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### What is what?

|               |  |
|---------------|--|
| <b>ACI</b>    | Achieving Cost-effective Compliance in Industry – a component under Danida's ESP programme |
| <b>CP</b>     | Cleaner Production   |
| <b>Danida</b> | Danish International Development Assistance – Denmark's aid organisation                   |
| <b>ECO</b>    | Environmental Compliance Office – the implementation unit of the ACI                       |
| <b>EEAA</b>   | Egyptian Environmental Affairs Agency  |
| <b>ESP</b>    | Environmental Sector Programme in Egypt financed by Danida                                 |
| <b>FEI</b>    | Federation of Egyptian Industries  |
| <b>SME</b>    | Small and Medium-sized Enterprises   |

### Purpose and structure of brochure

The purpose of this brochure is to provide readers with an insight into the Achieving Compliance in Industry project which was aimed at introducing Cleaner Production in Egyptian SMEs. The project financed by Danida was successfully implemented from 2002 to 2008. An additional feature of the project was to set up a sustainable consultancy office, ECO, in the Federation of Egyptian Industries providing environmental services to Federation member enterprises.

The brochure consists of a number of sections each describing specific aspects of the project. To the extent possible each section is readable on its own.



Ahmed Kamal, component manager, and Mogens Dinesen, technical advisor.

# Creating a sustainable Cleaner Production project

A major environmental problem in Egypt is the pollution caused by its industry. To assist in the abatement of pollution especially among Small and Medium-sized Enterprises, Danida launched in January 2002 the Achieving Compliance in Industry (ACI) component under its Environmental Sector Programme. The aim of the ACI component was through the introduction of Cleaner Production practices to assist Small and Medium-sized Enterprises in Achieving Cost-effective Compliance in Industry with environmental regulations.

## ACI and ECO

To realise the environmental and capacity-building objectives of the ACI component, the ACI set up the Environmental Compliance Office (ECO) at the Federation of Egyptian Industries (FEI). The ACI component phased out in January 2008 after six years, but leaves its legacy at the Federation in the form of ECO which is now a successful business unit at FEI.

ECO provides consultancy services to industry within the fields of Cleaner Production (CP), Environmental Management Systems and Energy Efficiency in five sectors: chemicals, engineering, food, metallurgy and textiles.

## Ms Bente Schiller, Counsellor Development, Royal Danish Embassy

“Cleaner Production methodology is not the easiest product to sell. Nevertheless, the CP concept has been successfully introduced in many SMEs.

A good manager of a factory has a real incentive to reduce the amount of raw material used for production, recover waste products instead of flushing them into the sewer system, and to reduce electricity and water consumption when there is a real profit.

It is rewarding for us to see that the cooperation between the Egyptian and Danish governments on abating pollution through Cleaner Production in SMEs has been so successful. In our view there are two important reasons for this. One is the excellent cooperation with the Federation of Egyptian Industries which has hosted the ACI project. The other is the establishment of the Revolving Fund which is a unique way of funding efficiently enterprises wishing to introduce Cleaner Production practices.”



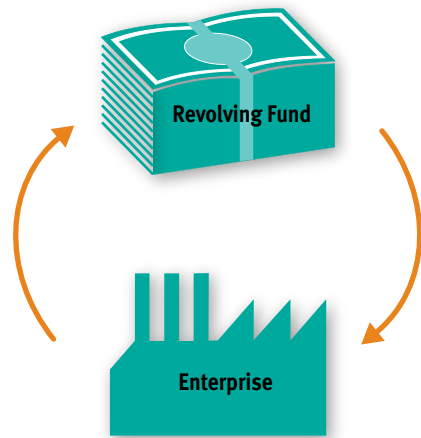
## Dr Sherif El Gabaly, Chairman of ACI Steering Committee and board member of Federation of Egyptian Industries:

“When approached six years ago as to whether we would host an environmental Danida project targeting SMEs we leapt at the chance. We had at that time already worked with Danida for two years on another environmental project, and we wanted to continue our good cooperation. We also felt that the presence of an environmental unit in the FEI was in keeping with our beliefs and values, and we were of the opinion that a combination of Danish and Egyptian knowledge would benefit our members. This has proved to be correct to such an extent that ECO is now fully integrated as a sustainable business unit in the FEI.

We believe that good cooperation between the private and public sector is the way forward for Egyptian industry, and the co-management of this project with the Ministry of the Environment has allowed us to develop further our working relations.”



## Revolving Fund - a unique instrument



A unique feature of the ACI component was the establishment of the Revolving Fund. The fund operates by granting loans to enterprises which then pay the loan back into the fund. This enables the fund to grant new loans to new enterprises - hence the name the Revolving Fund.

### Loans versus grants

The major advantage of providing loans instead of grants is management involvement. For an enterprise to make a financial commitment such as a loan, management has to believe in the reasons for taking it. Therefore management involvement in the introduction of new production methods has to be whole-hearted. It has not been difficult to find enterprises willing to take the responsibility of a loan - on the contrary. So far 50 enterprises have introduced Cleaner Production and 15 enterprises are in the pipeline.

### Fund set-up

The Revolving Fund was granted by Danida and is administered through an agreement entered into by the FEI, the Egyptian Environmental Affairs Agency (EEAA) and the National Bank of Egypt (NBE) in February 2005.

The NBE administers the loans and carries all risks of non-payment of the loans. Enterprises pay the NBE an annual administration fee of 2.5 per cent, and loans have to be repaid within a time frame of five years, including a one year period of grace. The advantages of this set-up is that the Revolving Fund bears no expenses for disbursement of the loans, and the ACI-ECO office is able to concentrate on providing environmental services rather than on loan brokerage.

### Loan size

The working capital of the fund was from the

outset EGP 69 million. A maximum ceiling for loans to enterprises was set at EGP 3 million. However, the actual size of the loan depends very much on the production method the enterprise wishes to improve.

### Eligibility

By making clear eligibility criteria for the enterprises the ACI project has proved that it to some extent is possible to push certain policies. The ACI-ECO criteria are the following:

- Membership of FEI
- Belong to the chemicals, engineering, food, metallurgy or textile sectors
- Management commitment
- Willingness to address working environment, child labour and gender issues
- Creditworthiness



# The process of funding Cleaner Production actions



# Results of investment in Cleaner Production

The results described below summarise some of the achievements reached by the ACI component during the project period. Please note that these results reflect the specific enterprises worked with and cannot be extrapolated to indicate the total potential of savings neither sector-wise nor country-wise. Figures are based on company assessment reports.

The ACI component's Revolving Fund has until October 2007 funded CP actions in some 50 enterprises in five sectors: chemicals, engineering, food, metallurgy (mainly foundries) and textiles. Energy efficiency is incorporated as a cross cutting issue, as many CP actions include options dealing with energy efficiency.

## Enterprises with CP actions – figure 1

Figure 1 shows the number of companies in each sector which undertook Cleaner Production actions during the project up until October 2007.

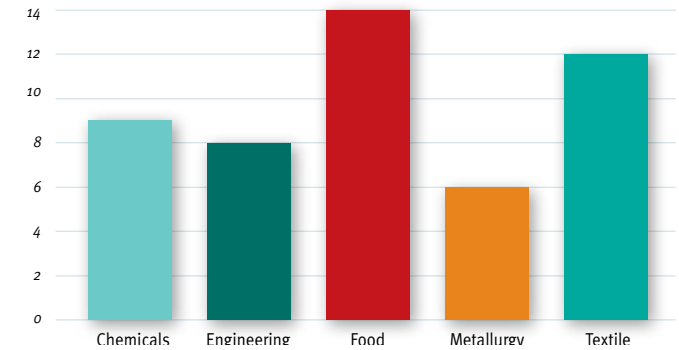


Figure 1: Sector distribution of the 49 recorded SMEs.

## Loans from the revolving fund – figure 2

A total of EGP 52 million were disbursed as loans from the Revolving Fund for Cleaner Production actions as of October 2007.

Figure 2 shows the distribution of loans among sectors. The average size of loans to enterprises in food, engineering and textile sectors are relatively small (around EGP 700,000 to 1 million). However, chemical and metallurgy enterprises require larger investments to achieve effective environmental effects, and borrowed an average of EGP 2 million per enterprise.

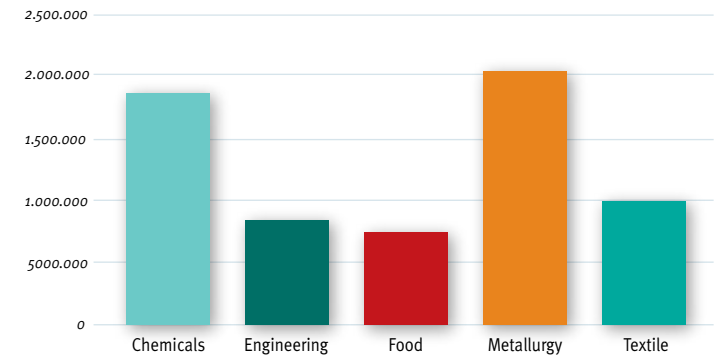


Figure 2: Average loan size (EGP) per enterprise per sector.

## Earnings from CP actions – figure 3

Cleaner Production actions have provided total annual earnings of EGP 40 million. When related to the EGP 52 million disbursed as loans from the Revolving Fund, the average pay-back period for investments proves to be 15 months.

Figure 3 illustrates the annual earnings in each sector per invested EGP. Earnings provided by the Cleaner Production actions mainly derive from energy savings and reduced loss of materials in production. In some cases (especially evident in the metallurgy sector) contributions also stem from improved products and quality.

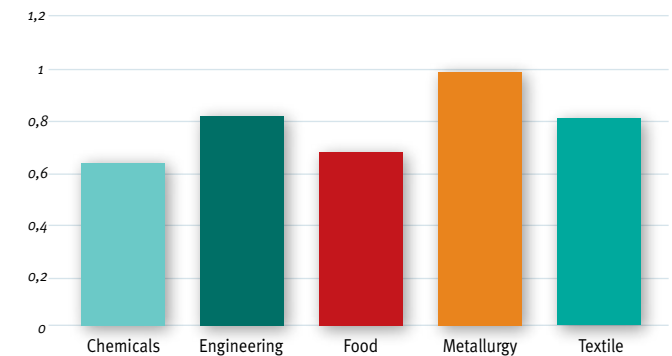


Figure 3: Annual earnings (EGP) per sector per each EGP from the Revolving Fund.

**Reduced energy consumption – figure 4**

Several Cleaner Production actions included options reducing energy consumption. Actions reducing electricity consumption are included in the total energy consumption. Energy savings derive from fuel switches and the introduction of more effective processing equipment. A reduction of 4050 Ton Oil Equivalents was recorded.

More than half of the reduction in energy consumption stems from the textile sector where the amount of water used in wet processing has been reduced resulting in a reduction of the steam energy used for heating water. The chemical, metallurgy and food sectors account for smaller amounts of about 15% each. The engineering sector does not contribute much to energy savings as most CP actions in this sector focus on process optimisation and technology upgrades.

**Wastewater and COD reduction in wastewater – figure 5**

The total amount of wastewater was reduced by 117 million m<sup>3</sup>. This amount was almost entirely contributed by the textile industry. Chemical Oxygen Demand (COD) indicates the load of organic pollution in water. As is typical, by far the largest reduction was found in the food sector which achieved an 80% total reduction of the 630 tonnes per year. Figure 5 illustrates the contribution from each sector to COD reduction. The COD reduction

in the textile sector is a result of the water savings in wet processing and the corresponding reduction of chemical additives.

**Carbon dioxide emissions – figure 6**

Many CP actions diminish and improve the quality of air emissions from enterprises. Over half of the total reduction of 50,000 t/year of CO<sub>2</sub> stems from CP actions in the chemical sector with process change and optimisation as the main contributors. The textile sector stands for almost a third of the emission reduction through - mainly - energy efficiency CP actions. The engineering, food and metallurgy sectors record only minor reductions in CO<sub>2</sub> emissions.

**Heavy metals, sulphur dioxide and PM<sub>10</sub>**

The reduction of heavy metals emissions through CP actions amounted to a total of 18 tonnes. This amount stems almost completely from CP air emission actions at a specific battery manufacturer.

A total reduction of sulphur dioxide of 1,400 tonnes a year is mainly the result of energy savings and fuel switches in the textile sector (48%), and process improvements in the chemical sector (35%).

Particulate matter under 10 micrometers constitutes a health hazard, because it is so small that it enters the respiratory system. CP actions reduced the PM<sub>10</sub> emission by

17 tonnes a year: 12 tonnes a year from CP actions in foundries where most options focused on the replacement of coal fired cupola furnaces with electric induction furnaces, and 5 tonnes from CP actions at a battery manufacturer with improved melting unit and dust collection in the processing areas.

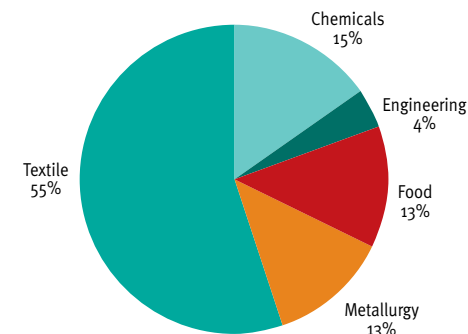


Figure 4: Share per sector of total energy savings.

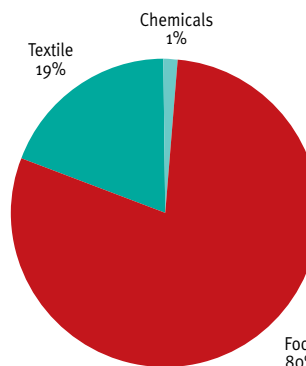


Figure 5: Contribution to COD reduction in wastewater

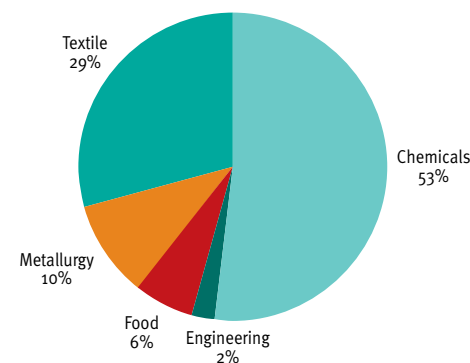


Figure 6: Reduction of CO<sub>2</sub> emissions per sector

## Examples of Cleaner Production in enterprises

| Options  | Environmental benefits   | Economic saving / year (EGP) | Investment (EGP) | Pay-back period (months) |
|--|--|------------------------------|------------------|--------------------------|
| Quality control laboratory                       | Wastewater reduction: 1250 m <sup>3</sup> /year<br>CO <sub>2</sub> reduction: 4 t/year | 264,000                      | 230,000          | 10                       |
| New equipment and rearrangement of the dye house | Wastewater reduction: 2600 m <sup>3</sup> /year<br>CO <sub>2</sub> reduction: 9 t/year | 986,000                      | 2,700,000        | 33                       |
| <b>Total</b>                                     |  | <b>1,250,000</b>             | <b>2,930,000</b> | <b>28</b>                |

### Textile sector

A textile enterprise manufactures knitted fabrics and ready made garments. Dyeing and finishing is also done on site. 320 employees work two shifts, six days a week. CP options implemented:

- The laboratory has been provided with a colour match system that determines the required contents in dye.
- New equipment and rearrangement in the

dye house, including installation of new dyeing machines to decrease the water fibre ratio by 50%, rearrangement of chemical and raw materials containers to reduce loss of raw materials and dyeing liquid, and substitution of sodium sulphide by glucose in sulphur black dyeing to avoid hazardous effects of sodium sulphide on the environment and worker health.



### Food sector

The enterprise in question is one of the largest white cheese producers in Egypt. The company supplies local and export markets. It employs 250 permanent employees working in two shifts, seven days a week.

### CP options implemented

- Replacement of manual packaging by automatic packing machine. Before this
- Switching to natural gas as boiler fuel instead of "mazout" (heavy oil)

CP action, the company used manual filling methods which lead to waste of final product. By shifting to automatic packing technology, the company produces less organic waste and reduces the use of energy and water. Product quality is improved through less rejects.

| Options   | Environmental benefits  | Economic saving / year (EGP) | Investment (EGP) | Pay-back period (months) |
|---|---|------------------------------|------------------|--------------------------|
| Replacement of manual cutting and packaging with automatic system | BOD reduction: 17 t/year  | 500,000                      | 1,700,000        | 41                       |
| Boiler fuel switch to natural gas                                 | CO <sub>2</sub> reduction: 630 t/year<br>SO <sub>2</sub> reduction: 20 t/year | 131,000                      | 110,000          | 10                       |
| <b>Total</b>  |   | <b>631,000</b>               | <b>1,810,000</b> | <b>34</b>                |

### Chemical sector

The enterprise manufactures batteries. Production steps include: Lead oxide paste production, plate charging, acid filling and assembling. The company employs 450 employees working three shifts, five days a week.

### CP options implemented

- Acid vapours extraction and collecting system in the tank formation area, improves working environment and reduces sulphuric acid consumption
- From manual to automatic sulphuric acid dosing system in the jar formation area

- New grid casting machine with closed melting pots and LPG that is more economical than electricity
- Dust collecting system in the cutting and enveloping area. Lead dust is removed from working environment and regenerated for production
- Waste water treatment plant to meet required parameters for COD, TDS and heavy metals. Treated water can be reused for cleaning

| Options  | Environmental benefits  | Economic saving / year (EGP) | Investment (EGP) | Pay-back period (months) |
|--|---|------------------------------|------------------|--------------------------|
| Acid vapours extraction and collecting system      | Sulphuric acid reduction: 51 t/year<br>Water consumption reduction: 3200 m <sup>3</sup> /year                     | 283,000                      | 1,050,000        | 45                       |
| Automatic sulphuric acid dosing system             | Sulphuric acid reduction: 37 t/year   | 53,000                       | 110,000          | 25                       |
| Controlled grid casting process                    | CO <sub>2</sub> reduction: 114 t/year<br>SO <sub>2</sub> reduction: 7 t/year<br>Heavy metals reduction: 2 kg/year | 152,000                      | 649,000          | 51                       |
| Dust collector for the cutting and enveloping area | Heavy metal reduction: 18 t/year<br>Regeneration of lead: 5 t/year  | 122,000                      | 303,000          | 30                       |
| Wastewater treatment plant                         | Heavy metals reduction: 290 kg/year<br>COD reduction: 9 t/year  | 111,000                      | 692,000          | 75                       |
| <b>Total</b>                                       |   | <b>721,000</b>               | <b>2,804,000</b> | <b>47</b>                |



| Options   | Environmental benefits  | Economic saving / year (EGP) | Investment (EGP) | Pay-back period (months) |
|---|---|------------------------------|------------------|--------------------------|
| Replacement of cupola furnaces with a rotary furnace operating on natural gas | CO <sub>2</sub> reduction: 648 t/year<br>SO <sub>2</sub> reduction: 24 t/year<br>PM <sub>10</sub> reduction: 8 t/year<br>Heavy Metal reduction: 220 kg/year | 615,000                      | 1,260,000        | 24                       |
| Upgrade shakeout and sand preparation processes                               | PM <sub>10</sub> reduction: 640 kg/year   | 493,000                      | 914,000          | 22                       |
| <b>Total</b>  |   | <b>1,108,000</b>             | <b>2,174,000</b> | <b>24</b>                |

### Metallurgy sector

This enterprise is a leading producer of taps and valves used for water and wastewater networks. The products are made of grey and ductile cast iron as well as copper and aluminium. The company supplies the local market, and employs 400 employees who work in one shift, six days a week.

### CP options implemented

- The existing cupola furnace has been replaced by a closed rotary furnace using less energy.
- The shakeout and blasting processes have been developed. The previous open manual shaking process with dust production is now replaced by an automatic shaking process with dust collection and filters.



# ECO - Building an effective business unit

ECO is located at the Federation of Egyptian Industries. This location provides ECO with direct access to the most recent developments and trends in Egyptian industry and enables ECO to work closely with FEI's chambers when targeting enterprises. The FEI has incorporated ECO into its institutional framework.

## ECO management

During the project period a Steering Committee was the top management level of the ACI component. The Executive Committee made up of some of the members of the Steering Committee sanctioned the enterprises selected for CP actions.

ECO's management team consisted of the component manager, Ahmed Kamal, and the Danish Technical Advisor, Mogens Dinesen.

ECO's staff of 12 is divided into two groups: Technical coordinators and a support unit.

## Egyptian/Danish cooperation

While the organisation of ECO reflects the environmental and capacity-building objectives of the ACI component, it also reflects the concept of combining Danish and Egyptian work experience.

The concept of the ECO office has been to build the capacity of the Egyptian technical team while at the same time ensuring that Egyptian enterprises benefit from the project. Throughout the project period ECO has benefited from the support and inspiration of a permanent Danish Technical Advisor (TA) and from the injection of Danish know-how through input from Danish short-term experts.

## Staff

Five Egyptian technical coordinators with appropriate university degrees in engineering ensure the day-to-day contact with enterprises. To expand their field of knowledge the coordinators have been trained in Cleaner Production and related technologies and in adapting these technologies to the individual industrial sectors. The coordinators are supported by a small group specialised in functions like communication, book-keeping and office backup.

To some extent local Egyptian consultants have also been trained by ACI/ECO to assist with the introduction of CP in enterprises. Without them ECO could not have provided the volume of services actually supplied.

## FEI helps ECO reach industry

Some enterprises could mistakenly regard ECO as an inspection authority. However, ECO's FEI affiliation clearly distances it from environmental authorities. This helps ECO promote itself as an integral part of Egyptian industry with its own distinctive portfolio of services. Gaining the trust of enterprises is highly important as critical production and process information is passed on to ECO.

## A win-win situation

As an integrated part of FEI, ECO is involved when FEI prepares new initiatives. ECO is seen as the environmental arm of the Federation, and represents FEI in committees and meetings when Egyptian industry's viewpoint is called for on environmental matters. ECO's presence in the FEI framework keeps environmental issues at the forefront of FEI activities.



# Communication and marketing



Right from the start the project's management team realised that the success of the project depended on its ability to attract SMEs and maintain contact with them. However, it was also well aware of the fact that to keep other stakeholder groups interested in the project and gain their support for introducing Cleaner Production there had to be some kind of continuous dissemination.

At a very early stage project management prepared an extensive communication strategy which later on developed into a marketing strategy. Thus the marketing strategy was mainly aimed at SMEs while the communication strategy targeted other stakeholders.

The communication strategy has been updated regularly, and throughout the project period ACI-ECO has had a permanent communication coordinator.

## Attracting SMEs

Typically, contact between ACI-ECO and SMEs was initiated through kick-off seminars at various locations in selected regions. The number of participants varied from 50 to 150. These seminars were arranged by the ACI-ECO in close cooperation with FEI chamber representatives, EAAA, NBE and the governorates. Pamphlets, news bulletins and merchandise were prepared for the kick-offs and the local media invited to cover the event. Once the first contacts with SMEs were

## Media channels

|                             |   |
|-----------------------------|---|
| Face-to-face communication: | Kick-off meetings, seminars, workshops, conferences, exhibitions, one-on-ones                                   |
| Printed material:           | Pamphlets, news bulletins, fact sheets, brochures, magazine "Industry and the Environment", slide presentations |
| Multi media:                | Web-site, video   |
| Presse media exposure:      | Articles and interviews in printed newspapers, TV coverage  |
| Other means:                | Posters, Ramadan cards, gadgets, Iftar, Award SME of the year etc.  |

made, ACI-ECO staff would then maintain contact through further face-to-face contact and printed material.

## Media channels

The basic idea of the strategies was to match selected media channels with stakeholder groups so that communication with each specified target could be optimised. The aim was to ensure that if the target groups were not reached through one media they would be reached through another. In addition the messages to be sent to stakeholders were carefully differentiated to make maximum impact.

An additional task of the project was to raise the awareness of the business community in general about Cleaner Production. The awareness strategy here was mainly to employ the press media - national as well as local - and produce a magazine which is distributed through the channels of the FEI.

## Action plans

Every year and on the basis of the project business plan, the communication staff prepare a detailed communication action plan listing proposed activities, timing/deadlines, their cost, the person responsible etc. In this way project management has in principle - on a sound basis - been able to give priority to certain actions, postpone others, etc.

## Challenges

Carrying out long-term planning, setting and sticking to deadlines as well as keeping up a continuous flow of information and dialogue with stakeholders are major challenges, especially in view of the fact that ACI-ECO management changed during the six years the programme ran. However, these challenges were met and overcome.

## Focus on cross-cutting issues

### Danida requirements

Danida requires all projects that it finances to focus on anti-corruption, poverty alleviation, gender issues and child labour - not easy to include in CP projects.

During the first years of the project's life-time cross-cutting issues were not a first priority as management attention was focused on getting the project up and running. However, once the project was running smoothly, cross-cutting issues were put on the agenda. The question was: How to make an active effort to integrate these issues into project procedures?

### Pro-activity pays

The ACI-ECO component found that the best way to tackle these difficult issues was to take a pro-active stance. And this has proved to be a viable path.

### Anti-corruption

Danida's anti-corruption policy was adopted simply by incorporating the policy into ECO policy. This means that anti-corruption applies to all staff members and is integrated into the component's working procedures.

### Poverty alleviation

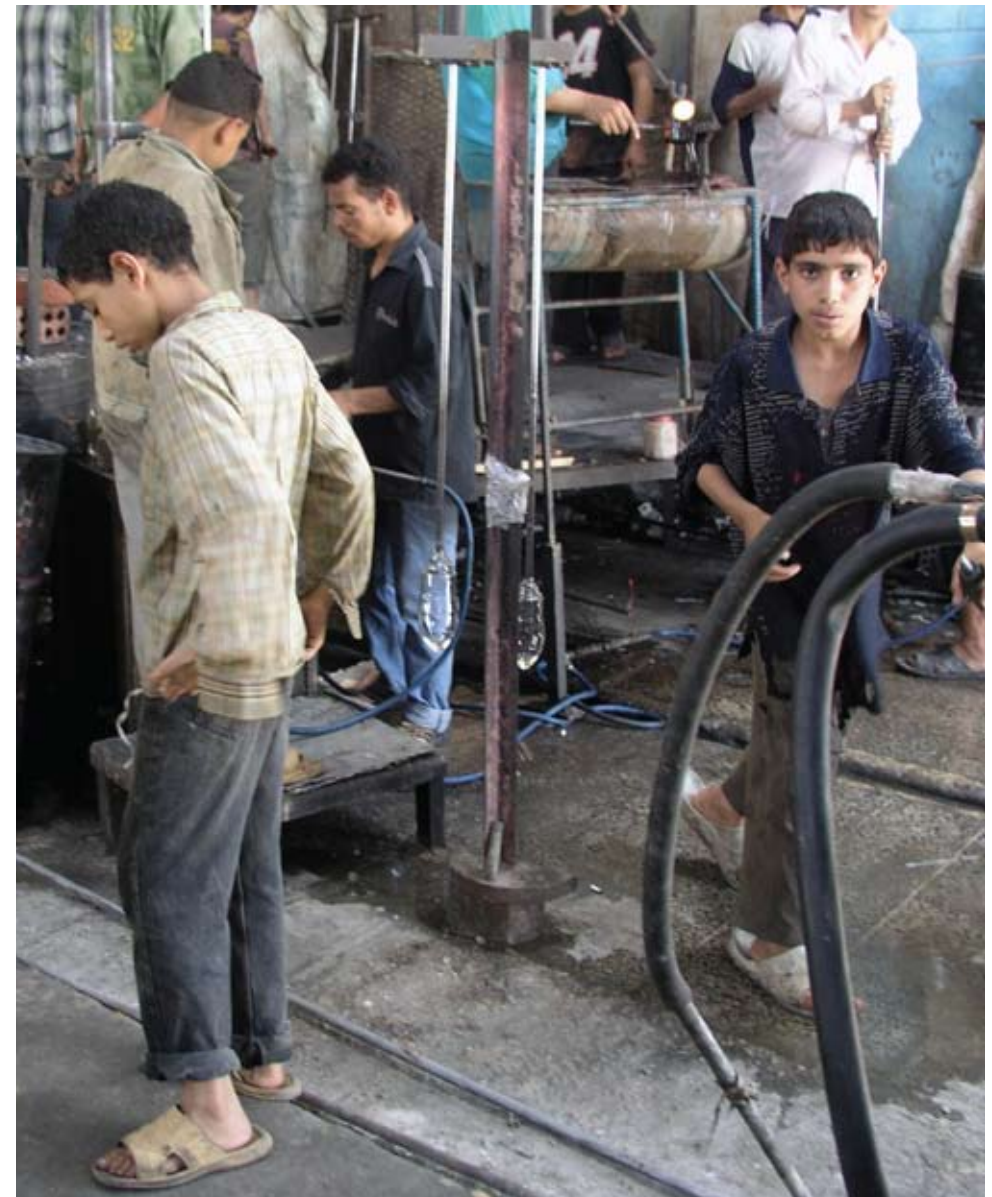
Poverty alleviation has at no point been a direct issue of the project. However, management has taken the issue into account when evaluating candidates for loans. It is a priority to consider factories located in poor areas.

### Gender

The gender issue has been in focus almost from the start. When new coordinator jobs were vacant it was natural for management to select women for two of the three positions available. Gender was given an additional boost when the communication coordinator participated in a gender course in Denmark. The direct result was the preparation of a gender strategy to be applied in SMEs. The strategy is being implemented. In addition gender is a criteria taken into consideration when picking candidate SMEs.

### Child labour

This important issue is dealt with in the same way as gender. It has been incorporated into the criteria for selecting SMEs.





## Co-operation among donors

There are many donors in Egypt involved or who have over time been involved in Cleaner Production, among others SEAM (the UK), CIDA (Canada), EPAP I and II (World Bank, European Investment Bank, Finland, France and Japan), UNIDO (UN), KFW (Germany), JICA (Japan), World Bank, and USAID (US).

It is characteristic that co-operation among donors has been limited. Although most donors acknowledge that in theory many synergies can be achieved by working together, conflicting interests often raise their ugly heads.

Nevertheless, the ACI-ECO has made continued efforts to work together with other donors, and ECO continues to seek cooperation possibilities to strengthen Cleaner Production efforts in Egypt.

### CIDA

The most successful cooperation initiative was established between CIDA and ECO. CIDA was supporting Cleaner Production in tanneries and chemical industries, but for organisational reasons CIDA decided to enter into an agreement with ECO for the administration and implementation of Cleaner Production. The initiative was completed successfully.

### Looking forward

ECO feels well-prepared to work with other donors, because the office through the years has become well acquainted with the way in which donor agencies actually work. With six years of Danida funding, its successful cooperation with CIDA and a deep knowledge of industry through its location at the FEI, ECO hopes to be able to assist other donors in distributing aid funds to industry effectively.

ECO will, naturally, continue to disburse loans through the Revolving Fund.

# Capacity building

## International inspiration

ECO's coordinators have been through an extensive capacity building programme. Three training sessions were held in Denmark during which the coordinators were exposed to a mix of CP training and visits to enterprises in the engineering, food, metallurgy, and textile industries (the chemical and energy efficiency sectors were added on later).

ECO staff has also been trained by Danish experts in Egypt. This training has both been hands-on in enterprises, special training sessions and achievement analysis at the ECO premises.

Corporate Social Responsibility was targeted through courses. Two ECO staff members attended two three week courses in Human Rights and Gender Issues, respectively. The courses were held in Copenhagen and arranged by Danida.

## Bringing CP to Egypt

A successful consultant has to be on the cutting edge of technology and familiar with the latest developments in his or her field of expertise. ECO coordinators have repeatedly attended sector specific industrial exhibitions, seminars and conferences in Egypt and abroad.

In order to conduct the necessary volume of work, ECO contracted local consultants

to prepare reports for enterprises under the auspices of ECO. Via several training sessions, local consultants were familiarised with the CP process (see other section in this booklet), Environmental Management Systems and the ECO working procedures. Local consultants were also invited to take part in sector specific training.

## Study tours

Representatives from Egyptian industry have been on study tours to Denmark, Romania and South Africa, where they experienced at first hand the application of CP in their industries. The study tours also served to strengthen ties between the industry and ECO.

## Involving universities

ECO has also worked with universities and other institutions of higher education. Young graduates have been introduced to and trained in CP technologies.





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*All photo material stems from Egyptian enterprises  
which have at some stage been involved in the project.  
The photos are all taken by ECO staff.*

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