002), the World Bank estimated the cost of this pollution in damage to the Egyptian economy. It estimated the cost of air pollution at LE3.3–9.6 billion or 1.1–3.2 percent of Egypt's gross domestic product (GDP), based on assessments of the impacts of urban outdoor and rural indoor pollution on human health. It estimated the cost of water pollution at LE2.1–3.6 billion or 0.7–1.2 percent of GDP, based on assessments of the lack of safe water, sanitation, and hygiene. When costs for soil, coastal zone degradation and inadequate waste management are added, the estimated cost of this pollution in damage to the Egyptian economy (in 1999) amounted to LE10–19 billion per year, or 3.2–6.4 percent of GDP. Moreover, the study estimated the cost of damage to the global environment at 0.6 percent of GDP. The World Bank concluded that the scope and magnitude of these economic costs are likely to offset a portion of Egypt's economic growth gains over time and could fundamentally undermine the country's economic reform and development program.

1.3 In order to mitigate this risk, the government during the past two decades has taken various macroeconomic and environmental management measures designed to support economic growth while minimizing environmental degradation. On the macroeconomic side, these included measures to reduce the adverse impacts from subsidies in the energy and water sectors. Government subsidies had long had the effect of promoting consumption of dirty fuels and scarce water for agriculture, with deleterious effects on the country's air and water resources. On the environmental management side, the government faced major challenges in building an effective, modern environmental management system. With weak institutional structures, limited technical and managerial capacity, and scarce financial resources, it had difficulty controlling pollution sources—including industry—that threatened public health and environmental quality. To remedy this, the government made significant improvements to the legal and institutional framework for environmental management and pollution control. These improvements included preparation of the country's first National Environmental Action Plan (NEAP) in 1992 in anticipation of the Earth Summit in Rio, adoption of an Environment Protection Law in 1994, and appointment of a Minister of State for Environmental Affairs in 1997. Finally, the government has worked to strengthen the minister's implementation and enforcement apparatus, the Egyptian Environmental Affairs Agency (EEAA),[3] which has gradually expanded its functions and responsibilities in all fields of environmental management at the national, regional, and local levels.

Project Context

1.4 EPAP II was designed as a follow-on project to the World Bank's initial Egypt Pollution Abatement Project (EPAP I), which introduced its first concessionary financing for pollution abatement investments in Egypt and financed a number of pollution abatement projects in the industrial sector from 1999 to 2005. EPAP I established the financial and technical mechanisms for supporting pollution abatement investments, strengthened the monitoring and enforcement capacity of the environmental regulatory institutions, and assisted in reducing industrial pollution that was causing adverse health effects and ecological degradation (see Appendix D for more detail on EPAP I). EPAP II was intended to build on the positive outcomes achieved by EPAP I and further scale up pollution abatement investments (the success of EPAP I attracted the additional donor funding from the European Investment Bank (EIB), the French Development Agency (AFD), and the Japan Bank for International Cooperation (JBIC) to improve ambient air and water quality in selected environmental hotspots in Egypt.

2. Objective, Design, and their Relevance

Objective

2.1 EPAP II's project development objective (PDO), as defined in the project Loan Agreement, was "to demonstrate the applicability of market-based financial and technical approaches to achieve pollution abatement in selected areas, particularly in and around the Greater Cairo and Alexandria areas."4 The PDO as stated in the project appraisal document (PAD) used slightly different language but remained essentially the same in scope: "to demonstrate, in the Egyptian context, the applicability of market-based financial/technical approaches in order to be able to achieve significant pollution abatement in selected hot spots areas in and around the Alexandria and Greater Cairo areas."5 Because the Loan Agreement is the legally binding document, this PPAR will use its definition of the PDO. The PDO was never modified.

2.2 EPAP II's PDO introduces the terms "demonstrate" and "market-based" with respect to the financial approaches used to achieve pollution abatement. While this may be appropriate in describing the carbon emission reductions to be purchased from the carbon market under the Carbon Finance Sub-program in EPAP II, it does not accurately describe the concessionary financial approach used by EPAP II to promote investments in pollution abatement. The latter is more in the nature of concessionary lending than a market-based approach.

2.3 The PDO-level outcome indicator described above was not revised, but two of the original intermediate outcome indicators were revised in the second restructuring, in June 2013. Both of these indicator revisions resulted from the failure of the Carbon Finance Sub-program to operate as originally planned. The indicator involving the agreement between the Environmental Protection Fund (EPF) and a commercial bank was dropped when the need for such an agreement did not materialize. The indicator involving the purchase of carbon

emission reductions (CER) was modified to track carbon emission reductions from EPAP II sub-projects rather than relying on purchases from the carbon market.

Relevance of Objective

2.4 EPAP II's objective was broadly relevant to Egypt's national economic development plans and environmental strategies. The government has made industrial pollution abatement part of Egypt's efforts at modernizing its economy while protecting its fragile resource base.[6] The priorities are clearly identified in its most recent National Environmental Action Plan (2002–17),[7] as well as in Egypt's 2015 *Sustainable Development Strategy: Egypt Vision 2030*,[8] which includes the environment as one of its three basic dimensions and commits the government to integrating environment into all economic sectors.

2.5 EPAP II's objective was in alignment with the country assistance strategy (May 2005) that was in effect at the time of Board approval; the strategy called for supporting the government of Egypt's environmental strategy in order to be able to address the environmental risks that could accompany economic growth and thereby encourage increased private sector awareness and involvement. EPAP II was seen as contributing to the promotion of environmental performance in the industrial sector with a view to the potential for increasing export opportunities for industrial companies. Although the World Bank's current strategy for Egypt has evolved away from individual environmental operations per se, EPAP II remains relevant to the present Country Partnership Framework (CPF) (2015–19),[9] which targets mainstreaming environment in projects where relevant, citing as examples World Bank projects in the energy sector, agriculture and rural sanitation. Finally, EPAP II's objective also remains highly relevant to the World Bank's current Environment Strategy (2011),[10] which places particular attention on helping countries to address environment-related health issues by supporting the creation of regulatory, economic, and financial incentives to reduce pollution and increase clean production.

2.6 EPAP II's objective is not a generic pollution reduction objective. Instead, it contains the language to "demonstrate the applicability of market-based financial and technical approaches." The goal of demonstrating a self-sustaining mechanism that could support pollution abatement more broadly throughout Egypt could be very relevant, but in practice the demonstration objective had only partial support within the project design. The EPAP II task team leaders interviewed for this PPAR were not particularly concerned with this language in the objective, focusing more on the "achieve pollution abatement in selected areas" language. They considered the EPAP model sufficiently demonstrated (to the World Bank, the government of Egypt, participating banks, and industry beneficiaries) in EPAP I and found (by all of the above) worth repeating in EPAP II and apparently in an EPAP III. Moreover, they basically disregarded the reference to "market-based financial approaches," relying on the EPAP I model of concessionary lending to achieve pollution abatement rather than demonstrating any new market-based approaches for this purpose. Finally, EPAP II's narrower geographic focus on selected areas "particularly in and around the Greater Cairo and Alexandria areas" focuses EPAP II's investments on the hotspots described above, the higher pollution zones of Egypt, which was a change from the scatter-shot approach taken by EPAP I. Given the scope of the industrial pollution in Egypt and the limited financing for pollution abatement provided by the project, prioritizing the most severe pollution loads

threatening vulnerable populations and environments made sense. However, the project did not appear to have a strategy that would lead to significant pollution reduction beyond the identified hotspots.[11]

2.7 The relevance of the objective is rated s**ubstantial**.

Design

COMPONENTS

2.8 EPAP II had two components: (i) a line-of-credit facility, and (ii) technical assistance, along with a stand-alone Carbon Finance Sub-program.

2.9 **Component 1—A line-of-credit facility** (Expected total: $162 million; actual total: $165.6 million). A line-of-credit facility managed by an Apex Bank (NBE)[12] to focus on pollution abatement in major hot spots in the Alexandria and Greater Cairo Governorates, and to target the industrial sector at large. The line of credit was financed by a loan from the World Bank ($20 million) and co-financed by concessionary loans from the EIB (about €40 million), from the JBIC ($40 million equivalent) and from the French Agency for Development (AFD) (€40 million).

2.10 **Component 2—Technical Assistance** (Expected total: $7.6 million; actual total: $7.64 million). Technical assistance activities aimed at strengthening the capacity of the EEAA in project management and in the areas of compliance, monitoring and enforcement, and strengthening of other key stakeholders to participate in EPAP II. This component was financed by the in-kind contribution of the government of Egypt, a contribution from the NBE ($1 million equivalent), a grant from the government of Finland (€900,000) and an additional grant from the EIB (about €3.5 million).

2.11 **Carbon Finance Sub-program**: This sub-program was intended to assist the GOE's efforts to set up a sustainable pollution abatement program by using portions of the revenues from the sale to the World Bank and other buyers of emission reductions generated under the Kyoto Protocol's Clean Development Mechanism. The Bank's role was to monitor the use of the revenues generated from the sales of emission reduction credits and ensure that pollution abatement activities were being implemented using the EPAP II model. There was no funding committed to this sub-program, which was not included in the EPAP II LA. It was treated as a standalone Carbon Finance Operation and later became the Onyx Alexandria Landfill Gas Capture and Flaring Project with its own Implementation Completion and Results (ICR).[13]

2.12 The project's components were not revised, but the project was restructured twice. The first restructuring (August 12, 2011) was a level 2 restructuring to extend the closing date from February 28, 2012, to August 31, 2013, as a result of delays caused by the global financial crisis, which occurred shortly after project approval, and disruption ensuing from the political events in Egypt beginning in January, 2011. The second restructuring (June 24, 2013) was also a level 2 restructuring to (i) extend the closing date again from August 31, 2013, to August 31, 2014, to allow proper completion of project activities, and (ii) revise the

two intermediate performance indicators tied to the abandoned Carbon Finance Sub-program: dropping the indicator with respect to a framework agreement between the Environment Protection Fund and a commercial bank, and modifying the indicator with respect to carbon emissions reductions purchased on the carbon market to tracking the CO_2 reductions from the EPAP II sub-projects. These indicators were relevant to the Carbon Finance Sub-program but were no longer relevant to EPAP II once the attempts to introduce the carbon market mechanism were abandoned.

2.13 As noted above, the Carbon Finance Sub-program did not develop as planned and was dropped from EPAP II, with the agreement of the government of Egypt, during the midterm review in 2009. At appraisal, the newly established carbon finance market seemed to present a financial mechanism (through the sale and purchase of CER credits) for promoting pollution abatement. But from the outset the sub-program faced significant barriers to implementation. First, the required registration of the project with the United Nations Framework Convention on Climate Change (UNFCCC) took much longer than anticipated at the time of appraisal. Second, this resulted in a further delay in the sale of CERs from eligible Clean Development Mechanism projects, which by then were also challenged by the global financial crisis. Finally, the World Bank's donor funds available to purchase CERs were quickly fully committed until the end of 2012, beyond the original closing date for EPAP II. For those reasons, the Carbon Finance Sub-program did not come to fruition. None of this (the extended delays, the lack of donor funds) was foreseen during project preparation (see Appendix E for more details on the Carbon Finance Sub-program).

IMPLEMENTATION ARRANGEMENTS

2.14 The EPAP II built on the existing institutional arrangements established by EPAP I. *Thus, EPAP II benefited from a highly committed government counterpart, an* experienced Project Management Unit (PMU) in EEAA, with its dedicated managerial and technical staff already in place, and an experienced banking sector (the NBE and other participating banks) with its nationwide institutional structures already established and functioning.[14] The Project Steering Committee established under EPAP I, which benefited from a broad coalition of members, had performed its responsibilities since 1996 and remained operational. Finally, the project also enjoyed a high degree of readiness at the appraisal stage with a solid pipeline of potential investment projects pre-identified under EPAP I.

Relevance of Design

2.15 EPAP II's design was based on the model developed by EPAP I: the use of a concessionary financing approach combined with collaboration on regulatory compliance to promote investments in pollution abatement by Egyptian industry. The EPAP II design included some elements to demonstrate technical approaches to pollution abatement through two paths: i) efforts to support industry-wide workshops to share knowledge and experience with other firms who were not covered by the project could potentially increase the likelihood that these firms would carry out pollution abatement investments on their own, and ii) technical assistance for capacity building in pollution abatement in private banks could potentially encourage those banks to carry out additional lending for such projects on their own. However, the design did not succeed in demonstrating any market-based financial

approaches, once the Carbon Finance Sub-program—the only real market-based element in the design—was dropped from the project. The design introduced a "carrot and stick" approach that married the "carrot" of the concessionary lending on attractive terms and the "stick" of EEAA monitoring, inspection and enforcement to achieve compliance with Egyptian environmental standards. This approach served EPAP II well in achieving pollution abatement, but it did not demonstrate a market-based approach for this purpose. Other models used by the Bank in similar pollution control projects did not fare as well.[15] In the end, the design enabled EPAP II to achieve at least the pollution abatement part of its PDO; it also serves as the basis for the follow-on operation, EPAP III.[16] This model has also been replicated in a similar project in Lebanon.

2.16 The relevance of the design is rated **substantial**.

3. Implementation

3.1 EPAP II implementation advanced quickly in the early phase. From the outset, the PMU began reviewing requests for finance from industries from the pipeline of proposals submitted prior to project start and by June 2008 four investment sub-projects were being implemented and the total value of the sub-project pipeline had grown to $220 million. Recognizing the need at that point to set priorities, the PMU and the World Bank agreed that the project should limit the sub-projects thematically, focusing on wastewater pollution in Alexandria and on air pollution in Cairo. In 2008, EPAP II began to experience the impacts of the global financial crisis at the sub-project-level; many industries ended up withdrawing their applications being unwilling to incur additional debt, which reduced the pipeline by 50 percent.

3.2 EPAP II's midterm review supervision mission took place in November 2009. In order to expedite implementation, the project decided to take a number of measures that would stimulate demand; among them were: (i) relaxing the thematic tie to specific geographical areas; (ii) expanding the eligible hotspot areas to include industrial areas in southern Cairo as well as to contiguous governorates, whose pollutants affect the hotspot areas in Greater Cairo and Alexandria; (iii) broadening the profile of eligible industries to include the cement sector and a cluster of small and medium enterprise brick manufacturers, as well as foundries needing to relocate; and (iv) introducing flexibility in the financial terms and conditions for NBE's on-lending to participating banks. These measures, for the most part, appear to be a reasonable midterm review response to the unexpected economic conditions impacting project implementation. Relaxing the thematic ties, expanding the hotspot areas around Cairo and Alexandria, and broadening the categories of eligible industries all remain consistent with EPAP II's objective. Also, introducing flexibility in NBE's on-lending corrected a practice that disadvantaged the other two participating banks (initially, NBE managed to keep its sub-project lending rate lower than that of its competitors).

Planned versus Actual Expenditure, by Component

3.3 EPAP II expenditures exceeded the appraisal estimates. As indicated in Table 3.1, the aggregated totals of actual/latest estimates of costs for both components exceeded the appraisal estimates. A breakdown of EPAP II costs by component is shown in appendix F.

Table 3.1. Planned versus Actual Expenditure, by Component

Component	Appraisal Estimate ($ million)	Actual/Latest Estimate ($ million)	Actual as % of Appraisal Estimate
1. Line of credit facility (pollution abatement investments)	162.00	165.60	102
2. Technical assistance	7.60*	7.64	100
Total:	169.60	173.24	102

*Includes $4.60 million for technical assistance, $3 million for equipment.

SAFEGUARDS COMPLIANCE

3.4 EPAP II's Integrated Safeguards Datasheet (2005) classified the project Environmental Category F, as such requiring a financial intermediary assessment. The project-financed investments in the line-of-credit component of the project triggered the World Bank's Environmental Assessment Safeguard Policy (OP/BP 4.01), but no significant adverse environmental or social impacts were expected because the sub-projects were designed to improve environmental conditions in the selected hotspots. In addition, the World Bank decided that EPAP II would pilot the use of country systems in lieu of the World Bank's safeguards policies, the first project in the Middle East and North Africa region to do so, under OP/BP 4.00 on Use of Borrower System to Address Environmental and Social Safeguards Issues in Bank-supported Projects.

3.5 Pursuant to OP/BP 4.00, an interdisciplinary World Bank team, in collaboration with EEAA staff, performed an Equivalence and Acceptability Assessment (EAA) during project preparation to determine the suitability of Egyptian systems for this purpose. The EAA determined that the Egyptian environmental impact assessment (EIA) system and the World Bank's Environment Assessment Policy had many features in common and that, despite a mixed history of implementation and enforcement, Egypt had the basic institutional and legal infrastructure at the national, regional, and local levels to perform these functions adequately. EEAA, however, had to commit to addressing key policy gaps identified by the EAA and to taking necessary measures to: (i) revise the EIA procedures, (ii) revise the screening criteria to make them more comprehensive, (iii) update the list of Competent Administrative Authorities, (iv) issue detailed terms of reference for preparing Compliance Action Plans, and (v) revise the sectoral guidelines to reflect updated procedures. Although EEAA agreed to complete these measures before project start, the full set of measures was not implemented until 2009–10.

3.6 EEAA also agreed to take a number of actions during project implementation in order to ensure the acceptability of the system. These included carrying out annual reviews of the screening forms, training a core group of EIA trainers, and training EEAA staff, NGOs

consultants, reviewers, ministries, the media, and the participating banks. EEAA also agreed to establish a database to monitor implementation of the Compliance Action Plans. Over several days during the mission, the PPAR team reviewed sub-project files in the PMU and EIA files in the Environmental Impact Assessment Unit in EEAA to verify their quality and value. The team for the most part found the files to be complete and comprehensive records of the activities performed, the environmental audit and Compliance Action Plan documents in the sub-project files detailed and thorough; the environmental impact assessment reports, environmental management plans, records of public consultations,[17] and other documents in the environmental impact assessment files were of acceptable quality as well. The one area in need of improvement, the team noted, was social impact assessments. The team concluded that the PMU and EEAA are implementing the national safeguard policy requirements on a consistent basis and are ensuring compliance with EEAA policy and regulations.

FINANCIAL MANAGEMENT AND PROCUREMENT

3.7 Financial management for EPAP II was handled by the Financial Management Unit established for that purpose at the NBE. The PMU in EEAA did not handle financial management for the project. The Financial Management Unit took overall responsibility for the project's financial activities and installed a qualified financial management team to oversee all aspects of their fiduciary responsibilities. Headed by a finance manager and supported by several accountants seconded from NBE, the Financial Management Unit handled all financial record-keeping, financing, disbursements, planning, and reporting. The midterm review in 2009 reviewed the project's financial management arrangements and internal controls and found them acceptable. No major issues were reported on financial management during project implementation.

3.8 The bulk of procurement under EPAP II was carried out by participating industries for the pollution abatement equipment or technologies necessary to come into compliance. The PMU did not have any direct responsibility for carrying out procurement; the main procurement function of the PMU was to ensure that procurement was carried out by the beneficiary industries in a manner consistent with the procurement requirements in the Loan Agreement. Since the procurement capacity in the PMU under EPAP I had been weakened by reassignment or turnover of staff, EPAP II had to undertake a program of intensive procurement training of staff from the Technical Support Section of the PMU, who in turn were supported during the first year by an international procurement specialist.

3.9 At the industry level, procurement was implemented by each participating industry with all contracts subjected to the World Bank's prior review and no-objection, whatever the procurement method: commercial competitive practice (CCP), national competitive bidding (NCB) or international competitive bidding (ICB). There were different views on how and when to apply these various procurement methods, the World Bank requesting that more contracts be processed using the more onerous NCB/ICB methods, the industries preferring the CCP method. This resulted in long delays in the approval of tender packages in the early phase of implementation and led several industries to withdraw their participation in EPAP II. In 2009, the World Bank and the PMU clarified the terms for CCP, and the World Bank resolved the issue by allowing the use of CCP on a broader basis for private sector industries.

The bulk of procurement for EPAP II sub-projects was submitted by private sector industries, so in the end the majority of contracts used CCP.

3.10 In its meetings with PMU staff and field visits to participating industries, the PPAR team found these procurement issues were a regular topic of discussion. The PMU staff acknowledged the problems they had with no-objection delays for procurement packages (one example given was as long as two years). The representatives of participating industries identified procurement delays as the chief barrier to more rapid progress in achieving pollution abatement targets. In some cases, they admitted trying alternative methods for using NCB or CCP so as to circumvent the delays experienced with procurement using ICB. Nonetheless, one of these public companies emphasized a positive side for the strict and long tendering process: it allowed selection of the most qualified suppliers or contractors, which had not usually been the case. So, in this case, it was considered a driver and guarantor of success, instead of a barrier to implementation.

4. Achievement of the Objective

OBJECTIVE 1- ACHIEVE POLLUTION ABATEMENT IN SELECTED AREAS, PARTICULARLY IN AND AROUND THE GREATER CAIRO AND ALEXANDRIA AREAS

4.1 The project accomplished the pollution abatement intent of this objective by substantially reducing the emissions in the designated industries located in the selected areas covered by the project. It did this by employing both a financial approach (the line of credit for concessionary financing extended to industry by the participating banks), and a technical approach (the technical support for compliance provided by EEAA). This combined effort, implementing financially sound and technically viable investment sub-projects in pollution abatement, helped a number of key industries in Greater Cairo and Alexandria to achieve significant pollution reductions.

Outputs

Line-of-Credit Facility

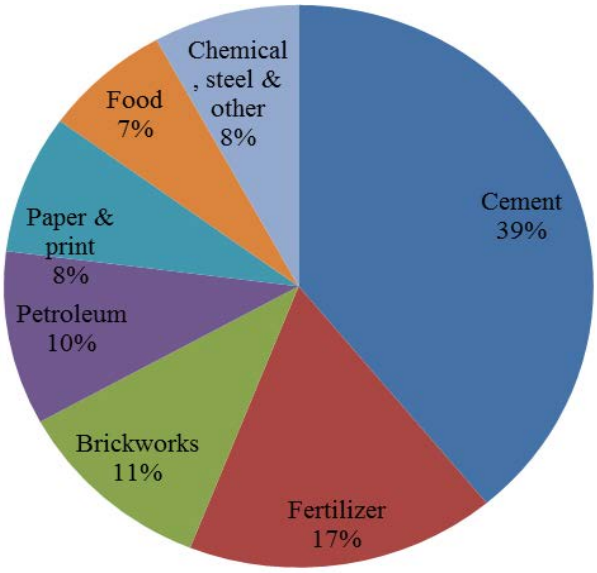
4.2 The principal output of this component was the credit facility managed by the NBE with the participating banks Commercial Industrial Bank (CIB) and Qatar national Bank (QNB),[18] which spent EPAP II's entire budget of $175 million for industrial pollution abatement investments. Industrial borrowers were responsible for a substantial burden of preparation activities to gain approval of an EPAP II loan.[19]

4.3 EPAP II's credit facility approved and financed 35 sub-projects for investments in pollution abatement (see Appendix G for an overview of the sub-projects): 21 of these were in Cairo for a total of $109.5 million (63 percent of the portfolio) and 14 in Alexandria for a total of $65.5 million (37 percent of the portfolio). Most of these sub-projects focused on reducing air pollution through (a) end-of-pipe equipment and technology upgrades (bag filters), (b) fuel switching (from mazout[20] to natural gas) and (c) process changes (solvent recovery). The pollutant load reductions for air emissions were highest in Cairo, with the greatest impact being in South Cairo around the Arab Abu Saad-Tabbin-Helwan-Tourah

areas. Pollutant reductions were measured by on-site monitoring systems and, in some cases, air dispersion modelling. The remaining sub-projects focused on reducing wastewater discharge pollution by installing wastewater treatment plants. The pollutant load reductions in wastewater discharges were highest in Alexandria, where wastewater was being discharged into Lake Mariout, El Mexx and Abu Qir Bays. The changes in water quality in these water bodies as a result of EPAP II sub-projects were difficult to verify, however, because very high levels of agricultural drainage were being discharged into these areas. However, EPAP II monitoring verified that its sub-projects in Alexandria resulted in phasing out of phenol discharges to Lake Mariout from Amreyah Petroleum, removing ammonia from Abu Qir Fertilizer's discharges to Abu Qir Bay, and removing chlorine from Misr Chemical's discharges to El Mexx Bay.

4.4 Figure 4.1 below shows the breakdown of EPAP II's sub-project portfolio by industrial sector. The 35 pollution abatement sub-projects that EPAP II financed were based on $175 million in EPAP II-supported concessionary loans and an additional $145 million in supplementary bank loans taken out by the industrial firms, which resulted in a total investment of $320 million in pollution abatement.

Figure 4.1. **Breakdown of Sub-projects by Industry**



Technical Assistance

4.5 The outputs for this component were strengthened capacity of EEAA, the industries, and participating banks to participate in the project; and general project management support. It was financed through grants from the Finnish Trust Fund, EIB and funds from the NBE and EEAA. The technical assistance developed a number of tools to support the PMU in EEAA in marketing the credit facility to industry, ensuring receipt of properly prepared

application forms, screening, prioritization, and evaluation of applications received. More specifically, these tools included:

- An EPAP II dedicated website to disseminate information concerning EPAP II.
- Guidelines to improve the quality of technical documentation submitted.
- Screening and evaluation tools for PMU use to appraise sub-projects.
- A screening checklist to ensure that the eligibility criteria are met.
- A prioritization exercise to focus on quality sub-projects and guide assessment.
- A Review and Reference Manual to streamline the review process.
- Guidelines for preparing Environmental Audits and Compliance Action Plans.

4.6 Technical support was provided by the PMU to the industries/sub-borrowers on the following issues: (i) technical advice on the proposed investment, including assessment of pollution load reduction and impacts; (ii) preparation of environmental audits; (iii) preparation of compliance action plans, (iv) review of the submitted technical information; (v) training on the preparation of the required technical documents. In addition, Procurement Advice was provided to the PMU and the industries and PMU advised all participating industries on procurement procedures, preparation and review of bidding documents, guidance through the bid process, bid evaluation and contracting issues.

4.7 A major output of this component is the project's three-tiered monitoring system, which included monitoring activities at the industrial site, impact area, and institutional levels, and was an integral part of sub-project implementation and verification of progress in pollution abatement (see Appendix H for a detailed description of the monitoring systems). During installation and implementation of the equipment or technology for the sub-project, the industry itself is responsible for self-monitoring and providing quarterly reports on the results to EEAA. EEAA verifies this self-monitoring by means of periodic inspections. EPAP II also developed an online monitoring system with a database to significantly upgrade the air monitoring infrastructure. This system includes equipment for stack monitoring at the industrial facility and air monitoring stations in the sub-project areas for ambient air quality monitoring, as well as hardware and software for the online transmission of monitoring data collected from these stacks and stations.

Outcome

4.8 EPAP II managed to achieve, and implement the technical approaches for, substantial reductions of key pollutants in the 35 sub-projects undertaken by the industrial firms that received EPAP II financing (see Appendix D for an overview of the 35 sub-projects).

4.9 The project's reductions in pollution loads for targeted industrial subprojects (Table 4.1) in both air emissions (91 percent) and water (97 percent) show the efficacy of EPAP II's technical approach. The perceived success of this was reaffirmed by the decision by the government of Egypt and other donors to continue to employ this model for EPAP III.

Table 4.1. Reduction of Pollutants under EPAP II

Outcome indicator	*Targeted Reduction*	*Reduction Achieved*	*Percent of target*
Pollution load expressed in terms of most significant pollutant generated by beneficiary companies in selected hotspots decrease by at least 75 percent	75%	> 75%	>100%
- Pollutant reductions in air emissions	75%	91%	121%
- Pollutant reductions in water effluents	75%	97%	129%
Particulate matter reduction achieved under project	52,000 tpa*	60,056 tpa	115%
Number of people with reduced exposure to PM_{10} in project area	917,500	917,500	100%
Volume of COD pollution load reduction achieved under project	2,100 tpa of COD	2,938 tpa of COD	140%
Total amount of CO_2 reduction form EPAP II	550,000 metric tons	646,479 metric tons	123%

Note: COD = chemical oxygen demand; PM_{10} = coarse dust particles (2.5 to 10 micrometers in diameter).
* tons per annum

4.10 The pollutant reductions for both air emissions and water effluents shown in Table 4.1 were based on measurements of the identified pollutants in each case (see Appendix I for the details on the pollutants identified and pollutant reductions achieved). The pollutant reductions in both air and water exceeded the target established for the outcome indicator (75 percent), as did the reduction in particulate matter achieved under the project. The same can be said for both chemical oxygen demand (COD) and CO_2. The most problematic indicator was the number of people with reduced exposure to coarse dust particles (PM_{10}) in the project area. This number was calculated based on air dispersion modelling for the project area. However, EPAP II sub-projects represented only a small part of the total pollution sources in the project area, so it was almost impossible to verify the actual attributable impact on air pollution within the hotspot areas.

4.11 The benefits from these pollution reductions, however, were not necessarily as high as could have been achieved with a different selection protocol, because the criteria for financing did not set explicit priorities based on public health or environmental concerns. Thus, the project did not necessarily target the highest priority pollution sources (in terms of public health threats and fragile environmental conditions) in the hotspots of Cairo and Alexandria. Under EPAP II, the EEAA developed screening and prioritization criteria for assessing sub-projects, including higher prioritization for the more polluting sectors and sub-projects likely to have a greater impact on surrounding communities. But, the PPAR team did not find any indication that EEAA set its priorities with EPAP II financing to meet those specific needs – no sub-project selection criteria that would allow EEAA to select the more urgent pollution abatement priorities based on public health and environmental concerns. In most cases, simply meeting the financial and technical eligibility criteria seemed to be sufficient to warrant acceptance as an EPAP II sub-project. In some cases, for reasons that are unclear, particular sub-projects were given priority at higher levels within EEAA or the

MSEA. Nor do the reductions in pollution loads provide any indication how significant the reductions are in terms of the overall pollution in the airshed or water body targeted. One of the public companies the team visited, for example, discharged significant amounts of pollution to neighboring water bodies for a number of years. Despite this fact, the company's application for EPAP II financing was not successful because of the company's lack of creditworthiness. Creditworthiness, as a rule, has been a bigger barrier to entry to EPAP II for public companies than for private ones. Yet, it would not have been realistic to somehow abandon creditworthiness requirements: these requirements are an inherent requirement of using a credit line model and financing by private banks. World Bank staff argue that any alternative model that sought to channel resources to highly polluting but less credit-worthy companies would have been seen as creating market distortions.

4.12 The progress made in reducing emissions at the pollution abatement investment sites is rated **substantial.**

OBJECTIVE 2 - DEMONSTRATE THE APPLICABILITY OF MARKET-BASED FINANCIAL AND TECHNICAL APPROACHES

4.13 A meaningful demonstration effect is more than completion of outputs successfully, it requires a mechanism by which it is likely to lead to subsequent actions beyond the narrow scope of the project.

Outputs

Technical Assistance

4.14 The project showed the development partners, the government of Egypt, and the participating banks and other industries the feasibility (if not sustainability) of such a concessionary financing approach to pollution abatement. This feasibility was evidenced by the high demand for EPAP II financing from industries.[21] But much of this had been demonstrated already in EPAP I, and the model did not go further in increasing the likelihood of pollution abatement investments outside of the project mechanism. EEAA organized 22 marketing workshops for industry, either solely for EPAP II or in coordination with other industrial pollution programs, attended by 2,058 industry representatives. EEAA also held one workshop for the media to raise their awareness of EPAP II.

Carbon finance

4.15 The Carbon Finance Sub-program faced significant delays from the outset, did not develop as planned, and was dropped at midterm review in 2009 without significant progress (appendix E).

Outcomes

4.16 There was limited evidence of achievement in the demonstration objective. The PPAR team was unable to obtain any data on the number of firms participating in workshops that actually implemented pollution abatement investments. In interviews with firms, most

companies emphasized that the concessional nature of the credit line had been a key part of their decision to invest, casting doubt on the likelihood that such investments would be carried out without concessional support. Among the banks participating in EPAP II, banks reported an increase in interest, capacity building and internal institutional arrangements to promote lending for pollution abatement and environmental compliance. The banks participated in the EEAA marketing workshops and generated their own marketing material. But, again the PPAR team was unable to obtain any information on increases in pollution abatement lending as a result of EPAP II. Bank staff suggested that increased enforcement capacity of EEAA might lead to increased likelihood of required investments by firms, and that it would be easier for EEAA to push firms to make investments that they can show from EPAP II subprojects is technically feasible - but there is no evidence that this has occurred. With respect to market-based financial approaches, the Carbon Finance Sub-program was the only market-based financial approach included in the project design. When it was dropped, there was no way for the project to demonstrate a market-based financial approach to achieving pollution abatement.

4.17 The demonstration of technical and financial approaches is rated only **modest,** because of no demonstration of market-based financial approaches and only limited evidence of demonstration of technical approaches.

5. Efficiency

5.1 The Implementation, Completion, and Results (ICR) attempted to measure efficiency in two ways: (i) comparing the unit costs of pollution abatement with benchmarks set at the time of appraisal and (ii) performing a cost-benefit analysis for each sub-project.

5.2 The ICR calculated the unit cost for each pollutant abated in the sub-projects and compared these costs to the benchmarks in the PAD generated during project preparation (based on the distribution of unit abatement costs in the project pipeline) and used as eligibility criteria for EPAP II funding. The ICR found that for both air and water pollutants the unit costs at project closing were lower than the benchmarks established during project preparation. For air emissions, the unit costs for abatement for SO_2 and total suspended particles (TSP) were lower than the 75^{th} percentile of the benchmark set in the PAD. For wastewater effluents, the unit costs for abatement of biological oxygen demand (BOD), COD and total suspended solids (TSS) in wastewater discharges were much less than the 25^{th} percentile of the PAD benchmarks.[22]

5.3 The ex ante and ex post cost-benefit analyses were performed on all individual proposals during implementation. These analyses covered capital and operating costs and benefits, reflecting changes in the throughput or productivity and changes in the consumption of water, energy, fuel and chemicals before and after sub-project implementation. Costs for site preparation, installation of utilities, and labor were also factored in. Software was developed to calculate net savings, net present value, internal rate of return, and payback period for each sub-project. (This estimation methodology was a useful process contribution that will be of future value.) It comes as no surprise that the analysis concluded that end-of-pipe treatment for air emission controls, such as filters and bags, have largely no financial

benefit despite some improvements in energy savings and production, because these are contributing mostly to public goods in terms of human health. Companies view these types of sub-projects as straight compliance expenditures.

5.4 However, some fuel switching and alternative fuel projects have proved financially attractive with satisfactory internal rates of return. Wastewater treatment sub-projects showed mostly negative internal rates of return, even though in some projects there was recycling of treated wastewater and product recovery. In contrast, process modifications leading to improvements in wastewater showed internal rates of return of 2–14 percent. Financial analyses do not include the economic value of benefits to public health and environmental quality of the pollution abatement. Given the early stages of pollution abatement in Egypt, data are insufficient to adequately assess the values of pollution abatement on the affected population (in terms of damage to health, income, and longevity) and on the damage to air, water, soil, flora/fauna, and natural habitat.

5.5 For the qualitative impacts that are difficult to measure, beyond the anticipated but not yet measurable health benefits, there have been developments in technical and financial skills among all the EPAP II stakeholders, as well as learning benefits, process developments and on-site and off-site monitoring and evaluation (M&E) developments. One example of the latter is the development of air dispersion modelling to measure air pollution load reductions from EPAP II sub-projects in communities in heavily polluted areas of South Cairo. Other qualitative impacts were demonstration benefits to nonparticipant businesses (as confirmed in meetings with industry during the PPAR mission), as well as awareness-raising benefits for both the government and the general public. These are likely to bring longer-term benefits through future interventions.

5.6 Based on unit costs of abatement realized, an expectation of health benefits (albeit at this stage on a modest scale and unmeasurable), and the qualitative benefits listed, the efficiency of the project is rated s**ubstantial**.

6. Ratings

Outcome

6.1 The relevance of EPAP II's objective is rated **substantial.** The relevance of design is rated **substantial,** though the theory of change for achieving demonstration effects was not spelled out as well as it could have been. The efficacy of the objective on achieving pollution abatement in selected areas is rated **substantial,** given the significant reductions of key pollutants achieved by the industrial firms receiving EPAP II support. The efficacy of the objective on demonstrating technical and market-based approaches is rated **modest,** due to no real demonstration of market-based approaches, and a lack of evidence on the effectiveness of demonstration of technical approaches (did it lead to any increased investment in pollution abatement?). Based on the unit costs of abatement realized and identified qualitative benefits, including health, the project's efficiency in use of project funds is rated **substantial.**

6.2 These ratings lead to an overall outcome rating of s**atisfactory**.

Risk to Development Outcome

6.3 Assessing the risks to EPAP II's development outcome involves gauging risks at two levels. At the institutional level, can the EPAP II model be sustained institutionally without continued international donor funding? At the environmental investment level, can the pollution abatement achieved with the investments under EPAP II be sustained over the long term?

6.4 At the institutional level, the EPAP model has demonstrated, at least on a modest scale, its applicability as a financial and technical approach for effectively promoting voluntary pollution abatement investments by polluting industries. This point is reinforced by the continuation of this model in EPAP III.[23] Unfortunately, the Carbon Finance Sub-program's attempt to develop a self-sustaining source of funding for pollution abatement failed. Although it does appear that Egypt is making real progress in designing and establishing a sustainable financial architecture in the banking sector that can provide adequate lending for future pollution abatement activities, it remains uncertain whether potential industrial clients will be interested in pollution abatement investments without the concessionary financing offered by the EPAP model. In its discussions with the three participating banks, the PPAR team learned about the institutional commitment and structural investments the banks have made in the emerging pollution abatement market in Egypt. But, these improvements in the banking sector are tempered by the fact that EPAP II's industrial beneficiaries readily admitted that the concessionary financing (the grant of 20 percent of the EPAP II loan) was the main driver (backed by EEAA's technical and regulatory support) in their decision to make pollution abatement investments. Without the continuing support of international donors, the risks to continuing the concessionary financing are significant.

6.5 At the environmental investment level, the EPAP model will no doubt be challenged in the coming years by (i) changes in fuel prices and consumption patterns, and (ii) high maintenance costs of the pollution abatement investments made. When the price of natural gas began increasing in 2014, for example, the project witnessed increasing numbers of industrial plants that had switched from mazout to natural gas (including brickworks and cement plants) switch back to mazout. Moreover, the government's effort to reduce the country's reliance on natural gas for power generation included the approval of industrial use of coal, leading many of the major cement producers to turn to coal to fire their cement plants. There is also the high cost of maintaining the expensive pollution abatement equipment and technologies (for example, bag houses, wastewater treatment plants) introduced by EPAP II.[24] The question posed is whether the EPAP model can survive these future changes in fuel consumption and high maintenance costs or whether it will be abandoned at some point in the future. Risks such as these are significant. In its visits to several of the beneficiary industries, the PPAR team witnessed the enthusiasm with which industry representatives discussed their participation in EPAP II and proudly displayed their investments in pollution abatement equipment and technologies. The challenge will be to maintain these investments over the long term, despite any changes in fuel or maintenance costs. The project has shown what is possible. What happens in the longer term will also depend on raising the pressure of enforcement relative to the financial incentives to ensure financial sustainability.

6.6 The Risk to Development Outcome is rated s**ignificant**.

World Bank Performance

QUALITY AT ENTRY

6.7 The World Bank's performance in preparing EPAP II as a follow-on to EPAP I was adequate, but there were significant shortcomings in the preparation of the associated Carbon Finance Sub-program. The World Bank team demonstrated due diligence in preparing EPAP II, providing the project with a solid diagnostic foundation and incorporating the lessons learned from EPAP I (more emphasis on the "stick" of enforcement and more results orientation in environmental objectives). As noted earlier, EPAP II benefited from a high level of commitment and local ownership based on EPAP I. Although the project itself was complex and involved many stakeholders (development partners, participating banks, industry beneficiaries), the implementation plan was well structured. As a result of EPAP I, project readiness was already in an advanced stage with a large pre-identified pipeline of potential investment sub-projects ready for implementation. Although procurement capacity needed rebuilding, financial management was in good hands in the existing Financial Management Unit. Safeguards questions required additional effort during preparation because EPAP II was chosen as the first project in the Middle East and North Africa to use country systems in lieu of World Bank safeguard policies. As a result, the World Bank had to perform an Equivalence and Acceptability Assessment, and EEAA had to begin implementing gap-filling measures identified.

6.8 Furthermore, EPAP II incorporated the lessons learned from EPAP I (i) in focusing more on the EEAA's compliance and enforcement function in order to balance the 'carrot and stick" approach initiated in EPAP I; and (ii) in placing greater emphasis on producing measurable environmental improvements. EEAA was known for having a weak compliance and enforcement program, its inspection unit understaffed, its inspectors poorly trained, its inspection and enforcement program operating without strategic focus.[25] EPAP II's capacity building in this area brought a new vigor and professionalism to EEAA's compliance and enforcement functions: EPAP II placed more emphasis on installing monitoring equipment, including both ambient air stations at EEAA and end-of-stack equipment at certain heavy polluting industries to enable real-time monitoring of compliance. Complemented with necessary capacity building, awareness raising and benchmarking, this approach gave EEAA better monitoring and evaluation capacity, which when combined with the use of Compliance Action Plans, lead to improved compliance and enforcement actions. These effects also allowed better project-level tracking of progress toward the ambitious target of reducing specified pollutants from participating industries by 75 percent overall.

6.9 Preparation of the Carbon Finance Sub-program was another matter. The sub-program was added to EPAP II as a pilot in order to test the idea that carbon finance could provide a sustainable financial architecture for future pollution abatement investments. The World Bank team was trying to tap into this new framework without realizing it would prove more challenging to implement than expected. While the design of the program itself seemed appropriate, the World Bank team failed to adequately assess the risks to completing this sub-program (such as. unanticipated delays in Clean Development Mechanism project

registration and, consequently, in the purchase of emissions credits, lack of committed World Bank funds to make such purchases) and achieving its associated outcome indicators. In the end, the sub-program was delinked from EPAP II and a separate project was financed, with a separate ICR submitted.[26] Although the Carbon Finance Sub-program is not part of this PPAR for implementation and outcome, it remains a part of World Bank performance in ensuring quality at entry, and results in an overall rating of moderately satisfactory.

6.10 Quality at entry is rated **moderately satisfactory**.

QUALITY OF SUPERVISION

6.11 World Bank supervision was generally adequate given the external disruptions to project implementation. The World Bank team undertook 14 implementation support missions in eight years, slightly less than the planned two implementation support missions per year. The tense security situation in the first half of 2011 partly explains it. World Bank supervision was responsive as unexpected issues arose during implementation. At the midterm review in 2009, for example, the World Bank took a number of measures to facilitate project implementation (see Section 3.2). The World Bank dealt effectively with the challenges that arose among the participating banks regarding disadvantageous lending terms and the continuing delays in action by the PMU to complete all the gap-filling measures identified in the EAA safeguards report. The World Bank team remained highly committed and focused on achieving planned development outcomes in spite of the extraordinary external challenges the project faced. Faced with a serious lack of appetite or capacity for pollution abatement investments following the 2011 revolution and weak economic situation, the Bank team deserves credit for working with the implementing agencies to support an intensive outreach and marketing campaign which built a new pipeline of potential subprojects.
An earlier revision of key outcome indicators would have served the project better, but the candor and quality of performance reporting throughout implementation was generally high. Towards the end of the World Bank project period, it became clear that the full loan could not be fully disbursed based on the disbursement rates. The World Bank then acted to adjust the financing ratio with the other co-financiers to so that World Bank funds could be fully disbursed, allowing other donor funds to be used after the World Bank project had been closed.[27]

6.12 The major shortcomings in World Bank supervision were related to the failure to revise the project objective once the Carbon Finance Sub-program was delinked from the project and the delays in providing no-objections for procurement actions. Given the complexities of the program, the World Bank made the correct decision to drop the carbon finance subprogram from EPAP. However, once the sub-program was dropped the project objective lost its one active support for market-based approaches, and so the Bank should have sought to revise the project objective as part of the restructuring, and to eliminate the language referring to market-based approaches. With respect to the often-unreasonable delays in the no-objection reviews in the early phases of implementation, the World Bank should have moved more rapidly to resolve the disagreement over the application of the various procurement methods (ICB, NCB, CCP). The delays resulted in several industries withdrawing their EPAP II applications and financing the sub-projects by other means.

Because the majority of the procurements were by private sector companies, the need to apply the CCP method was much higher than the World Bank was used to. Adapting to working with private sector companies in EPAP II took more time on the World Bank's part than it should have.

6.13 Quality of supervision is **moderately satisfactory.**

6.14 Together, these ratings lead to an overall rating of World Bank performance of **moderately satisfactory.**

Borrower Performance

GOVERNMENT PERFORMANCE

6.15 The government of Egypt first demonstrated its commitment to industrial pollution abatement with EPAP I and reinforced its position with EPAP II, as evidenced by its timely adoption and ratification of new laws and regulations to support the environment sector, such as Law 9 of 2009 and its Executive Regulations. Since EPAP I, the government has worked closely with the World Bank and other international donors to improve its environmental management. For EPAP II, the government supported its implementation throughout the project period, appointing key staff members to serve in the PMU and providing critical resources so the PMU could perform its functions. Finally, throughout implementation, the government maintained good relations with all co-financing institutions and built on this collaboration to prepare and implement a new pollution abatement operation, EPAP III.

6.16 Government performance is rated **satisfactory.**

IMPLEMENTING AGENCY PERFORMANCE

6.17 Assessment of implementing agency performance is divided between the technical PMU in EEAA and the financial PMU in NBE. The two-tiered PMU structure supported project implementation well. Both PMUs performed their EPAP II functions, on the whole, satisfactorily.

6.18 As a holdover from EPAP I, the PMU in EEAA started its work with EPAP II with an understandably high level of commitment and ownership. Having strengthened the technical capacity of its staff and reinforced the professionalism of its management, the PMU was positioned to secure the success of the project in the often-challenging external operating environment. Throughout project implementation, for example, the PMU delivered critical technical support to participating industries, ranging from the initial application for funding through to the final verification of results. This range included support for developing compliance action plans, feasibility studies, procurement documents, monitoring systems, etc. The PPAR team reviewed examples of these documents and systems with PMU technical staff and discussed the level of required collaboration with industry. The engineers in the technical arm of the PMU played a key role in ensuring the success of investment outcomes by reviewing the technical soundness of the proposed approach and introducing the most appropriate and best technologies available. The main implementation shortcoming the PMU

faced was the delay in completion of the gap-filling measures identified in the EAA for using country systems in lieu of World Bank safeguard policies. Even recognizing that certain aspects of the delay were beyond its control, the PMU still had the responsibility for aligning the country systems with the World Bank requirements. The PPAR team found no evidence, however, that the delays in completing the gap-filling measures permitted any violations of Bank safeguard policies. In its meetings with the participating banks and industries, the PPAR team confirmed their basic satisfaction with the performance of the PMU. Within EEAA, the PMU became a model for effective project management.

6.19 The corresponding financial PMU at the NBE performed its financial management functions equally well, confirming the view that outsourcing financial management to the Apex bank would increase transparency and accountability in the management of project funds. In the PMU, a highly qualified financial management team brought a high level of attention and professionalism to handling their fiduciary responsibilities. These included ensuring timely delivery of financial management and audit reports. The main implementation challenge the PMU faced was the initial introduction of lending terms that disadvantaged the other two participating banks, CIB and QNB. This issue was eventually resolved, however, by the NBE, EEAA and the World Bank to the satisfaction of CIB and QNB and industrial beneficiaries. Finally, the PMU in the NBE has built significant capacity for handling pollution abatement investments and developed a close collaboration with EEAA. In its meetings with the other two participating banks, the PPAR team learned that once the coercive lending terms were resolved, the other banks were able to work well and compete fairly with the NBE.

6.20 Implementing agency performance is rated **satisfactory.**

6.21 Overall borrower performance is hence rated **satisfactory.**

Monitoring and Evaluation

6.22 EPAP II's results framework, contained in Annex 3 of the PAD, defined the measures for the project's outcome in terms of industrial pollution abated rather than market-based approaches demonstrated. The arrangements for results monitoring were set up at the three levels described below, and the project reported good monitoring results on this basis, with decreases in pollution loads meeting or exceeding the 75 percent target for the outcome indicator. The problem is that these measurements of reductions in a single pollutant, without the context of the levels of other pollutants in the airshed or water body, make it difficult to determine to what extent "environmental conditions … are improved." The snapshot of the reduction in "the most appropriate pollutant" does not reveal its impact on the larger pollution picture.

6.23 **Design.** The design and operation of a solid M&E system for the project was a key objective of EPAP II from the outset and formed a critical part of the technical assistance component designed to strengthen the capacity of the EEAA. EEAA needed an advanced M&E system that would permit the precise verification of project results. The three-tiered monitoring system, based on monitoring activities at the industry level, impact area level and institutional level (see description in below) became an integral part of EPAP II sub-project

implementation and verification of the pollution abatement necessary to qualify for the grant. In addition, EEAA intended the M&E system to allow the benchmarking of Egyptian industries in terms of environmental and technical performance, with the idea that public disclosure of environmental performance would increase public awareness and pressure on heavy polluters to come into compliance. In the end, however, the abrupt changes in the political climate in 2011 forced EPAP II to abandon this idea of deploying a color-coded benchmarking system based on environmental performance.

6.24 The design facilitated monitoring of the various outcome indicators in the results framework, which enabled the PMU to provide the latest information in its progress reports to the World Bank, as well as the pollution monitoring necessary to support measurement and verification of pollution abatement results. In addition, EPAP II established a sub-project management information system (MIS) to handle all of this information in sub-project files. Finally, the project installed an online monitoring system with a database to upgrade the already established air monitoring infrastructure.

6.25 **Implementation.** EPAP II employed its three-tiered monitoring system to monitor the project outcome and intermediate outcome indicators in the project results framework. An overview of the outcome indicators and the corresponding monitoring systems is shown in Table 6.1 below. The basic pollution load monitoring for the project outcome indicator was based on industry self-monitoring at the participating industrial sites; the results were reported to EEAA in the quarterly reports required of all beneficiary companies. This was augmented in some cases by online air monitoring systems that provided monitoring data directly to EEAA for review and reporting. In addition, EEAA installed air monitoring stations in impact areas around industrial sites to monitor impacts on ambient air quality. Similar monitoring systems were employed for the other outcome indicators (measuring particulate matter, PM_{10}, COD and CO_2 emissions), except the indicator for establishing M&E benchmarking systems in two project areas, which did not require monitoring systems.

Table 6.1. Overview of Project Outcome Monitoring Systems

Outcome indicators	***Monitoring systems***
Pollution load expressed in terms of most significant pollutant generated by beneficiary companies in selected hotspots decrease by at least 75 percent	Source monitoring of target pollutants EEAA online monitoring of air emissions Ambient air monitoring stations in impact areas
Particulate matter reduction achieved under the project	Source monitoring of particulate matter emissions Ambient air monitoring stations in impact areas
Number of people with reduced exposure to PM_{10} in the area of the project	Source monitoring of PM_{10} emissions Ambient air monitoring stations in impact areas
Volume of COD pollution load reduction achieved under the project	Source monitoring of COD Ambient water quality monitoring in impact areas
Two project areas have an M&E benchmarking system in place	Two M&E benchmarking systems in place
Total amount of CO_2 reduction from EPAP II	Source monitoring of CO_2 emissions

Note: COD = chemical oxygen demand; PM_{10} = coarse dust particles (2.5 to 10 micrometers in diameter); M&E = monitoring and evaluation.

6.26 During its mission, to verify functionality, the PPAR team discussed the outcome monitoring systems with PMU staff and with the heads of the Air Quality Department and Environmental Quality Sector within EEAA. The team witnessed a demonstration of the online monitoring system for one of the cement factories and saw an ambient air monitoring station in the impact area outside the factory. While in Alexandria, the team visited the Regional Branch Office's environmental laboratory, met with the technicians there, and viewed the environmental monitoring equipment, including mobile air and water monitoring equipment used in the field. During each of the industrial site visits, the team discussed with industry representatives the monitoring and reporting activities required by EPAP II, visited the on-site laboratory facilities, and discussed operations with laboratory technicians, and examined the data/reports generated by the monitoring equipment that had been installed.

6.27 Implementation of the EPAP II's monitoring systems (critical to monitoring progress against the outcome indicators in the project results framework, as well as to identification and measurement of the key pollutants and calculation of the average load) incorporated a three-step verification process. First, the industry provided a sample at full operational capacity to EEAA. Second, an unannounced spot verification visit was made by the EEAA inspection department to the industry site to obtain a sample and analyze it in-house. Third, a sample was taken by an independent third party and sent to a laboratory for verification. The results were reviewed by EEAA to determine whether there were any discrepancies. The verification was then technically approved at the level of the CEO of EEAA. Then a twelve-month monitoring process began once the installation and operation of the sub-project was completed. At that point, the industry provided self-monitored quarterly reports to EEAA over a 12-month period. Following this period, the final verification of results was initiated and the same three-step process was repeated. The MIS handled project-related files and information, beginning with the application through to the final pollution abatement results for the release of the grant.

6.28 **Utilization.** The monitoring systems described above allowed the Bank to gauge EPAP II's progress in achieving project pollution abatement outcomes and permitted the Bank to make the decisions necessary to keep project implementation on track. When implementation slowed as a result of the financial crisis, for example, the Bank took appropriate measures to expedite implementation. When the Carbon Finance Sub-program was dropped in 2009, the Bank modified the relevant outcome indicators to ensure their relevance to EPAP II. For the sub-project monitoring in particular, the PMU used the monitoring data provided in quarterly reports from industry to make recommendations with respect to sub-projects to the CEO of EEAA. The CEO then made the final decision to release the grant on the basis of compliance. In order to improve the monitoring system, EEAA financed additional air monitoring stations in the sub-project areas with advanced hardware and software that allowed for the on-line transmission of monitoring data collected from stacks and stations. At project close, EEAA had installed the online monitoring system at several cement companies, a petrochemical company, an iron and steel company and a fertilizer company. This 24-hour stream of data allowed EEAA to develop compliance and load emission reports and perform statistical analyses on the data as necessary.

6.29 Monitoring and evaluation is rated **substantial.**

7. Lessons

7.1 **The use of concessionary financing can be effective in triggering private investments in pollution abatement, but operations that rely on donor funding for such financing risk not being scaled up to the point where they can have a major impact on pollution outcomes because of the inherent limitations on the availability of such funding.** The EPAP II model attracted private industrial co-financing of as much as 55 percent of total investment costs, well beyond the required 10 percent in co-financing. In some cases, industries self-financed additional actions agreed to in their CAPs. Yet the model remains dependent on funding from international financing institutions, with no evidence that investments would occur without a substantial concessionary incentive. The challenge remains for building a self-sustaining financial model, with the support and participation of the banking and industrial sectors, that would allow eventually phasing out financial support from international sources, and that could be scaled up to the level necessary to make significant impacts on pollution emissions. Similar operations in the future could incorporate an exit strategy with the necessary measures (for example, gradually reducing the grant component of the loan, finding another revenue stream to support the concessionary financing) to leave a self-sustaining concessionary financing program in place.

7.2 **A "carrot and stick" approach that combines the appropriate use of financial incentives (concessionary financing) backed by potential administrative/legal threats (environmental enforcement actions) can promote industrial compliance, particularly in the early stages of tracking national pollution.** The traditional model for promoting environmental compliance in the industrial sector pitted industry against environmental authorities in adversarial roles. EPAP II introduced a new model for collaboration with industry to identify and implement the best available techniques in pollution reduction to achieve environmental compliance. The approach married the "carrot" of concessionary lending to industry to make pollution investments on attractive financial terms and the "stick" of EEAA monitoring, inspection and enforcement actions to achieve compliance with Egyptian environmental standards.

7.3 **The use of continuous environmental monitoring systems at industrial sites represents best practice for pollution control projects.** EPAP II broke new ground in Egypt with the installation of continuous monitoring systems at industrial facilities. EEAA's use of continuous stack monitoring systems in its cement sector sub-projects, with its independent online connection to EEAA monitors, proved very effective in ensuring the availability and reliability of data generated by participating industrial sites. Although this type of system is more easily installed for monitoring air emissions, it is equally important for monitoring wastewater discharges. The use of these monitoring systems in EPAP II was critical to collecting and verifying the data on the pollution load reduction, which was fundamental to verifying the targets for obtaining the investment grant and for measuring results in achieving the objective of the project.

7.4 **With the uncertainties surrounding the carbon finance market, World Bank operations involving carbon finance–linked projects should undergo careful preparation, delinking implementation schedules if necessary, in order to avoid pitfalls.**

At the time of EPAP II's preparation, the new area of carbon finance represented an enticing if untested opportunity. It appeared to promise a steady stream of revenue to support additional environmental financing, offering hope of establishing some financial sustainability in development projects. The lessons from the EPAP II experience, however, are that careful and realistic planning is critical and may require avoiding attempts to coordinate the carbon market project implementation with that of the associated project. In the end, the Bank make the correct decision to drop the carbon finance subproject from EPAP II, and the carbon market developed at its own pace, which was very different from that of EPAP II. Moreover, without funds committed prior to project approval, the framework proved inadequate to fulfilling its promise.

7.5 **Ensuring careful alignment between project objective and project design is critical to avoiding confusion in determining whether a project has achieved its goals.** The project objective of EPAP II included language with respect to "demonstrating" the applicability of "market-based" approaches to "achieve pollution abatement" in the industrial sector. The project design, however, did not follow a clear logic of demonstration (what was being demonstrated to whom?) and did not use what is traditionally considered a market-based approach. The Carbon Finance Sub-program may have been intended to address demonstrating a viable market-based approach based on the carbon market for sale of carbon emission reductions, but shortcomings in timing and preparation prevented the Sub-program from realizing its potential. The project was also not as clear as it could have been in laying out its theory of change for demonstration of technical approaches, or how the project would have been likely to lead to additional investments in pollution abatement beyond the specific subprojects. Monitoring and evaluation systems were also not established to build any evidence of such effects.

7.6 **Managed carefully, the World Bank's role in organizing collaboration with its development partners can significantly enhance its ability to scale up its operations in the environmental management sector.** The World Bank's initial investment operation in pollution abatement in Egypt, EPAP I, placed it among a number of other international financing institutions and bilateral donors already in the field. Using the apparent success of that first operation, however, the World Bank attracted, organized, and managed a larger group of co-financing partners for EPAP II, which allowed it to grow the level of investment financing available (from $35 million to $170 million) and scale up industrial investment in pollution abatement in Egypt. The EPAP II model was similarly seen as sufficiently successful in supporting pollution abatement that the co-financing partners continued the model with EPAP III, without World Bank participation.

7.7 **Environmental operations that rely on a credit line mechanism may be limited in their ability to target the most serious pollution issues because of requirements for creditworthiness.** A credit line mechanism using private banks can have many advantages, but is likely to exclude firms with poor creditworthiness, even if they have severe pollution emissions with serious environmental health consequences. In the case of EPAP II, for example, a number of the public-sector industries, some of them among the heaviest polluters in Egypt, were unable to secure EPAP II loans because they were could not meet the project's creditworthiness requirements. The project also developed but did not seem to act

on screening and prioritization criteria that would have favored more polluting sectors and sub-projects likely to have greater impact on surrounding communities.

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[1] *Arab Republic of Egypt: Country Environmental Analysis (1992–2002)*, World Bank, 2005. The *Country Environmental Analysis* reviewed four major environmental issues (air quality, water quality, solid waste and coastal zone management) during the period 1992–2002. Among other things, it found the degradation of air quality in Greater Cairo and in the metropolitan and secondary cities to be one of the most serious environmental issues, with values of pollutant parameters (PM_{10}, SOx, NOx, lead and ozone) in Cairo often exceeding WHO and national ambient concentration limits. It also found that disposal of municipal and industrial effluents and agricultural drainage degrades water quality in the Nile Delta and northwards.

[2] *Arab Republic of Egypt: Cost Assessment of Environmental Degradation (2002)*, World Bank, 2002.

[3] The Egyptian Environmental Affairs Agency is the executive arm of the Ministry of State for Environmental Affairs. Established in 1997, its functions include formulating environmental policies, setting priorities, ensuring compliance with environmental regulations, and implementing initiatives in the context of sustainable development.

[4] Loan Agreement between Arab Republic of Egypt and IBRD, Schedule 2, p. 12, May, 2006.

[5] Project Appraisal Document, Arab Republic of Egypt, Second Pollution Abatement Project, p. 5, February 2006.

[6] After project closure, the government stated that they interpreted the objective to involve: (i) increasing awareness in the banks of the market opportunities for lending on pollution abatement projects; (ii) obtaining market-based pricing through competitive, transparent, and efficient procurement of pollution abatement technologies, thereby reducing the scope for price negotiation and the potential for corruption; and (iii) strengthening contracting and contract performance, including the use of robust and binding operating and pollution abatement guarantees. However, this did not appear in the Bank's project documents as a rationale for demonstration.

[7] National Environmental Action Plan of Egypt (2002–2017), Egyptian Environmental Affairs Agency, 2002.

[8] Sustainable Development Strategy: Egypt's Vision 2030, Government of Arab Republic of Egypt, Ministry of Planning, Monitoring and Administrative Reform, March 2015.
[9] Country Partnership Framework for the Arab Republic of Egypt (2015–2019), World Bank, International Finance Corporation, Multilateral Investment Guarantee Agency, November 2015.
[10] *How Environment Sustains Development—2011 World Bank Group Environment Strategy: Toward a Green, Clean and Resilient World for All*, World Bank, January 2012.
[11] Although EPAP II was limited to the hotspots identified, there were other donor-financed pollution abatement projects addressing industrial pollution and EEAA stated that it used its increased capacity for on-line monitoring and compliance action plans to address polluters outside the hotspots.

[12] The National Bank of Egypt (NBE) is the oldest and largest bank in Egypt, with more than 300 branches located around the country. The government nationalized the NBE in 1960 and created a separate central bank for the country.
[13] Implementation Completion and Results Report (TF056124), Arab Republic of Egypt, on Carbon Finance for the Onyx Alexandria Landfill Gas Capture and Flaring Project, April 15, 2015.

[14] For the banks involved in EPAP II, environmental and social issues increasingly became business issues. EPAP II assisted the Apex Bank in developing its own environmental policy and management framework and some of the participating banks have started to implement their own environmental and social risk management strategies.
[15] The World Bank's experience with other designs in similar projects did not turn out as well. The Industrial Pollution Prevention Project in India, for example, did not use the EPAP model for collaboration between the technical and financial sectors in lending for pollution prevention investments. The project struggled to develop the technical capacity in the financing institutions but finally had to cancel much of the loan for underutilization.
[16] EPAP III (2014–2019), financed by European Investment Bank (EIB), French Development Agency, Kreditanstalt fur Weideraufbau of Germany, and the European Union, continues the EPAP II model, providing a financial package to public and private industries nationwide for investments in (i) treatment of air emissions and wastewater, (ii) in-process modifications and cleaner production, (iii) on-site industrial solid waste management; and (iv) work environment. The two key changes from EPAP II are: (i) the grant amounts are set at 10 percent or 20 percent of the loan, depending on the financial viability of the sub-project and (ii) a grant-only facility is available for eligible small and medium enterprises. The PPAR team did not get a clear explanation of World Bank management's decision not to participate in EPAP III. It may be, as explained below in the Country Partnership Framework, that the World Bank decided to move away from environmental projects per se in favor of higher level policy reforms.
[17] In its meetings with the nongovernmental organizations (NGOs), the PPAR team learned that the NGOs want the Egyptian Environmental Affairs Agency to take actions to engage them in a wider range of activities in its EPAP II sub-projects. The NGOs, for example, participate in the public consultations held on draft environmental impact assessments, but they do not currently have the opportunity to participate in industry facility selection, preparation of Compliance Action Plans, impact area monitoring activities, and final approval decision.

[18] The facility provided loans with a five-to-eight-year repayment period, a one-to-two-year grace period, a 10 percent minimum contribution from the company, a Libor/Euribor +2 percent interest rate for foreign loans, and 13 percent for loans in Egyptian pounds; and a 20 percent grant on loan repayment subject to meeting agreed environmental targets. The 20 percent grant was the critical term for industry in the loan agreement (but other drivers included (i) technical approaches to assist companies to identify solutions available in the market place and (ii) the opportunity for companies to work with EEAA (as regulator) to develop practical time-bound schedules of actions and investment for achieving full compliance). Most industries contributed more than the 10 percent co-payment required; but, they worked to achieve environmental compliance in order to receive the 20 percent grant at the end, which meant repayment of only 80 percent of the original loan.
[19] These activities include: (i) preparing environmental assessments of the proposed sub-projects; (ii) submitting compliance action plans for the entire facility for EEAA approval; (iii) preparing necessary technical feasibility studies; (iv) undertaking procurement following EPAP requirements (World Bank procurement guidelines); and (v) entering into a legally enforceable EEAA Technical Agreement on environmental objectives, monitoring, and implementation.
[20] Mazout is the heavy, very polluting fuel oil commonly used by industry in Egypt.
[21] EPAP II generated applications from industrial firms for 130 sub-projects, only 35 of which could be financed. Applications totaled requests for support for subprojects costing $493 million, of which EPAP II provided actual

support for $320 million of investments ($175 or 55 percent from the project, supplemented by an additional $145 million or 45 percent in co-financing by the industries).

[22] These pollutants are at the lower end of the cost curve, which may explain the lower unit costs.

[23] The PPAR team did not get a clear explanation of World Bank management's decision not to participate in EPAP III. It may be, as explained below in the Country Partnership Framework, that the World Bank decided to move away from environmental projects per se in favor of higher-level policy reforms.

[24] EPAP II tried to minimize this risk by considering the maintenance capabilities of the industries and by including operator training in the investment costs. Bid evaluation criteria included operating costs as well as capital costs.

[25] This was documented in a Finnish Consulting Group report, Industrial Pollution Control Policies in Egypt: Institutional Strengthening of the EEAA to Improve its Environmental Policy Formulation and Environmental Management Capabilities, 2010.

[26] Because emission reductions generated under the project were significantly lower than the estimated amount in the Project Design Document, the ICR rated the overall project performance *moderately unsatisfactory*.

[27] The *pari passu* ratio for much of the implementation period had been based on each co-financier's contribution to the initial $160 million according to the exchange rates in 2007, which for the Bank was 12.5 percent. However, in 2014 the World Bank, in agreement with the other co-financiers, increased its ratio to 30 percent to ensure full utilization of the loan proceeds prior to the August 31, 2014, closing date. This flexibility in design and willingness to cooperate helped to ensure full disbursement of the World Bank loan by the project's closing date.

Appendix A. Basic Data Sheet

SECOND POLLUTION ABATEMENT PROJECT (EPAP II)

Key Project Data (amounts in US$, million)

	Appraisal estimate	Actual or current estimate	Actual as % of appraisal estimate
Total project costs	169.6		
IDA	20.0	20.0	100
Cofinancing			
EIB	54.13	53.71	99
AFD	47.74	53.71	113
JBIC	40.00	36.98	92
Government of Finland	1.10	1.20	109
Cancellation	0	0	—

Note: AFD = French Development Agency; EIB = European Investment Bank; IDA = International Development Association; JBIC = Japan Bank for International Cooperation.

Cumulative Estimated and Actual Disbursements

	FY06	FY07	FY08	FY9	FY10	FY11/12
Appraisal estimate (US$, millions)	0.0	1.0	5.0	7.0	3.0	2.0 2.0
Actual (US$, millions)	0.0	1.0	2.0	2.0	1.0	4.0 1.0
Actual as % of appraisal	—	100	40	29	33	200
Date of final disbursement:						08/31/14

Project Dates

	Original	Actual
Initiating memorandum	10/12/04	—
Negotiations	—	—
Board approval	—	03/23/06
Effectiveness	10/12/06	10/12/06
Closing date	02/28/12	08/31/14

Staff Time and Cost

Stage of Project Cycle	Staff Time and Cost (Bank budget only)	
	Staff Weeks (number)	$, 000s (including travel and consultant costs)
Lending		
FY04	0.6	3.36
FY05	20.9	119.36
FY06	23.1	131.78
Supervision/ICR		
FY07	13.1	74.96
FY08	19.3	110.39
FY09	16.4	93.5
FY10	19.5	111.39
FY11	21.6	123.26
FY12	16.4	93.5
FY13	12.0	68.46
FY14	16.1	96.8
FY15	8.1	46.57
Total:	**142.5**	**813.83**

Other Project Data

Task Team members

Name	Title (at time of appraisal and closure, respectively)	Unit	Responsibility /Specialty
Lending			
Hocine Chalal	Senior Environmental Specialist, TTL	MNSRE	
Sherif Arif	Reg. Environmental Safeguards Advisor	MNSRE	
Maged Hamed	Senior Environmental Specialist	MNSRE	
Knut Opsal	Senior Social Development Specialist	MNSRE	
Dahlia Lotayef	Senior GEF Operations Coordinator	MNSRE	
Supervision/ICR			
Alaa Sarhan	Senior Environmental Specialist, TTL		
Hocine Chalal	Lead Environmental Specialist	GENDR	
Dahlia Lotayef	Lead Environmental Specialist	GENDR	
Maged Hamed	Regional Safeguards Adviser	OPSOR	

Source: PAD, ICR.

Appendix B. List of Persons Met during IEG Mission

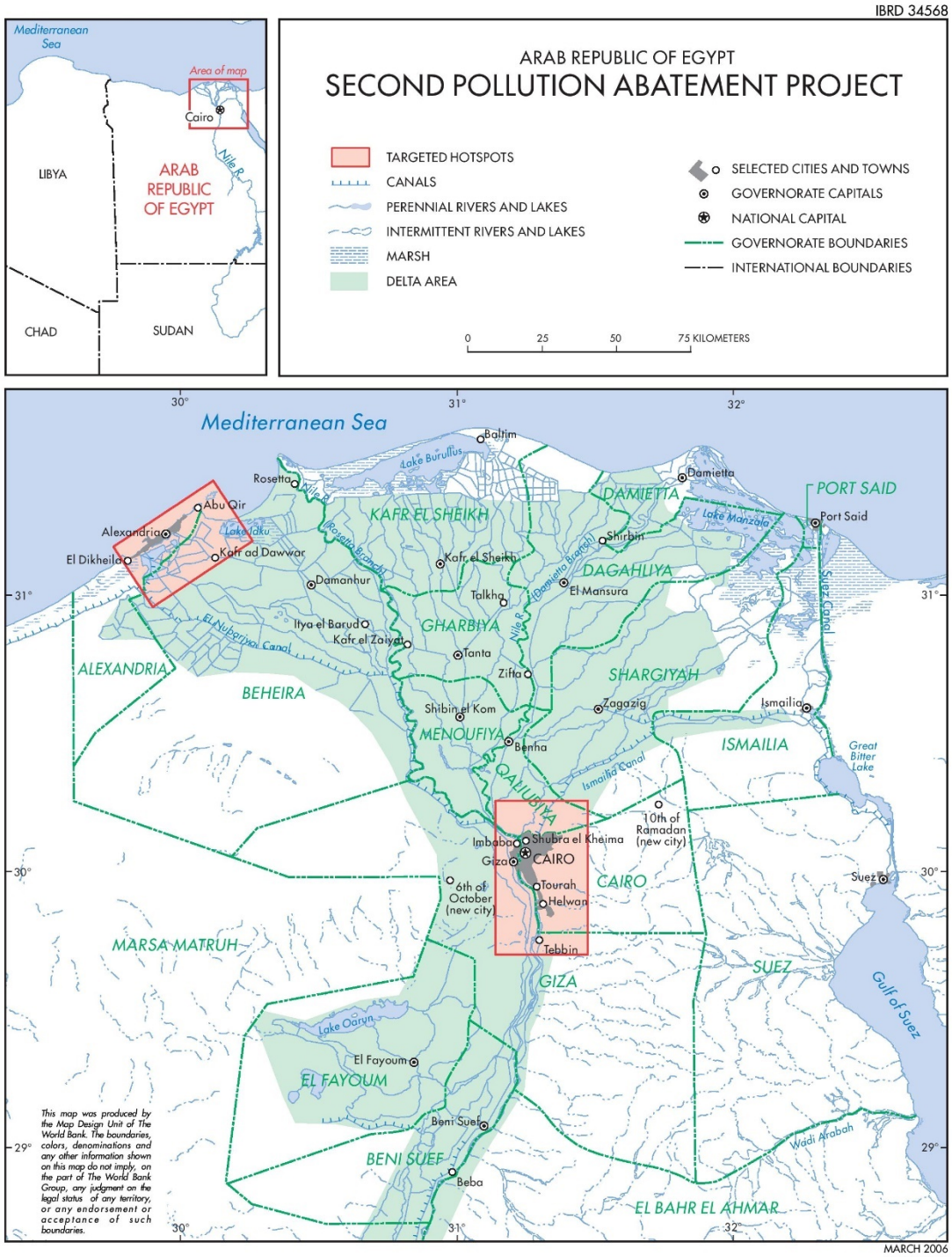
Table B. 1. Stakeholders Met by EPAP II Mission, 20 November–2 December 2016

Institution/Organization	Name	Title
Government of Egypt		
Ministry of Environment (MOE), Egyptian Environmental Affairs Agency (EEAA)	Eng. Maysoun Nabil Ali	Director, EPAP/PSI II
	Eng. Mohamed Amir Elsholkamy	Senior Environmental Expert
	Mr. Philip Jago	Team Leader, EPAP II Technical Assistance
	Chem. Moustafa M. Mourad	General Director, Air Quality Department
	Dr. Mona Kamal	Head, Environmental Quality Sector
	Eng. Waleid El Zainy	Senior Environmental Expert, EPAP II
	Eng. Ahmed Silem Mohamed	Senior Environmental Expert, EPAP II
	Mr. Mohamed Farouk	General Manager of Environmental Inspection Department
	Dr. Ahlam Farouk	General Manager, Environmental Compliance Department
	Mr. Mahmoud A. El-Aroussy	Environmental Grant Projects Manager
	Eng. Mohamed Meselihy Elghazawi	PMU Manager, Coastal Zone Management Project
	Eng. Ahmed Abdelhamid	Project Manager, Persistent Organic Pollutants Project
EEAA Alexandria Regional Branch Office	Eng. Ehab Sarkawy	Environmental Specialist, CAP Follow-up
	Chem. Lamyaa Moustafa Mahmoud	Water Monitoring Laboratory
Ministry of International Cooperation	Ms. Zahraa Allam	
	Ms. Nadwa Ads	Senior Program Specialist, International Financial Sector
Participating Banks		

National Bank of Egypt	Mr. Mohamed Shawky	Product Development and Credit Lines, SMEs Corporate Banking Center
	Ms. Noura Abo El-Nasr	Credit Lines and Product Development, SMEs Division
Commercial International Bank (CIB)	Mr. Kamel Shehata Sallam	Head of Finance Programs & International Donor Funds
	Mr. Mahmoud Abdelaziz Sherif	Senior Specialist, Finance Programs & Donor Funds
	Ms. Alyaa Yehia Hafez	Associate, Finance Programs & Donor Funds
Qatar National Bank (QNB)	Mr. Khaled Salah	Senior Relationship Manager
	Mr. Sherif Tag	Trade & Finance Relations Manager
EPAP II Development Partners		
World Bank	Mr. Ehab Shalaan	Senior Environmental Specialist
	Mr. Mohammad Kandeel	Senior Environmental Specialist
	Mr. Gustavo Demarco	Program Leader, Human Development
Japan International Cooperation Agency (JICA)	Dr. Ashraf El-Abd	Chief Program Officer (Transport)
European Investment Bank (EIB)	Ms. Malak El Shishiny	Project Officer
French Development Agency (FDA)	Mr. Zachary Burk	Investment Officer
Private Sector Site Visits		
Tourah Cement, Helwan	Mr. Ahmed Ragaei Ibrahim	Plant Manager, Tourah Plant
	Mr. Mohamed Ayman	Corporate Environmental Manager
Porta/Rotopack, 6 October City	Dr. Haytham A. El Moneam Awad	Quality Manager, Environment, Safety & Health
Egyptian Starch & Glucose Manufacturing Company, Mostorod, Cairo	Eng. Amr Helal	Operation Director
	Eng. Hassan Sarhan	Deputy General Manager

	Eng. Mohamed Shallot	Environmental Affairs Manager
	Dr. Salwa Hamed	Glucose Quality Manager
Abu Qir Fertilizers Company, Alexandria	Eng. Ashraf Abd El-Baky	Vice Chairmen for Production Affairs
	Chem. Walid Abdou	QHSE – CSR Sectors Head
Amreyah Cement Company, Borg El Arab, Alexandria	Eng. Martin Isasa	Industrial Director
	Eng. Mohamed Khalifa	QHSSE Department Manager
	Eng. Walid Mahgoub Ismail	Supply Chain Department Manager
	Eng. Taher Ismail	Alternative Energy Department Manager
Public Sector Site Visits		
National Cement Company, Cairo	Eng. Mohamed Abdel Hakam	Director, Quality and Environment Department
Delta Steel Company, Cairo		
RACTA, Alexandria		
Non-governmental Organizations		
Egyptian Sustainable Development Forum (ESDF)	Dr. Magdy Allam	Director
GEF /Small Grants Programme	Dr. Ezzat Abdel Hamid	Director
Arab Network for Environment and Development (RAED)	Eng. Essam Nada	Director
Friends of the Environment Association, Alexandria	Counsellor Mohamed A El Guindy	Chairman
	Ms. Gihan Zaalouk	Executive Manager, Board Member
	Ms. Amel Hatem	General Secretary

Appendix C. Map of Hotspots Targeted by EPAP II



Appendix D. Egypt Pollution Abatement Project (EPAP I)

In the early 1990s, the severe air and water pollution from industrial sources affecting Greater Cairo and Alexandria, as well as the cities of Suez, Ismailia, and Tenth of Ramadan, was exposing more than 10 million people to industrial pollution and resulting in serious health risks and extensive ecological degradation. The government of Egypt requested World Bank assistance in tackling this industrial pollution in the country, which resulted in preparation of the World Bank's first industrial pollution abatement operation EPAP I. EPAP I was the World Bank's first environmental management project in Egypt to combine environmental institution building with concessionary financing for environmental investments by public and private enterprises. The development objective of the project was to assist the government in reducing industrial pollution; its specific objectives were to strengthen the monitoring and enforcement capabilities of the environmental institutions and establish technical and financial mechanisms for supporting pollution abatement investments in Greater Cairo, Alexandria, Suez, and Ismailia. EPAP I was approved by the Board on December 16, 1997, for an amount of $35 million, became effective on January 20, 1999, and closed, after an extension of the original closing date on March 30, 2005.

EPAP I was strategically important for Egypt's environmental management in introducing the "Four I's Strategy," which was designed to move the industrial sector towards voluntary compliance. The strategy involved (i) appropriate incentives, including grants and a financing strategy; (ii) a strengthened institutional framework; (iii) targeted investments; and (iv) information dissemination through the World Bank, nongovernmental organizations (NGOs), and the establishment of an environmental database. The project established the financial and technical mechanisms for supporting pollution abatement investments, strengthened the monitoring and enforcement capacity of the environmental regulatory institutions, and assisted in reducing industrial pollution causing adverse health effects and ecological degradation.

EPAP I resulted in five positive outcomes: (i) it reduced the pollution loads at the plant levels; (ii) it created a general awareness among the banking community about compliance with the environment protection law; (iii) it established a core of expertise in the banking sector for understanding and assessing environmental and pollution control investments; (iv) it increased competition among the different banks for managing these funds; and (v) it enabled the local banking sector, with the technical assistance provided, to market the environmental investments with its individual clients in order to move toward compliance with existing environmental regulations.

EPAP I ended up financing 25 sub-projects addressing air emissions, wastewater, work environment, and solid waste. It provided technical services to about 75 facilities to identify pollution abatement sub-projects for World Bank or other donor financing. The project's Implementation Completion and Results Report (2005) and Implementation Completion and Results Report Review (2005) both concluded that the project achieved its development objectives and rated it **satisfactory.** Both also agreed on rating World Bank and borrower performance **satisfactory.**

Appendix E. The Carbon Finance Sub-program

The Onyx Alexandria Landfill Gas Capture and Flaring Project was developed as a Carbon Finance Sub-program attached to the Second Pollution Abatement Project (EPAP II). The project was intended to promote the participation of Egypt's private and public sectors in the Clean Development Mechanism, and to help the country benefit from the emerging carbon market and achieve sustainable development. The project development objective was to maximize the capture of landfill gas from the two new landfill sites in the Governorate of Alexandria, namely Borg El-Arab and El-Hammam. Through collecting and flaring of the gas, methane emissions would be reduced, thereby generating emission reduction credits to be purchased by participants in the Spanish Carbon Fund.

The emission reductions generated under the project were significantly below the estimated amount in the Project Design Document (PDD), mainly because the Emission Reductions Purchase Agreement (ERPA) between the Spanish Carbon Fund and the Project Entity (PE) was terminated much earlier than expected, over a back-payment issue between the latter and the Governorate of Alexandria. Other issues experienced by the project were related to: (i) the model used to estimate, *ex ante*, the emission reduction credit generation potential of the project, imposed by the rules of the UNFCCC, was overly optimistic; and (ii) the monitoring plan implemented by the PE during the first two years of activity was not in conformity with the one described in the Project Design Document, which resulted in initial delays in the issuance of emission reduction credits.

The project overcame initial operational challenges and improved performance, but the PE eventually encountered problems in receiving payments from the Governorate of Alexandria for the services provided. As a result, the PE ceased its municipal waste management activities at the two landfills in October 2011. Despite the satisfactory operation and even though the ERPA was terminated for reasons beyond the project's control, the Implementation, Completion, and Results (ICR) rates overall project implementation *moderately unsatisfactory* because the PE withdrew its business from Alexandria before generating the expected amount of emission reductions.

The Bank, for its part, made every effort, before the ERPA was terminated, to keep the project alive by trying to mediate between the Governorate of Alexandria and the PE, even offering support to the new company (Arab Contractors) that took over the landfills. There was not enough interest, however, on the part of the new PE or the Spanish Carbon Fund to continue the project. The ICR rates the overall World Bank performance **moderately satisfactory.** The PE, for its part, maintained its own quality health, safety and environment system to ensure compliance with the environmental and health safeguards (at the level of the World Bank safeguard policy), conducted the monitoring of the emission reductions systematically, and was responsive in addressing all issues relating to operations and monitoring. The ICR rates the overall PE performance **moderately satisfactory.**

Appendix F. EPAP II Project Costs by Component

Project Cost by Component – all sources

Components	Appraisal estimate	Actual/latest estimate	Percentage of appraisal
Component I	162.0	165.6	102
Line of Credit Facility	162.0	165.6	102
Component II	7.6	7.64	100
Technical assistance	4.6	7.64	100
Equipment	3.0		
Total baseline cost	169.6		

Appendix G. Overview of EPAP II Sub-projects

Name of Company	Investment	Pollutant	Before (tpa*)	After (tpa)	EPAP ($M)	Total ($M)
Tourah Cement Company South Cairo	Install bag filters	TSP	1,876	79	15	24
Amreyah Cement Company Alexandria	Install fabric filters	TSP	1,191	15	6.0	6.6
National Cement Company South Cairo	Install fabric filter, mobile suction unit	TSP	4,728	768	18.1	70.0
Amreyah Cimpor Cement Alexandria	Install fabric filter	TSP	559	214	7.5	8.5
Amreyah Cement Alexandria	Install fabric filter	TSP	1061	53	7.0	35.0
Porta Egypt 6th October, Cairo	Solvent recovery and reuse	ethyl acetate	1,160	6.0	4.0	4.4
Rotografia 6th October, Cairo	Solvent recovery and reuse	ethyl acetate	1,950	10	5.0	6.5
Delta Steel & Milling Company, North Cairo	Upgrade/install emission control systems	TSP	137	61	4.4	4.8
Abu Zabel Fertilizers North Cairo	Rehabilitate phosphoric acid plant	hydrogen fluoride	5	2	7.9	29
		TSP	102	18		
Egyptian Starch and Glucose South Cairo	fuel switch, mazout to natural gas	SO2	837	1	0.33	0.37
Misr Chemicals Alexandria	fuel switch	SO2	255	0	0.44	0.52

Name of Company	Investment	Pollutant	Before (tpa*)	After (tpa)	EPAP ($M)	Total ($M)
Delta Steel & Milling Company, North Cairo	Fuel switch, mazout to natural gas	SO2	200	0	0.175	0.296
Helwan Cement Company South Cairo	Fuel switch, mazout to natural gas	SO2	5,794	0	2.5	3.8
Middle East Paper Manufacturing, Cairo	Fuel switch, mazout to natural gas	SO2	960	0	0.297	0.389

*tons per annum

Name of Company	Investment	Pollutant	Before (tpa*)	After (tpa)	EPAP ($M)	Total ($M)
General Company for Paper Industry (RAKTA), Alexandria	Rehabilitate boilers and switch from mazout to natural gas	SO2	1,848	0	3.9	4.6
Arab Abu Saad brickwork cluster	Convert 200 brick kilns from mazout to natural gas	TSP	59,437	3,508	19.8	28.0
		SO2	15,700	4,065		
Harvest Foods Alexandria	Install wastewater treatment plant	COD	172	91	0.21	0.23
		BOD	114	50		
		TSS	79	66		
El Nile Soft Drinks Alexandria	Install wastewater treatment plant	COD	380	2	0.64	1.33
		TDS	869	159		
Kiriazi Electric North Cairo	Install wastewater treatment plant	HM	1	0	0.45	0.48
Kiriazi Engineering North Cairo	Install wastewater treatment plant	HM	4	0	0.59	0.66
Abu Qir Fertilizers Alexandria	Install wastewater treatment plant, recycle wastewater	Ammonia	744	2	16.0	24.0

Name of Company	Investment	Pollutant	Before (tpa*)	After (tpa)	EPAP ($M)	Total ($M)
Misr Chemicals	Modify process, upgrade wastewater treatment plant	Chlorine	2,970	0	1.28	2.0
Universal Company for Gas Cookers	Install wastewater treatment plant	HM	0.59	0.07	0.10	0.11
Egyptian Petrochemicals Alexandria	Upgrade wastewater treatment	COD	696	175	1.6	2.0
Egyptian Starch & Glucose North Cairo	Technology change, upgrade wastewater treatment plant	COD	4,751	37	10,564	17.67
		BOD	3,213	24		
Amreyah Petroleum & Refining Company Alexandria	Replace phenol with NMP	phenol	181	0	15.0	29.3
Alexandria Petroleum	Replace furfural with NMP	furfural			3	20

Name of Company	Investment	Pollutant	Before (tpa*)	After (tpa)	EPAP ($M)	Total ($M)
Alexandria Sodium Carbonate Company	Upgrade calciners to reduce dust in workplace	TSP			1.71	12.35
Helwan Cement Company South Cairo	Upgrade filters	TSP			1.24	2.64
Nasr Coke South Cairo	Replace coke oven doors	VOCs			1.94	2.14
Amreyah Cement Alexandria	Upgrade filters	TSP			1.26	1.4
Universal Company for Gas Cookers, 6th October, Cairo	Ventilation system				0.09	0.1
Arabian Cement Ain Suknah	Install alternative fuel system	Solid waste			9.0	13.5

Appendix H. Details on EPAP II Monitoring Systems

A major output of the Technical Assistance component is the project's three-tiered monitoring system, which included monitoring activities at the industrial site, impact area, and institutional levels, and was an integral part of sub-project implementation and verification of progress in pollution abatement. The table below presents an overview of the monitoring systems installed at these three levels.

M&E Systems Installed during EPAP II

Industry level (specific enterprise)	Source monitoring of target pollutants EEAA online monitoring of stack emissions Management information system
Impact level (area of pollution impact)	Ambient air monitoring network Air dispersion modelling
Institutional level	Number of inspections and fines Compliance Action Plan approval and follow-up EREMIS database Community complaints

As designed by EEAA, sub-project monitoring and evaluation begins prior to approval with the preparation of three key documents central to the later measurement and verification of results: (i) an environmental audit to establish the environmental baseline at the facility, (ii) a Compliance Action Plan to identify the actions to be taken to achieve compliance and (iii) the technical specifications for the pollution abatement equipment or technology required for the sub-project. These documents are critical to identification of the key pollutants, measurement of concentration and flow, and calculation of the average load. After a three-step verification process validates the results, EEAA confirms that the results are acceptable and recommends the sub-project to the CEO for approval.

During installation/implementation of the equipment or technology for the sub-project, the industry itself is responsible for self-monitoring and providing quarterly reports on the results to EEAA. EEAA verifies this self-monitoring by means of periodic inspections. Once the sub-project is fully installed and operational, the industry continues to self-monitor and send quarterly monitoring reports to EEAA for a 12-month test period. Once this period has passed, the final verification of results is made using the same three-step process. At the last step, the CEO, on the recommendation of the PMU, makes the final decision to release the grant on the basis of industry compliance.

Finally, EPAP II developed an online monitoring system with a database to significantly upgrade the air monitoring infrastructure. This system includes equipment for stack monitoring at the industrial facility and air monitoring stations in the sub-project areas for ambient air quality monitoring, as well as hardware and software for the online transmission of monitoring data collected from these stacks and stations. At project closing, EPAP II had installed online monitoring systems at three cement companies, a petrochemical company, an iron and steel company and one fertilizer company. This 24-hour stream of data allows EEAA to develop compliance and load emission reports, as well as perform statistical analyses on the data gathered. The PPAR team discussed the online monitoring system with officials in the PMU and

reviewed examples of the emissions reports from a cement company. During its visits to several of the industrial facilities, the team discussed the monitoring requirements with industry representatives. The team concluded that this monitoring system has been key in ensuring environmental compliance, especially for cement companies, which are all connected to the online monitoring system.

Appendix I. Details of EPAP II Pollutant Reductions

Reduction of Pollutants under EPAP II

Outcome indicator	Target	Achieved	Percent of target
Pollution load expressed in terms of most significant pollutant generated by beneficiary companies in selected hotspots decrease by at least 75 percent	75%	75%	>100%
Pollutant reductions in air emissions	75%	91%	121%
Pollutant reductions in water effluents	75%	97%	129%
Particulate matter reduction achieved under project	52,000 tpa*	60,056 tpa	115%
Number of people with reduced exposure to PM_{10} in project area	917,500	917,500	100%
Volume of COD pollution load reduction achieved under project	2,100 tpa of COD	2,938 tpa of COD	140%
Total amount of CO_2 reduction form EPAP II	550,000 metric tons	646,479 metric tons	123%

* tons per annum.

The pollutant reductions in air emissions shown in the table above were based on measurements of the identified pollutants, which included sulphur dioxide (SO_2), total suspended particles (TSP), hydrogen fluoride (HF), ethyl acetate (EA) and carbon monoxide (CO), showing reductions from 98,498 tons per annum (tpa) to 8,880 tpa. For the pollutant reductions in water effluents shown above, the identified pollutants were chemical oxygen demand (COD), biological oxygen demand (BOD), total suspended solids (TSS), total dissolved solids (TDS), phenol, chlorine, and ammonia, which were reduced from 19,276 tpa to 552 tpa. The pollutant reductions in both air and water exceeded the target established for the outcome indicator (75 percent), as did the reduction in particulate matter achieved under the project, with 60,056 tpa reduced against a target of 52,000 tpa.

The same can be said for both COD and CO_2, with 2,938 tpa of COD reduced compared to a target of 2,100 tpa and 646,479 tpa of CO_2 reduced compared to a target of 550,000 tpa. The most problematic indicator was the number of people with reduced exposure to PM_{10} in the project area. This was calculated based on a fixed project area population (917,500) using air dispersion modeling to calculate exposure in terms of maximum TSP/PM 24-hour concentrations. The reduction measured at the site of emission was from a baseline of 201 ug/m^3 before attributable EPAP II sub-projects to 15 ug/m^3 after sub-project implementation. However, EPAP II sub-projects represented only a small part of the total pollution sources in the project area. It was, therefore, almost impossible to verify the actual attributable impact on air pollution within the hotspot areas.

Appendix J. Borrower Comments

EPAP II PMU Comments on World Bank PPAR

The PPAR is comprehensive and helpful - and thanks to the World Bank consultants involved in its preparation. There are a number of comments as summarized below:

Development Outcome

- EPAP II's main development objective was "to demonstrate, in the Egyptian context, the applicability of market-based financial/technical approaches in order to be able to achieve significant pollution abatement in selected hot spot areas in and around the Alexandria and Greater Cairo" areas. This involved: a) increasing awareness in the banks of the market opportunities for lending on pollution abatement projects; b) obtaining market based pricing through competitive, transparent and efficient procurement of pollution abatement technologies, thereby reducing the scope for price negotiation and the potential for corruption; and c) strengthening contracting and contract performance, including the use of robust and binding operating and pollution abatement guarantees.
- The indicator for achieving this objective was "at least 75 percent reduction in the quantity of pollutants emitted by the companies in each of the targeted hot spots". As a result of the above approaches this indicator was successfully achieved.
- The use of the grant element (sub-loan principal reduction) was not the only reason for companies to participate in EPAP II. Other drivers for company participation included: a) technical approaches to assist companies identify solutions available in the market place; and b) the opportunity for companies to work with EEAA (as regulator) to develop practical time bound schedules of actions and investment for achieving full compliance.
- Involvement in, and lessons learnt, from sub-project financing also strengthened the enforcement capacity of EEAA in supporting regulatory and policy development as well as developing new tools for improved enforcement.
- As stated in para 4.9, "the perceived success on this combined financial and technical approach was reaffirmed by the government of Egypt and other donors to continue to employ the 'carrot and stick' model for EPAP III.

Risk to development outcome

In reference to the "risks to pollution abatement lending without donor financing" it should be noted that:

1. EPAP II only contributed 55 percent of the total investment costs, the rest coming from the enterprises.

2. Compliance action plans were successfully piloted by EPAP II and have now been implemented more widely by EEAA. CAPs lock companies into time-bound expenditure, which companies will self-finance or borrow to implement. CAP actions in EPAP II alone, amounted to company expenditures of $245 million.

3. For the banks involved in EPAP II, environmental and social issues are increasingly becoming business issues. EPAP II assisted the Apex Bank develop its own environmental policy and management framework. Within this context, at least one of the participating banks has also started to implement environmental and social risk management strategies. Such actions can only help their clients take advantage of new opportunities for pollution abatement investment while expanding and strengthening the bank's loan portfolios.

With respect to risks associated to the "maintenance of abatement investments over the long term":

1. This is always a risk; however, EPAP II tried to minimize that risk by considering maintenance capabilities of the sub-borrowers and by including operator training in the investment cost.

Bid evaluation criteria included operating costs in addition to capital costs. This enabled companies to procure the most cost efficient pollution abatement technologies available in the market place.

2. High costs for replacing consumables such as bag filters should not be an issue, at least in the cement sector as this is standard in cement plants globally. Indeed, many companies' corporate emission targets necessitate regular replacement. As a result of online monitoring of stacks by EEAA, enterprises are required to maintain their pollution abatement investments in good working order or face penalties.

Public Sector Companies
An eligibility requirement for EPAP II financing was that applicants should be creditworthy. To bring non-creditworthy public sector companies into compliance will require a different mechanism than the EPAP II model.

Any such model would also need to take into consideration the challenges of sustainability in such (non-creditworthy) companies.

General Comments

Para 2.6 – "However, the project did not appear to have a strategy that would lead to pollution reduction beyond the identified hotspots" - this was outside the scope of EPAP II but was covered by other projects that also used tools developed in EPAP II. Of course, the increased EEAA capacity in online monitoring and CAP implementation is being applied to companies outside the hot spots.

Para 3.2 – "On the other hand, including sub-projects for the relocation of foundries seems to be a questionable measure, since relocation expenses are not an investment in pollution abatement technologies or process changes". The relevance of this point is not clear as EPAP II did not support such measures.

Para 3.10 – "In this instance, the tender process allowed the selection of the most qualified consultants, which had not usually been the case". Assume this refers to contractors/suppliers and not consultants.

Para 4.11 – Note that: a) air pollution was considered the priority in Cairo and wastewater in Alexandria; b) EPAP II developed screening and prioritization criteria for assessing sub-projects including higher prioritization for the more polluting sectors and sub-projects likely to have a greater impact on surrounding communities.

Para 6.25 – Table 6.1 title does not relate to the contents of the table.

Appendix K. Bibliography

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