

**EVALUATION OF THE
NATIONAL CLEANER PRODUCTION CENTRES IN CENTRAL EUROPE**

US/CEH/94/071: Czech Cleaner Production Centre
US/HUN/96/093: Hungarian Cleaner Production Centre
US/SLO/94/072: Slovak Cleaner Production Centre

Volume 2

**Czech Cleaner Production Centre
US/CEH/94/071**

Report of the joint in-depth evaluation mission*

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Explanatory Notes

Value of Czech Koruna (CZK) during the period of the evaluation, according to the UN operational rate of exchange is:

1 US\$ = 39.8400 CZECH KORUNA (CZK)

Acronyms

AMCP	- Association of Managers for Cleaner Production
APES	- Association of Producers of Environmental Systems
BAT	- Best Available Technologies
CCPC	- Czech Cleaner Production Centre
CEMC	- The Czech Environment Management Centre
CP	- Cleaner Production
DBU	- German Foundation of Deutsche Bundes Umwelt Stiftung
EMS	- Environmental Management System
EMAS	- Environmental Management and Audit System
EZU	- Institution for Energy Testing
IPPC	- Integrated Pollution Prevention and Control
NEFCO	- Nordic Environment Finance Corporation
PPR	- Project Progress Reports
QMS	- Quality Management System
TEZUS	- Institute for construction testing

1 INTRODUCTION

Evaluation of the Czech Cleaner Production Centre (CCPC) constitutes a part of evaluation of 3 UNIDO NCPCs funded by the Austrian Ministry of Foreign Affairs, the donor of the project. The evaluation of CCPC was carried by a team consisting of:

- Mr. Andreas Windsperger, team leader
- Mr. Zdenek Beranek, national consultant
- Mr. Jaroslav Navrátil, UNIDO staff.

The field mission was carried out 14 – 18 May 2001. The list of persons met and interviewed is in Annex 6.1.

Conclusions and lessons learned summarized for all three Centres are in a separate text.

2 CONCEPT AND DESIGN

2.1 Socio-economic Context

The process of transition to a market economy implies profound changes at the policy, institutional and company levels. At the time the project started (1994) the country's policy was focused on economic objectives, primarily on consolidating the ownership structure. Indirectly it was supported by the fact that indicators of industrial and agriculture-based pollution were improving as a result of contraction and restructuring of industrial and agricultural output. New environmental laws were adopted in early 1990s, preventive approaches and cleaner production were introduced already in the state environmental policy in 1995 but environmental objectives were actually given higher policy attention after changes of Governments in 1997-98. Within the last three years sectoral environmental policies were elaborated. Prevention and cleaner production were reflected particularly in the state industrial policy and the state energy policy. The Czech Ministry of Environment elaborated a new version of the State Environmental Policy in January 2001 that includes all voluntary tools such as Cleaner Production, EMS, Life Cycle Assessment and Eco-labeling. Cleaner production is also identified as a guiding principle in the new waste management law. In conformance with cleaner production principles the Ministry of Trade and Industry included in the Law on Energy that every major energy consumer is obliged to conduct an energy audit.

Some of the policy measures introduced in the last years were initiated or supported by the CCPC (see Chapter 4.1.7).

At the municipal level attention to human environment is also growing. There exists a national network of Healthy Cities; CCPC established cooperation with some of them. According to the Municipal Act the municipal authorities are responsible for protection of human environment on their territory. They are entitled to introduce relevant regulations and carry out projects. This allowed CCPC to organize and implement joint CP programmes with some municipalities.

At the company level restructuring of industry implied radical changes in ownership, production (product mix, technology) and market orientation of companies. These changes had to be implemented by management bodies that themselves were exposed to frequent changes. Prior to consolidation of ownership and management the companies were concerned with short term objectives of survival only. In 1994 such a situation was quite frequent. Gradually the situation improved but some sectors (such as metallurgy, coal mining, agriculture) still face serious problems of competitiveness and low demand for their products with high risk of bankruptcy. Many companies also in other sectors consider cash flow and market to be their top priority. Such companies can hardly be interested in CP advisory services.

On the other hand there is a growing number of companies, in many cases foreign-owned or with foreign partnership, that progressed not only in introducing quality management system and were

certified according to ISO 9000 but also such companies that introduce EMS. Currently more than 120 companies were certified according to ISO 14000.

Generally, however, the demand for environmental advisory services particularly by SMEs is rather low and calls for extensive promotional activities. As exemplified by CEMC, in carrying out a POEM project (supporting SME in introducing EMS) 200 companies were approached but only 12 joined the programme.

2.2 Institutional Framework

Institutional framework relevant for cleaner production in general and CCPC in particular is very complex.

2.2.1 Ministries

Due to adoption of the National Cleaner Production Programme not only the Ministry of Environment (the key player at the Government level) is involved in this field but also other ministries (industry and trade, health, agriculture and some others) elaborate their sectoral CP programmes.

2.2.2 Governmental organisations

From Government organizations working under the Ministry of Environment the following ones are of particular relevance in the field of pollution prevention:

- the State Environment Fund – supporting by soft loans BAT projects (including P measures) and subsidizing (up to 50% of consultancy costs) implementation of EMAS (all in SMEs only).
- Czech Environmental Institute with specialized agencies for Eco-labeling and EMAS and the Information Center for IPPC; this institute is sometimes a partner and sometimes a competitor of CCPC (in tenders for the Ministry's projects).

2.2.3 Universities

At the time the project started two universities (Technology Faculty Zlín, Institute of Chemical Technology Prague) had the experience of having hosted CP training courses carried out under a Norwegian-funded project. Later more universities got involved in the CP programme thanks to promotional activities of CCPC (see 4.1).

2.2.4 Non-governmental organisations

- Confederation of Industry. An umbrella association of sectoral associations of industrial and transport companies.
- The Czech Environment Management Centre (CEMC), originally the host organization for CCPC, now a cooperating partner. Established in 1992, currently associating 55-60 primarily large companies (and some consulting companies), 11 permanent staff, two of them operating a Pollution Prevention Centre established by the World Environment Centre. Other programmes/activities: EMS, eco-efficiency (mainly training, counseling), legislation (lobbying), dissemination of information. Technical working groups for BAT.
- Association of Managers for Cleaner Production (AMCP). Association of 50-60 professionals who attended intensive training courses in the framework of CP demonstration projects (more than 200 hours). Established in 1993, it is a platform for exchange of information and experience, with plenary meetings once in two years and more frequent meetings of the Steering Committee. However, truly active membership is limited to approximately 10 consultants.
- Association of Producers of Environmental Systems (APES). Associates producers of waste management equipment, waste water treatment plants, etc. Co-operates with CEMC on establishment of an IPPC agency and implementation of IPPC in industry.

There is a number of other NGOs related to cleaner production, prevention of pollution or EMS, such as SEVEN (energy conservation and energy efficiency) or MS TEAM (association of professionals around DEKONT for EMS implementation).

2.2.5 Private consultancy companies providing advisory services to implement EMS

- Consulting companies focused on quality management systems (at least one such a company can be found in yellow pages of bigger towns).
- Foreign consulting companies (such as KPMG, DHV).
- Private consultants.

Some geology-related companies (GEOTEST, KAP) started environmental consulting when The State Fund of National Properties paid remediation for environmental damages from the past (usually soil pollution). Later these companies started to look for other opportunities and some of them are advising on EMS. There are also private consultants who were originally active in waste management programmes required by waste management act; usually they are former environmentalists of industrial companies who made themselves independent.

Comparing the number of certified companies and the number of consulting companies one can assume that many consultants/consulting companies are trying to establish themselves on the market but only about 20 consulting companies are actually active in the field of EMS.

2.2.6 EMS certifying companies (ISO 14000)

- EZU (Institution for Energy Testing)
- Institute for testing and certification, a.s.
- TEZUS (institute for construction testing)
- CERT-Aco Kladno, s.r.o.

Apart from that, several foreign organizations are also accredited for this function like Det Norske Veritas, TUV Rheiland, Lloyds Register Quality Assurance, KPMG Certification GmbH, etc. These companies also provide advisory services in this field.

2.2.7 Banks

Some banks (such as IPB) have a credit line with soft term loans for environmental programmes; this support includes also end-of-pipe measures.

2.2.8 CP-related programmes of other donors

In 1992-95 a Czech-Norwegian Cleaner Production Project was implemented with the Institute of Chemical Technology in Prague and the Technology faculty in Zlin. It consisted mainly of demonstration projects combined with intensive training. In total 33 demonstration projects were carried out and 122 people were trained. This provided a core of expertise which could be used later by the CCPC. The PHARE programme also included some sub-programmes focused on prevention (demonstration projects focused on EMS, IPPC and EMAS implementation). Other programmes include:

- *Creating of preventive system for environmental protection in North Bohemia Region* The objective of this project is to create environmental prevention system in 7 companies in the region. This system uses selected elements of CP and EMS. Project is supported by the German Foundation of Deutsche Bundes Umwelt Stiftung (DBU).
- *Follow up to regional CP Project in Moravska Trebova.* To disseminate results of a CCPC project 12 seminars were held in cities belonging to the network of Healthy Cities. Supported by Canadian and UK Embassy.
- *"Environmental Protection Officer"* Developing a set of educational modules for employees responsible for environment. Modules are used for training by consultants of the CCPC. Supported by EU Programme Leonardo da Vinci.

The above projects are either partly implemented by CCPC or CCPC-associated consultants or results of such projects are used by CCPC and their consultants.

A number of NGOs are supported by the US foundation Partnership, but they are focused mainly on ecological initiatives and not on industrial pollution prevention.

2.3 Project Relevance and Design

As can be inferred from the preceding chapters, at the time of project preparation the objective of introducing and promoting the CP concept was relevant to the needs of the country. In the course of project implementation the objective remained relevant but the project concept and design had to be amended.

Reviewing the project document seven years after it had been prepared and confronting it with what has actually happened revealed both the strengths and weaknesses of project design:

Strengths (what turned out to be valid/relevant):

- Linkage to (integration with) prior and on-going programmes in cleaner production (the Czech-Norwegian Cleaner Production project, IVAM, the World Environment Centre); using extensively national expertise developed by the above projects and linked to the Association of Cleaner Production Managers.
- Combining capacity building for direct advisory services to industry with creating conducive environment for CP at policy level.
- Capacity building primarily through intensive training and on-the-job training (in-plant demonstrations), with support of a twinning organization from a developed country.
- Conceiving the Centre primarily as pivotal organization promoting CP both directly (awareness raising) and indirectly through policy dialog, consulting companies, etc. and not as a consulting company.
- The concept of the Steering Committee and its composition.
- Use of realistic indicators at the Output level (in the "Brief Description").

Weaknesses:

- Assumption that CP financial benefits alone are significant enough to motivate companies for replication; the risk at Purpose level ("companies not interested in following up and applying the concept at large-scale basis") was well identified but not adequately qualified ("MEDIUM" instead of "HIGH"). Consequently, the project purpose ("Wide-scale and sustainable application of CP in industry") turned out to be too ambitious.
- Expectations that research institutions would work on low-cost indigenous process changes that could be marketed to industry.
- Conceiving CP in isolation, not linking it with EMS and/or quality management system.
- Paying no attention to assistance in accessing financial resources for implementation of CP measures.
- Absence of a firm commitment of the host country to subsidize public functions of the Centre (awareness raising, policy, training, information, etc.).

In the course of project implementation some of the weaknesses were rectified (integration with EMS was established, assistance in accessing financial resources was introduced).

The Centre has so far managed to remain a relevant organization particularly due to its contribution to policy formulation, dissemination of the CP concept through a network of partners and continuous updating of methodological tools. This capability will be decisive also for its relevance in the future.

3 IMPLEMENTATION

3.1 Inputs, Budget and Expenditures

According to the project document the host country was expected to provide office space, salary of the deputy director and the administrative assistant, and logistical support (communication). Office space and communication support was provided by the Czech Environment Management Centre in the initial phase only. Later the CCPC made itself independent and rented larger offices for which it had to pay. No salary was paid by any counterpart to the deputy director or the administrative assistance. Thus inputs of the host country were small and were provided for a very short period only.

UNIDO inputs were provided in the framework of the UNIDO budget and its revisions (see Table CEH-1).

Table CEH-1: Budget and Expenditures : US/CEH/94/071

Budget line		Original Budget	Latest Revised Budget	Total expenditures
11-99	Project Personnel	180,000	40,406	35,906
15-99	Project Travel	39,000	14,842	14,842
16-99	Other Personnel Costs	5,000	25,575	6,875
17-99	Short-Term National Consultants	81,000	101,614	98,414
19-99	Personnel	305,000	182,437	156,037
29-99	Contracts	15,000	110,110	110,110
39-99	Training	43,000	271,897	271,896
49-99	Equipment	40,000	23,413	23,412
59-99	Miscellaneous	12,000	15,143	13,868
Total:		415,000	603,000	575,323

Breakdown of the budget and actual expenditures reflect the following features of the implementation modality:

- focus on training (BL 39).
- use of the twinning organization STENUM Graz (22% of total project expenditures) (BL 11 - \$ 31430; BL 29 - \$ 95610).
- extensive use of national experts (including salary of the Director) (BL 17).
- modest provision of some office equipment only (no testing or laboratory equipment) (BL 49).

Differences between the original budget and its latest revision concern primarily a shift between project personnel (BL 11) and contracts (BL 29), and a large increase of the budget line 39 for training. The first change reflects the preference of STENUM to provide services under a subcontract rather than individual personal contracts. The second change accommodates all the increase of the total budget as well as some savings in other inputs (equipment, travel) in order to cover diverse training-related expenses (study tours abroad, participation at annual meetings of the NCPs, awareness raising and training events in the country, training in the course of in-plant assessments). The changes reflect the fact that there had not been previous experience with such a project so that optimal implementation modalities had to be searched in the course of implementation.

Cooperation with STENUM Graz represented a significant support for the Centre but it was not the exclusive source of foreign expertise. Study tours were organized also to other countries (Denmark, the Netherlands). Apart from that the Centre had access to expertise of other advanced countries supporting CP or EMS projects in the Czech republic (the PHARE programme, UK, Germany). This is related to the fact that the UNIDO project represented the key support for the Centre during the project lifetime but not the only one. This can be illustrated in budgetary terms as follows:

Total budget revenue of the CCPC 1995-2000 [a]	approx USD 1,150,000
Total UNIDO expenditures [b]	USD 575,323
UNIDO support implemented through the Centre [c]	approx USD 200,000
% of the UNIDO project in the Centre's revenue [d] = [c]/[a]	17
Total resources 1150000 + (575323 – 200000) [e]	USD 1,525,323
% of the UNIDO project in total resources [f] = [b]/[e]	38

(It should be noted for explanation that only a part of the UNIDO project - [c] – was channeled through the Centre, larger part was spent on direct recruitment – for example STENUM - or procurement by UNIDO.)

Thus the UNIDO project with total expenditures of USD 575323 in the course of six years did not cover the whole budget of the Centre and the Centre had to secure complementary funding. Different sources of revenue are described in Chapter on Sustainability.

3.2 Activities

During the project lifetime two categories of activities were carried out:

- a) internal project activities constituting the Centre (equipping the office, training of the staff, preparing manuals and guidelines, establishing the management information, accounting and reporting systems, etc.) and,
- b) external activities of CCPC consisting of services for various clients, promotion of CP and networking.

The latter activities also contributed significantly to continuous capacity building of the Centre (through the learning feedback) but primary target groups of these activities were outside the Centre.

As the activities are embodied in results reported in Chapter 4 (internal activities primarily in Output 1, external activities in the other outputs), this section refrains from duplication and focuses only on some aspects highlighting important features of implementation:

- *Intensive use of external consultants* (primarily national ones) in carrying out services to companies. The Centre contracts external consultants recruited from among the core of 8-10 CP experts from the Association of Managers of Cleaner Production (AMCP) for conducting training and in-plant assessments. Some external consultants also support the Centre in elaboration of methodological tools (manuals and guidelines), databases and the website. Three consultants have semi-permanent contracts with the Centre and use its office space. The Centre's staff themselves are engaged primarily in establishing and maintaining contacts with current and potential clients and partners, marketing of services, organizing events, compiling and disseminating CP information, preparing methodological tools and guiding and assisting external consultants in carrying out training courses and in-plant assessments. Policy-related papers for the Ministry of Environment are prepared primarily by the Centre's staff themselves.
- *Cooperation with STENUM Graz*. Consultants from STENUM Graz participated primarily in elaboration of methodological tools and provided guidance in conducting training and in-plant assessments. In some in-plant assessments (such as ZNOVIN Company) they served directly as external consultants (however, this activity was not funded by this project). Use of STENUM Graz as source of specialized (sectoral) technical information on CP options was marginal.
- *Wide networking and cooperation*. In order to promote the CP concept the Centre has established numerous contacts at the ministry level, universities, a number of municipal offices and a number of environment management consultants and consulting companies (one of them being DEKONT Zlin, visited by the evaluation team). Cooperation with the Ministry of Environment itself is secured through annual agreements on policy-related services (in 2000 in the range of approx. USD 13000). Consulting companies such as DEKONT act in cooperation with the Centre as CP promoters, coordinators and implementing agencies of CP projects in the region of their residence.

- *Great attention to creating a CP-conducive policy environment.* From the very beginning the Centre tried to influence policy bodies with the objective to support CP application. Later the attention became broader to include BAT and other voluntary measures.
- *Great efforts in searching for clients.* The Centre searches for clients among companies, ministries and municipalities. Two factors proved particularly important: personal contacts (frequently dating back to the pre-project time) and availability of funds for subsidizing the services for companies and municipalities. In some cases the clients can not pay at all for the services. The Centre tries to make use of funds available with external donors or to do project work (studies etc.) for international or bilateral agencies. The Centre managed to become implementing agency for Czech-funded CP-oriented technical cooperation projects abroad.
- *Evolution of new activities.* Confronted with low company demand for CP in-plant assessments alone the Centre engaged in new activities extending the scope of services, such as integrating CP with EMS, financing of CP measures, introducing CP measures in curricula of universities, organizing regional CP programmes with participation of industrial SMEs as well as companies from the service sector and agriculture.

On the whole, implementation could not be guided only by activities specified in the project document but rather had to adjust the activities to reflect acquired experience and meet new challenges particularly in view of completion of the UNIDO project.

3.3 Project Management

On the host country side the counterpart function was only temporarily executed by CEMC. After separation of CCPC from CEMC any formal national counterpart vanished and the supervisory function was executed by the Steering Committee only. The Steering Committee consisted of key stakeholders (including the Ministry of Environment, Ministry of Industry and Trade, the Confederation of Industry and two universities) so that its composition was appropriate for the task of strategic guidance and – vice versa – promotion of the Centre. However, contacts with some members between meetings were less intense (Confederation of Industry). Meetings were conceived as project review meetings with Project Progress Reports (PPR) or Activity Reports prepared before the meetings. (Copies of PPRs dated 1996 and 1997 and a Terminal Report dated 2001 are available in the UNIDO Office of Internal Oversight and Evaluation.)

Operational management was in the hands of a national Director with international experience who had good managerial and leadership qualifications with capability to search for innovative approaches. His departure from the Centre approximately at the time of project completion is to be regretted in spite of the fact that the new Director is also an experienced and dedicated professional with extensive working contacts useful for the Centre.

The project was executed by UNIDO. The project management function was carried out (during 6 years, if preparatory phase is included) subsequently by three UNIDO staff from the same Branch but no particular problems of management discontinuity were recorded by the evaluation team. Contacts between UNIDO and the Centre, including visits for briefing, training and solving administration issues, were quite frequent. (Administration of the discretionary budget was rather laborious.) Monitoring of the project by UNIDO included participation of the UNIDO Project Manager at the review meetings of the Steering Committee. In 1999 the Centre was entrusted by UNIDO to organize the annual meeting of all UNIDO/UNEP NCPCs in Prague. Contacts with UNEP were established as well.

4 RESULTS

4.1 Outputs

Presentation of Outputs follows the list of Outputs as stipulated in the project document. The last two outputs (4.1.8 and 4.1.9) were not envisaged in the original project document and represent a distinct extension of the original objectives.

4.1.1 Establishment of the Centre

According to the project document the Centre should have had a staff of two professionals and be able to carry various promotional, training and advisory functions.

The Czech Cleaner Production Center (CCPC) was established in 1994. CCPC was initially hosted by the Czech Environmental Management Centre, receiving from this institution free office space and logistical support. In 1998 CCPC left the host institution, and is now located in offices that it rents. The Centre's legal status under Czech law is an NGO with a status of a civic, non-governmental, non-profit organisation. Ever since the beginning of its operations, the Centre's activities have been overseen by a Steering Committee.

The project was able to build on cleaner production activities already undertaken in the Czech Republic, funded by Norway. UNIDO chose as the Director of the Centre Mr. Vladimír Dobes who was involved in the previous CP projects and who remained at its head until December 1999, when he handed over to the current Director, Ms. Anna Christianova. Currently, the Centre has a staff of 7.5 persons: the director, 5 professionals, and 1.5 secretaries. The Director, Deputy Director and a secretary are long-term employees of the Centre, the other staff have contractual status of consultants with most of the time allocated to projects executed by the Centre, thus using the premises and facilities of the Centre. From among the 5 professionals, two of them are engineers and three hold a Master of Science degree. Educational background is very good, some of them have factory experience. Most of them have a good command of English.

The office in Prague has adequate office space (rented) and office equipment. Measuring or laboratory equipment is not available.

The Centre keeps good records about its demonstration projects. The information used to be reflected in the annual reports with indication of aggregate impact of the CP measures identified by the Centre and adopted for implementation. Such aggregate indicators of CP measures were prepared till 1999 but in 2000 this practice was discontinued.

Apart from the central office in Prague CCPC established a subsidiary in Brno which is actually staffed with one professional and a secretary (part-time). After completion of the UNIDO project it was decided to make the subsidiary financially independent. Though activities of the branch office were rather successful in 2000 the future of that office is uncertain.

In addition to the office in Prague and an autonomous office in Brno there were two representations, in Karlovy Vary (for Western Bohemia) and in Ostrava (for Northern Moravia), which had no real permanent character, but contributed to promotion and implementation of CP projects in those regions. The team in Karlovy Vary is still active on ad hoc basis.

The Centre is capable of performing all services envisaged in the projects document as well as services that were not envisaged (such as EMS, advising on access to funding).

Assessment: More than planned

4.1.2 Dissemination of information

Dissemination of information on CP and CCPC was very intense particularly in the first years of the Centre's operations. A press spokesman was appointed, more than 20 articles in newspapers were

published, press conferences were organized when completing particular projects. The CCPC was also presented at congresses and exhibitions, like the ENVI Brno or ENVI Kladno. Handbooks and manuals on CP or EMS (see Output 4.1.6) and their wide distribution either by CCPC or the Ministry of Environment also helped in disseminating the CP/EMS concept.

The CCPC webpage is well structured and provides a comprehensive and updated overview on the activities and the framework of the Center. The information content was extended with lists about reports on the progress of adopting legislation on IPPC and about granting programmes at the State Environment Fund. The webpage has a considerable number of links to other CP-relevant webpages, including UNIDO and the UNEP database of CP case studies. (However, demand for technology-related information by outsiders is very low.) The webpage serves more and more as a central platform for information about CP and related fields in Czech Republic.

As a result of these activities CCPC is well recognized as the focal point for CP in the Czech republic and the CP concept is well known among environmental professionals and within a certain segment of government organizations, municipalities and industry. The CP concept has not yet become known by all industrial and service companies but it would be unrealistic to expect such a result under this output.

Assessment: As planned

4.1.3 Demonstration projects

This is the core and the most difficult output of the project. According to the project document CP demonstration projects should have been carried out and at least partly implemented in 20 industrial companies. Actually 76 demonstration projects (case studies) were carried out at 65 companies (disregarding case studies carried out under the Norwegian project and case studies carried out by CCPC under other projects abroad – 27 case studies were carried out in Uzbekistan and Croatia alone). Thus the target was considerably exceeded.

The demonstration projects (case studies) followed different patterns:

- CP project in one (large) company with extensive training of company staff in situ, creating CP teams for selected production lines, identification of CP options by the factory teams with methodological support of external consultants, screening and adoption of CP options by top management. Training involved more than 200 hours for every participant. (Example: Mora Moravia).
- Ekoprofit: similar to the above but covering several smaller companies, with joint training of the companies' staff; usually organized on regional basis (Example: Zlin 1).
- EMS implementation on the basis of CP (Zlin 2, pottery Horni Brza).
- Implementation of an integrated CP/QMS/EMS system (example: Provio Jaromer; certified according to ISO 9002 and 14001 in 1999).
- A regional CP project (Moravska Trebova). The project applied approach advocated by the 5th EU Action Programme to reduce pollution and at the same time increase competitiveness. It was started 1998 with support from British and Canadian embassy and carried out in the form of interactive training courses, divided in collective training in CP methodology and demonstration projects in the participating enterprises. The trainees applied the presented knowledge directly in their enterprises, and were hereby assisted by the CPC consultants.
- BEP (Banking Environmental Programme). To show practical EMS implementation in companies a project was started in Roznov nad Radhostem with financial support of Danish environmental agency. BEP project was the first practical application of this system in the framework of National EMAS programme. Up to then no accredited EMAS verifiers had been in Czech Republic. This project is supposed to be used for the first audits of EMAS verifiers.

Generally there has been a distinct trend in demonstration projects from CP demonstrations to demonstrations of CP in the framework of EMS implementation.

The evaluation team visited Mora Moravia, some companies in the region Zlin as well as the Municipality Office Zlin (see 6.2 Annex).

Assessment: More than planned

4.1.4 Training

According to the project document at least 50 people should have been trained in CP practices and application. Actually 219 people were trained out of whom approximately 80 people also participated actively in the demonstration projects in companies (each of them altogether more than 200 hours) so that they acquired considerable insight in CP. These numbers do not include results of training carried out under the Norwegian project or CCPC projects implemented abroad (77 people trained in Uzbekistan and Croatia alone). Thus the project exceeded by far the target for this output.

Assessment: More than planned

4.1.5 Research Institutes

This output was dropped.

Assessment: Less than planned

4.1.6 Documentation and Manuals

CCPC prepared a number of manuals and handbooks, probably many more than what was expected at the start of the project. The most important ones can be listed as follows:

- "Cleaner Production – Pollution Prevention" – a handbook for industrial companies
- "Introducing CP and Developing Municipal Policy" – a handbook for municipal officers
- "CP as part of EMS and Audit Scheme" – a handbook for government bodies, issued by the Ministry of Environment
- "From CP to EMS" – translation of the STENUM manual for implementation of EMS
- "Handbook on IPPC Directive 96/61/EC"
- "Implementation of EMAS in Czech companies" – manual and working sheets

In addition some other handbooks were prepared, including some issued in Russian and Croatian languages.

At present CCPC tries to develop further the relation between CP and EMS as this will be much more demanded in future.

Assessment: More than planned

4.1.7 Policy advice

CCPC established close and very effective working contacts and dialog with some policy bodies, particularly with the Ministry of Environment. CCPC prepared a number of inputs for their work and decision making and participated in several inter-ministerial working groups organized by the Ministry (such as the EMAS Programme, Eco-labeling, etc.). As a result of such promotional activities the Minister of Environment signed in March 1999 the International Declaration on Cleaner Production. (The Declaration was signed on the occasion of an annual meeting of the UNIDO/UNEP NCPC Directors in Prague.) As a follow up to the International Declaration a National Cleaner Production Programme was prepared (in cooperation with other ministries) at the end of 1999. CCPC contributed significantly to its preparation. The National Cleaner Production Programme was promulgated by a Government Decree on February 9th 2000. Herein it is recommended to use CP principles and apply them widely in all resorts. A continuous monitoring of the Programme implementation was introduced. The first evaluation of the resulting benefits of the Programme for the year 2000 could already be drafted by the CCPC for the Ministry of Environment. Through this monitoring activity on behalf of the

Ministry the CCPC is in contact with a number of other ministries involved in the implementation of the National Programme (Ministry of Industry and Trade, Ministry of Regional Development, etc.).

CCPC was also instrumental in introducing a CP sub-programme within the State Environmental Fund. The sub-programme initiated by the CCPC provides for soft term loans or payment of interest on commercial loans for implementation of CP (and more recently BAT) measures. CCPC drafted criteria and procedures for applications and suggested a list of CP experts entitled to appraise the applications or to help companies prepare such applications. Only SMEs are eligible to apply for such a support. Up to now 8 such applications were approved by the Minister, amounting to approximately 1.2 million USD of soft-term loans in support of total investment in the amount of 4.3 million USD.

CCPC was also involved in negotiations with the NEFCO fund which released 4 million EURO for soft loans in support of CP in the Czech republic. NEFCO and CCPC signed an agreement about CCPC consultancy services for NEFCO. One application is currently under consideration by NEFCO, CCPC searches for new suitable candidates.

More recently CCPC supported the Ministry of Environment in preparatory work for accession of the Czech republic to the EU. Considerable work has been done for better understanding of the IPPC Directive 96/61/EC. In addition to preparing for the Ministry a publication on the Directive, a number of other studies were prepared, such as:

- BAT Indicators and their statistical monitoring. Proposal of BAT indicators for integrated permit licensing within the IPPC Directive.
- Mapping of raw material and energy flows in companies and regions. An application of the expertise of Germany, Austria and the Scandinavian countries in that field.
- Cleaner technologies in the Czech textile industry. In collaboration with the Dutch Embassy and Dutch consulting companies CCPC reviewed possibilities to implement cleaner technologies in this industrial sector.

Cooperation with the CCPC was explicitly appreciated by the Minister himself (the Minister has a professional background of an environmental auditor) and, no doubt, the CCPC contributed significantly to the high attention given by the Ministry to CP and BAT. As a recognition of its activities in this field the Ministry was requested by UNEP to host the 7th international workshop on cleaner production in 2002 in Prague.

Assessment: More than planned

4.1.8 Integration of CP in University curricula

This output was not foreseen in the original project document but it turned out to be very important for broader dissemination of the CP concept.

A successful co-operation with universities to implement CP principles in the university's curricula has been established in particular with the Agricultural and the Technical Universities in Brno and further with Technical University Ostrava, the University of Economics and the University of Chemical Technology in Prague, and the Universities in Pilzen and Usti nad Labem. In addition to lectures and seminars on CP mainstreamed in selected subjects CP also constituted one of the themes of diploma theses and dissertations.

The evaluation team could have a close look at the situation at the Georg Mendel University of Agriculture in Brno, where the department of landscape engineering hosts that activity. Cleaner Production is not established as a separate subject, but the principles are presented in the subject "environmental protection" for students of food technology, agroecology and transport technology (approximately 8 hours, annually approximately 120 students). The branches waste management and forest management have a more specialized semester-long programme in Cleaner Production to the extent of 3 hours of lectures and 3 hours of seminars per week. Each of these branches are studied by about 15 students but the waste management course is quite new so that an increase in future is expected.

CP subject is covered in PhD and diploma theses. During the last years the problem areas listed hereunder were investigated:

- CP in a poultry slaughterhouse;
- energy and material flow in a dairy factory;
- CP in production of biodiesel out of rapeseed;
- rationalization and management of particular agricultural companies (diploma works).

These works revealed, among others, the difficulty of applying CP in agriculture, as the current economic problems faced by agriculture and private ownership of small farms pose a constraint to such CP analysis (reluctance to provide data, limited interest due to problems of survival). Much better is the situation in food industry as the installed measures can be related to economic benefits in a more transparent way.

Cooperation with CCPC was established upon initiative of the University staff who learned about the CCPC from their promotional activities (ENVIBRNO fair, articles in newspapers). The University is using CCPC manuals, the CCPC Director sits at the Board of Examiners for the PhD and diploma works.

While the share of students exposed to CP at the Agricultural University reaches approximately 15% and may appear modest it is acknowledged that CP does not apply to all lines of study and the pure fact of having a permanent CP focal point at the University should be considered as a good result of the CCPC's dissemination activities.

4.1.9 International Projects

International activities help the Centre in maintaining a close co-operation network with foreign institutions, on the other hand they transfer accumulated know-how to other countries in transition.

CCPC has been an active partner in the UNIDO/UNEP NCPC network; in 1999 the CCPC hosted the meeting of the directors of UNIDO/UNEP National Cleaner Production Centres. CCPC has participated within the 5th Frame Programme of the European Commission over three years in the INNET project. Through this project a network for promotion of CP shall be constituted. Apart from that the CCPC maintains professional contacts with a number of organizations abroad.

In the context of Czech voluntary contribution to the UNIDO Industrial Development Fund UNIDO entrusted CCPC to implement its project "Building up CP-capacities in Croatia". In the course of project implementation 19 demonstration projects were carried out and 58 national experts trained in Croatia. The demonstration projects identified a significant reduction of pollution combined with distinct economic savings.

A similar project funded by the Czech republic was started in Macedonia. The project is based on the know-how acquired in Croatia. It is planned for three years focusing mainly on demonstration projects and training of consultants in the CP methodology. Other CP training and demonstration activities were carried out by CCPC experts in Uzbekistan, Armenia and the Russian Federation. In all these cases the CCPC could demonstrate the CP potential and, at the same time, accumulate additional experience in this field and improve its financial situation.

4.2 Achievement of the Purpose

"The purpose of the project is to achieve a critical mass of awareness, expertise and experience in the application of cleaner production in industry so that the application and dissemination of the concept can proceed on a sustainable basis". Another quotation from the project document defines project objective as *"Wide scale and sustainable application of cleaner production to Czech industry"*.

No quantitative indicator was set for evaluating the success as defined above but even if such an indicator would have been established (for example, a percentage of industrial companies applying

cleaner production or a number of companies newly introducing CP) it would have been impossible for the evaluation team to arrive at a quantitative finding since there is no monitoring of CP activities of industrial companies available and a special survey would be prohibitively expensive. Thus the evaluation of this aspect is based on qualitative information only.

It can be concluded that a critical mass of expertise and experience in the application of cleaner production was actually achieved. There are enough consultants acquainted with and experienced in application of CP methodology not only in industry but also in other sectors, such as services. New expertise is continuously generated through some universities that introduced CP in their curricula.

As regards awareness, it is high at policy level: there it was even codified in signing the UNEP-initiated International Declaration on Cleaner Production, in Government resolution approving a National Cleaner Production Programme, and in establishing the possibility of subsidizing implementation of CP measures by SMEs from the State Environmental Fund. Awareness of CP is disseminated also through some universities and a network of consultants, organizations and municipalities cooperating with the Centre. Yet the demand for CP advisory services (in-plant assessments) by companies remains rather low and in spite of reported incidence of CP applications by a number of consultants in the field of environment management it can hardly be concluded that CP is widely applied in the Czech industry. Thus, in spite of excellent results in production of outputs in general and in creating a conducive policy framework and building up sufficient CP expertise and experience in particular, the objective of wide scale and sustainable application of CP to the Czech industry has not been fully achieved and needs to be further pursued.

This statement needs a qualification. Constraints to CP application by industry, particularly by SMEs, are prompted by a number of factors. First, the expected financial benefits from implementation of non-investment CP measures may not seem robust enough and easily identifiable to deserve staff time, fees to consultants and organizational effort for conducting in-plant assessment. Risks associated with interference in established technologies may also fend off some companies. Implementation of investment options requires either use of their own capital, which the SMEs are usually short of, or a loan which is difficult to access for a number of reasons. Thus the reasons for low demand go beyond insufficient awareness raising and can hardly be influenced by the Centre alone.

4.3 Impact

What ultimately matters are changes at industry level once CP options are implemented: economic savings and environmental benefits (reduction in use of natural resources and reduction of pollution and waste "at the end of the pipe"). Such an impact can be generated through implementation of CP options identified or induced by the CCPC demonstration projects themselves (direct impact of the UNIDO project) or through CP options identified by consultants or consulting companies trained by CCPC but operating independently (spin-off impact). The latter category would also include impact of CP applications induced by former students of universities cooperating with CCPC in introducing CP in the education process, as well as by the CP-conducive policy environment to the creation of which the CCPC contributed significantly.

As regards the direct impact, CCPC monitored some results of its demonstration projects up to the end of 1999. The technical reports of each demonstration project included information about options identified, options selected for implementation and their (potential) impact.

Table CEH-2: Impact of CP options approved for implementation, 1995-1999 (based on 75 demonstration projects)

Type of CP option by pay-back period	Volatile matters t/year	Waste water 1000 m ³ /year	Hazardous waste t/year	Other waste t/year	Annual savings (\$ mil) 1 \$ = 38 Kc
Immediate	193	633	8451	9380	1.3
Less than 0.5 years	11	18	1394	1786	1.0
More than 0.5 years	2512	3795	1136	389	4.2
Total:	2716	4446	10981	11555	6.5

Both the environmental and economic benefits appear considerable and compare well with the budget of the UNIDO project. However, the actual impact is going to be lower due to the following factors:

Not all CP options approved by management for implementation are actually implemented. In case of Mora Moravia, a company with highly environmentally conscious top management, approximately 60% of approved CP options were implemented. Even though the implementation continues, the pace is much slower.

The structure of CP options indicates that (except for solid non-hazardous waste) the scope of impact is higher in case of investment options with longer pay-back period. As the experience from the companies visited by the team suggests, rate of implementation of such investment options is lower compared to the rate of implementation of non-investment options.

The sample of 75 demonstration projects seems to include some of those that have been carried out under the Norwegian project.

In 2000 such a monitoring of CP options and their potential impact was discontinued since CCPC got involved more in EMS projects. Though CP options continue to be identified in the course of such projects the CP results are no longer aggregated in order to give prominence to system changes rather than to one-event results.

As regards the indirect impact no monitoring information is available. It can be assumed that CP changes with environmental and economic impact are introduced by some companies in the course of their on-going technology upgrading or in the course of EMS application and that such changes are supported or speeded up by the growing number of CP-aware consultants and the conducive policy framework. However, such changes can not be attributed to the activities of the CCPC alone as they result from a combination of various factors and driving forces.

5 SUSTAINABILITY

Sustainability of the Centre depends on effective demand for its services and on professional and managerial competence to deliver such services to the satisfaction of clients. From all the visited institutions which had contact with the center the evaluation team heard satisfied up to enthusiastic assessment of their experience with the work of CCPC. The CCPC staff approached actively people involved in their projects with companies and could therefore manage to remove in-house obstacles coming from low awareness, disinterest and preoccupation with other business. Yet, as explained elsewhere, the demand for CP-alone services is low and the Centre had to diversify the activities and provide services also to other clients. This is reflected in the structure of income generated by the Centre.

Income of the Centre in 2000 was more than 8 mil CZK and lay herewith clearly above the plan of 6,5 million For 2001 about 9 million CZK are expected, from which 8 million are already covered by agreements. After completion of the UNIDO project the gap had to be balanced by increase of income from other sources. At present the Centre bases its major income on project work contracted by various organizations, showing the prosperity of the built up competency.

Table CEH-3: Income structure in 2000 (% of total income)

National sources	(50)
Ministry of Environment	25
Ministry of Industry	5
Companies	15
Municipalities	5
International sources	(50)
external donors	30
projects abroad funded by the Czech Government	20

External donors are both bilateral (UK, Canadian, German..) and multilateral (UNEP) organizations. So far CCPC managed to co-implement two projects funded by EU (Leonardo, INNETH).

Expenditures in 2000 could be kept lower than income. The largest item was costs for external consultants. Compared with that amount the volume of salaries for the employed staff is relatively low. This allows for a high degree of flexibility in reacting to varying income situation. On the other hand it is a sign that comfortable financial sustainability to ensure current scope of activities has not been reached yet and is probably not expected for the next years. A stabilized income would allow to dedicate more resources for the salaries of the staff and investment in building up human capacity. At the moment the Centre depends a lot on external expertise (consultants).

Cooperation with external consultants has some positive aspects (the above mentioned flexibility and intense interlinkage and close contact with external professional groups) but it also entails some competition for the same jobs. This could become more significant if the Centre would have to rely on income from services to companies. To avoid that the CCPC should primarily serve as a super-trainer and a platform for transferring knowledge and information from research, international organizations or working groups abroad (primarily EU) to local consultants. This can be done also in the course of demonstration projects. The finances should come on one hand from international funding sources, which is actually the case, and from national bodies responsible for elaboration and implementation of concepts and strategies in branches or regions. Although CCPC is currently active in this direction, the financial income has been insufficient as the ministries are lacking resources for that purpose. Accession to EU may provide a better framework for this type of activity.

6 ANNEX

6.1 Persons Met and Interviewed

Monday 14 May 2001

The Czech Cleaner Production Center

Ms. Christianova Anna, Director of CPC

Mr. Miroslav Krcma, Deputy Director

Mr. Libor Novak, consultant

Mr. Jan Koubsky, consultant

Mr. Jan Stejfa, consultant

Association of Managers of Cleaner Production (AMCP)

Mr. Kveta Remtova, President of AMCP

Czech Environment Management Center (CEMC)

Mr. Bohuslav Mucha, Director of Pollution Prevention Center

Tuesday 15 May 2001

The Czech Ministry of Environment

Ms. Dagmar Sucharovova, Deputy Director of Strategy and Planning Department

Ms. Vlasta Mikulová, Director of Waste Department

The State Environmental Fund

Mr. Jaroslav Kubin, Department of technologies, wastes and alternative resources

Wednesday 16 May 2001

MORA Moravia

Mr. Vojtech Vlcek, General Director

Mr. Veroslav Mach, Director of Quality Control Department

Ms. Renata Medvedova, Head of the Environment Department

MORA Aerospace

Mr. Martin Steindler, General Director

Thursday 17 May 2001

DEKONT

Mr. Ivo Spacek, External Consultant of DEKONT (employee of FATRA Napajedla)

Mr. Jan Lindtner, Director of Quality Control Department

Municipal Authority of Zlin

Ms. Vladimira Marconova, Head, Department of Environment and Agriculture

Technical Services of Zlin

Mr. Frantisek Kostelnik, General Director

Mr. Ladislav Vasina, Environmentalist

Water Supply and Sewage Company

Ms. Katerina Ondrusova, EMS manager

Friday 18 May 2001

Mendel's Agriculture and Forest University, Brno
Mr. Jiri Filip, Department of Nature Conservation

6.2 Visits in Companies

6.2.1 MORA Moravia and MORA Aerospace

Employees from MORA Moravia attended the Cleaner Production Training in 1996. During the pilot project 11 options were identified in total and 4 of them were implemented. In 1997 and 1998 MORA contracted CCPC for technical support to continue with Cleaner Production. In the course of this contract 25 options were identified in total and 15 of them were implemented. However, from this number 11 can be classified as clearly CP options.

Out of the 15 options implemented so far, 11 options were non-investment and 4 options were investment options with total investment of USD 174,000. Total annual savings are calculated at USD 44,500. Simple pay-back period is 3.9 years, discounted (10%) pay-back period is 5.3 years. The annual environmental benefits are as follows:

reduction in electricity consumption	10686 kWh
reduced air pollution - solid particles	4799 t
organic substances	3579 t
SO ₂	6772 t
reduction of hazard waste	25 t
reduction of other solid waste	90 t
reduced discharge of waste water	607 m ³
reduction of material inputs	770 t
reduced consumption of water	1994 m ³

Both companies MORA Moravia and MORA Aerospace appreciated the positive climate towards CP activities they could establish in the company thanks to the project.

The company was certified according to ISO 9000. Now, the company introduces environmental management system in accordance with ISO 14001. The company continues with implementation of some of the remaining options. Two options are planned for implementation in 2001.

6.2.2 Technical Services Zlin

A success story was the CP component in an EMS project for this company. The company participated in the Ecoprofit project undertaken on initiative of the municipality in 1997. At the beginning there was a lot of resistance at operational level. Things went on smoothly when a new head was installed, who saw the benefit of the project for his working in that job. To show the benefits of that approach and convince also the others the swimming pool was selected as a case study. Only at beginning CCPC with the consultants of DEKONT launched the project, hereafter the staff continued independently, advised by staff of the CCPC. The project could be finalised successfully in 1999 with installation of the following measures:

- substitution of chlorine against O₃ including improved control of the chemical dosage - this brought also a distinct rise in the bathing quality;
- low energy bulbs;
- reuse of water for showers saving the heat content – heat supply from a co-generation plant at the moment, use of landfill gas was under investigation;

Although a clear improvement of the measures can be expected no definite confirmation was possible as the responsibility of the operation was taken over in the meantime by another institution, from which no information could be requested.

Table CEH-4: Options identified in Mora

Type of option	Implemented CP options	
	Number	%
1. Good housekeeping	3	20
2. Input material change	2	13
3. Better process control	1	7
4. On-site recovery & reuse of waste (recycling)	0	0
5. Equipment/hardware/modification/replacement	3	20
6. Change of process technology	5	33
7. Producing of useful by-product	1	7
8. Product modification	0	0
Total:	15	100

Option description	Type of option
1996	
Elimination chemicals in regeneration of degreasing bath No 4	2
Elimination of pickling bath No 13	6
Improving of sorting of dangerous waste (gauntlets)	1
Covering of bath used for water warming	5
1997 – 1998	
Automatic regulation of temperature in lead coating furnace	3
Pickling of primary heat changers by using of equipment for pickling bath regeneration (implemented partly)	6
Using of water based paint in rettery of casts	2
Substitution of oil based degreaser by alkaline degreaser	6
Rationalization of lubrication of plates by using of sprayers	5
Substitution of lubricants	6
Implementation of closed cooling system	1
Elimination of water leakage from sanitary facility	1
Improving of sorting of waste paper as by-product	7
Substitution of classical heating by emitters	5
Substitution of alkaline degreaser by ESSO CLEAN	6

6.2.3 Water supply and operation service Zlin

The water operation company is owned by the municipalities of the regions. It concentrates on service of water supply, sewage and waste water treatment for the public. The project to introduce EMS was mainly advised by CCPC together with DEKONT, STENUM was involved only at the beginning. Although application of CP is very difficult in that field significant improvements could be arrived at:

- water pretreatment – substitution of chlorine with chlorine-dioxide
- partial replacement of fibre cement against cast iron pipes for water supply to avoid leakage in case of damage
- water buffer basins to avoid hydraulic overload of the treatment plant in case of heavy showers
- enhanced maintenance to prevent emergency cases through plugging

Moreover the company strives for a reduction of laying expenditures for new pipes and for repair of old ones and imposes on the discharger to reduce the waste water amounts.

6.2.4 Municipality Office Zlin

This visit could well exemplify cooperation of CCPC with a municipality and its evolution. Municipality office of Zlin was involved in CP programmes from the very beginning. When training courses in CP conducted under the Norwegian-funded programme were hosted by the University of Zlin (1992-94),

the Municipality assisted organizers in identifying potentially suitable companies, in contacting them and marketing the programme. Similarly when the Centre was established and started operations, the Municipality cooperated with the Centre and the DEKONT consulting company in conducting CP programmes in the region by selecting and inviting suitable companies to participate in the programme and supporting each programme financially (approx USD 9000 for each programme). In the course of time the three programmes carried out in the region evolved from purely CP programmes to programmes combining CP with EMS. Involvement of the Municipality Office also was changing, from selecting and contacting industrial companies for the first programme to selecting service companies owned fully or partly by the municipality for the second programme and, finally, to direct participation of the Municipality Office in the third programme, with the objective of achieving EMAS certification for the office (still in progress). The role of the office was very significant in raising interest of companies in the projects. At the same time a lesson was learned that implementation of the programme by a company and its results depended on acceptance of the CP concept by the management of the company. Programmes carried out by convinced and dedicated management achieved better results.