Unclassified **CCNM/ENV/EAP(99)25**

Organisation de Coopération et de Développement Economiques
Organisation for Economic Co-operation and Development

OLIS : 01-Jul-1999
Dist. : 05-Jul-1999

Or. Eng.

CENTRE FOR CO-OPERATION WITH NON-MEMBERS
ENVIRONMENT DIRECTORATE

CCNM/ENV/EAP(99)25
Unclassified

Task Force for the Implementation of the Environmental Action Programmes for Central and Eastern Europe (EAP)

CLEANER PRODUCTION CENTRES IN CENTRAL AND EASTERN EUROPE AND THE NEW INDEPENDENT STATES

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FOREWORD

This work is undertaken in the context of the Environmental Action Programme (EAP) Task Force. This Task Force was established by the Environment Ministers at the first "Environment for Europe" Ministerial Conference at Lucerne, Switzerland, in 1993 to facilitate implementation of the Environmental Action Programme for Central and Eastern Europe. OECD's Environment Directorate serves as a Secretariat for the EAP Task Force through its Centre for Co-operation with Non-Members.

To help mobilise additional efforts in promoting better environmental management in enterprises in CEEC/NIS, a Policy Statement on Environmental Management in Enterprises in CEEC/NIS was submitted by the EAP Task Force and adopted at the Aarhus "Environment for Europe" Ministerial Conference in 1998. It includes a commitment by the Environment Ministers to catalyse, facilitate and strongly support effective environmental management in enterprises, and invites all stakeholders to join efforts. The Policy Statement underlines the importance of appropriate institutional arrangements, as well as strengthening environmental policy instruments and financial mechanisms in implementing effective environmental management in enterprises.

Cleaner Production Centres[1] (CP Centres) in Central and Eastern European countries[2] (CEEC) and the New Independent States[3] (NIS) provide a mechanism for promoting more effective environmental management in enterprises. Typically they are non-profit organisations which focus on promoting CP in the country via a wide range of activities including training, conducting demonstration projects, disseminating information, and providing policy advice to governments.

This paper examines the Centres' roles and objectives, the services they provide, their financial and institutional situations, and relations with other Centres and stakeholders. The paper aims to disseminate information about CP Centres' operations to potential partners, and to facilitate discussions on the main principles that could make CP Centres most effective in promoting wide-scale CP application in CEEC/NIS.

The future of the CP Centres is discussed in the context of their contribution to promoting a continuous process of improving the environmental performance of enterprises in CEEC/NIS. The paper examines which organisational structures and practices are most effective in supporting sustainable CP programmes, including ways in which government and/or donor support could be best applied. It also discusses conditions necessary for the overall advancement of CP in CEEC/NIS and draws lessons from the experience of existing Centres that can be used in establishing new ones in the region and elsewhere.

This document has been prepared by the EAP Task Force Secretariat on the basis of information provided by CP Centres and other sources such as the World Environment Center (WEC), UNIDO, UNEP Industry and Environment, and World Cleaner Production Society (WCPS). It also relies on materials from a number of seminars and conferences, including two workshops organised for CP Centres in CEEC/NIS within the framework of the EAP Task Force work programme: first meeting of a Network of Cleaner Production Centres in CEEC/NIS was organised in 1997 in Kaunas, Lithuania; second meeting of the Network was organised in 1998 in Prague, Czech Republic, with support from the UK Know-How Fund, to discuss the development of business plans for CP Centres.

[1] All centres (cleaner production, pollution prevention, etc.) analysed in this paper are called Cleaner Production Centres as their objectives and types of activities are very similar.

[2] Albania, Bosnia-Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, FYR of Macedonia, Poland, Romania, Slovakia, Slovenia, Yugoslavia.

[3] Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, The Kyrgyz Republic, Moldova, Russian Federation, Ukraine, Uzbekistan.

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EXECUTIVE SUMMARY

The paper examines the organisation and activities of Cleaner Production (CP) Centres in Central and Eastern European Countries (CEEC) and the New Independent States (NIS), including the services they provide and their relations with stakeholders. It reviews the establishment of existing Centres and discusses possibilities for their future development. The paper aims to further support the work of CP Centres by disseminating information about their operations, and to facilitate discussions among potential partners concerning the guiding principles for the work of CP Centres.

Cleaner Production Centres generally are non-governmental, non-profit and independent entities having the legal status of foundation. They aim to promote CP by serving as a resource for methodological and technical knowledge for industry and incorporation of CP into the national environmental policies. CP is a focused approach to manufacturing processes, designed to maximise the efficient use of raw materials, energy and water, and to minimise the output of waste and harmful substances.

The Centres are typically small units which employ up to 10 persons. The majority of the CP Centres are located at universities as independent units within the university's structure; a few of the Centres operate in conjunction with industrial associations; and some Centres have gradually become entirely independent organisations. Initially, CP Centres were supported by external assistance programmes, but all programmes aim for Centres to eventually become sustainable, and therefore donor assistance is being reduced over time. Virtually all CP Centres in CEEC/NIS have been established by one of the following programmes:

- *World Environment Center's (WEC) Waste Minimisation Programme.* There are eleven Centres established by the WEC in CEE countries: Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland (3 Centres), Romania, and Slovakia.
- *Cleaner Production Programmes funded by the Norwegian Government* and carried out by the World Cleaner Production Society. CP Centres have been established in Poland, Czech Republic, Slovakia and the Russian Federation. The Czech CPC and Slovak CPC gradually broadened their operations under the support of UNIDO/UNEP NCPC Programme.
- *UNIDO/UNEP National Cleaner Production Centre (NCPC) Programme*. The Programme provides grants to the Centres in the Czech Republic, Slovakia, and Hungary. The establishment of National CP Centres in Slovenia, and Croatia is under way.

To achieve wide-scale demand-driven application of CP, especially after donor support ends, several enabling factors must be in place. In addition to local capacity, an adequate policy framework is needed to create demand for CP. This includes an economic environment which provides incentives for enterprises to use energy and raw materials efficiently. Equally, environmental policies should encourage implementation of low/no cost pollution reduction measures. In order to make larger investments, enterprises must have access to financing, to affordable credit, as well as the capacity for project preparation.

When the framework conditions are in place, CP Centres can provide a variety of services to help overcome barriers to CP implementation within enterprises: training, demonstration projects and information dissemination, all of which are essential elements of awareness raising and capacity building. In addition, some CP Centres provide technical assistance to enterprises, support a policy dialogue on improving CP incentives, facilitate the financing of CP investments, and support the development of environmental management systems that incorporate CP within enterprises.

One of the most important activities is training. While university training of future specialists is the most effective way to build capacity in the medium and long term, CP centres can complement these efforts by providing post-education training. Centres could enhance their programmes by assisting enterprises in developing business plans for CP investment projects and in entering into a dialogue with financing sources: banks, environmental funds, etc. To play this role, CP Centres should develop/strengthen their own capacity in this area. CP Centres can help to promote the policy framework required to stimulate CP. One way would be to initiate the establishment of a working group in the country to facilitate CP implementation. Such a group could consist of Ministries, CP Centres and other stakeholders. Involvement of local authorities in promoting CP is also important.

While some of the services provided by CP Centres are commercially viable once enterprises are willing and able to pay for them, (e.g. audits), others (e.g. education and information dissemination) are public services which require donor or government financial support. If Centres are required to rely exclusively on selling services commercially, important aspects of promoting CP in a country would be discontinued. When donors establish CP Centres it is important to secure the host government's commitment to support the Centre once the co-operation programme has ended and to build the local capacity which will be required to run the Centre independently of donor programmes.

The contribution of CP Centres to the achievement of wide-scale CP application depends on many different aspects related to the Centres' organisation, range of activities and relations with other stakeholders. Based on the experience of existing CP Centres in CEEC/NIS, the effectiveness of CP Centres is strongly influenced by several factors: the selection of the host institution and staff; the effectiveness of counterpart institutional arrangements; the relationship with the government and other stakeholders; the role of the advisory board; and the development of performance indicators. CP Centres also benefit from developing realistic business plans with clear and measurable targets.

1. BACKGROUND AND INTRODUCTION

1.1 What is Cleaner Production?

Cleaner production (CP) is the term used in this paper. Other terms such as pollution prevention, waste minimisation, and cleaner technologies could be also used in the same context; all of them share a common emphasis on pollution and waste reduction or elimination at the source where it is generated.

Cleaner production is a focused approach to manufacturing processes designed to maximise the efficient use of raw materials, energy and water, and minimise the output of waste and harmful substances. CP is applied to production processes and products, using methodology which includes the following basic steps: planning, analysis of pollution causes, development of CP options, feasibility study, implementation of feasible measures and measuring of results.

CP should not be considered only as an environmental strategy, because it also relates to economic considerations. In this context, waste is considered as a "product" with negative economic value. Each action to reduce consumption of raw materials and energy, and prevent or reduce generation of waste, increases productivity and brings financial benefits to enterprises.

1.2 Promotion of Cleaner Production in CEEC/NIS

There are several different actors that can play a role in promoting and implementing CP among enterprises. They are mentioned briefly here, and discussed further later in the report.

- government – to create a policy environment that encourages enterprises to minimise resource use and maximise profits. Such an incentive structure will motivate enterprises to take advantage of CP opportunities, because they will want to realise the cost savings and/or productivity increases that accompany CP.
- industry groups or informal networks – to promote the concept of CP among enterprises of a particular industrial sector.
- non-profit or non-government organisations, including CP Centres and universities – to provide education, training, demonstration projects, and information dissemination services for enterprises.
- private consulting companies – to sell CP technical advisory services and equipment to enterprises.
- financial institutions/mechanisms – to provide financing necessary for enterprises to make CP investments.

In CEEC/NIS, these groups often lack the awareness, knowledge, and resources to be fully effective in promoting and implementing CP; the often low priority assigned to CP is both cause and effect. Experience to date suggests that enterprises, particularly in CEEC/NIS have been passive regarding the introduction of preventive approaches. Generally, industry and other stakeholders are not familiar with preventive strategies, environmental management and the potential benefits they could bring. It is here that the CP Centres can act as a catalyst for sparking interest in CP and providing services to allow for its implementation.

1.3 EAP Task Force Support for Cleaner Production

In keeping with recommendations of the Environmental Action Programme for Central and Eastern Europe, the EAP Task Force adopted CP as one of its main priorities in the period 1993-98. In 1993, the potential opportunities and benefits seemed particularly large in CEEC/NIS, where the pollution and resource intensities of the economies were high.

After the Sofia "Environment for Europe" Ministerial Conference in October 1995, the EAP Task Force established the objective of achieving "basic capacity level" (BCL) in cleaner production (Box 1) in all CEEC/NIS by 1998.

Box 1. Basic Capacity Level for CP (BCL)

Basic Capacity Level is the level thought to be needed for further dissemination of the CP concept and principles throughout industry and society by the host country. Specifically, it involves creating:

- an active core of CP advisors and trainers,
- a set of CP case studies, demonstration projects and model business plans,
- a functioning CP Centre or Centres,
- training materials in the local language, and
- cleaner production principles included in university course curriculum, such as business administration, engineering and economics.

The progress in achieving these objectives was later reviewed by the EAP Task Force Secretariat at the OECD. By late 1997, CEEC/NIS could be divided into four groups in relation to the goal of achieving the BCL:

- *Countries that have achieved BCL:* Poland, Czech Republic, Slovakia, Hungary, Lithuania, Estonia, and the Russian Federation;
- *Countries on the way to achieving BCL:* Romania, Bulgaria, Ukraine, Latvia, and Slovenia;
- *Countries with some CP activities*: Croatia, Georgia, Uzbekistan, and Kazakhstan;
- *Countries which have yet to establish CP programmes:* Albania, Armenia, Azerbaijan, Belarus, Bosnia-Herzegovina, FYR of Macedonia, Moldova, and The Kyrgyz Republic.

Overall, progress has fallen short of the established BCL target. Seven countries have achieved BCL and several others are moving in that direction. In most of the NIS, CP programmes are just now being, or have yet to be, established. The assessment carried out by OECD showed that even in those countries where BCL has been achieved, the demand for CP is still not highly developed.

Donor support for CP services has been crucial in all countries where BCL has been achieved. The U.S., Norway, Denmark, the Netherlands, Austria, and Sweden have supported CP activities on a bilateral/multilateral basis. All programmes pursue similar goals but with different approaches. Experience from countries where different donors/organisations were active shows the complementarity of these approaches for introducing preventive environmental practices into the industrial sector.

However, despite the apparent high benefit/cost ratio, relatively few donors have supported CP programmes. Additionally, in the case of official development assistance/funding, governments have all too often favoured end-of-pipe approaches rather than cleaner technologies. Generally, CP has not been structured into donor programmes to the extent that the benefit/cost ratio of CP activities would suggest should be the case.

To focus attention on these needs and to help mobilise additional efforts, a Policy Statement on Environmental Management in Enterprises in CEEC/NIS was submitted by the EAP Task Force and adopted at the Aarhus "Environment for Europe" Ministerial Conference in 1998. It includes a commitment by the Environment Ministers to catalyse, facilitate and strongly support effective environmental management in enterprises, and invites all stakeholders to join efforts. The Policy Statement is supported by a set of recommendations which identify actions that different CP stakeholders can take to promote wide-scale CP implementation in CEEC/NIS. The progress in implementing the Policy Statement will be assessed by the EAP Task Force prior to the next "Environment for Europe" Ministerial Conference in 2002, Kiev, Ukraine.

The Policy Statement underlines the importance of appropriate institutional arrangements, as well as several other factors, in implementing effective environmental management in enterprises. CP Centres can play an important role in achieving CP sustainability, provided that they are designed to achieve specific and realistic objectives, and that they are well managed with adequate resources.

1.4 Evolution of CP Centres in Transition Economies

Most of the CP Centres in CEEC/NIS are non-governmental, non-profit and independent structures having the legal status of a foundation. Six CP Centres are located at universities (Annex 1) as independent units within the university's structure: Hungarian PPC, Hungarian CPC, Kaunas PPC (Lithuania), Lodz PPC (Poland), Silesian PPC (Poland), and Slovak CPC.

Some CP Centres operate in conjunction with industrial associations, e.g. Bulgarian Clean Industry Center is a separate unit of the Bulgarian Industrial Association. The Polish Cleaner Production Centre NIF-NOT works in the framework of the Polish Federation of Engineers. One Centre in Poland is established at a consulting company (Atmoterm Ltd). The Russian-Norwegian CP Centre is established at the International Centre of Social and Labor Problems. Some of the Centres gradually have become entirely independent organisations, i.e. the Czech CP Centre, Latvian PPC and Romanian PPC.

Generally, CP Centres are small units which regularly employ from 1 to 10 persons. The actual number of persons involved is often higher as several consultants work part-time on a project basis. However, some CP Centres have no full time staff at all. For example, all staff at the PPC at Silesian University of Technology (6 persons), Lodz PPC in Poland (5 persons), Polish Cleaner Production Centre NIF-NOT (5 persons), and Hungarian PPC (4 persons) work on a part-time basis.

The annual budgets of CP Centres vary from USD 30 000 to USD 160 000. While most CP Centres receive financial support from one individual donor, some have broader relations with donors, e.g. Kaunas PPC has close relations with several donors and with other CP programmes which were or are being implemented in Lithuania (Danish, Norwegian, USAID, EU LIFE). The Slovak CP Centre has ties with the Norwegian programme and the US Environmental Protection Agency, and access to the Dutch CP Programmes. WEC Pollution Prevention Center in the Czech Republic also co-ordinates various activities with the Norwegian Programme. These arrangements are increasing as the primary donors who established the Centres and funded them for several years are phasing out their support, aiming for the Centres to eventually become financially and operationally self-sustaining.

As market economies develop in CEEC/NIS, it is anticipated that many of the services currently provided at no charge by CP Centres can be provided on a commercial basis, and that CP Centres can be at least partially self-financing by selling some of their services to enterprises. This is already taking place in some CEEC (as discussed later in this report), but the domestic economic situation as well as environmental and economic policy frameworks must be right. Also, a number of CP Centres have managed to secure funding from new sources, including domestic ones.

2. ESTABLISHMENT OF CLEANER PRODUCTION CENTRES IN CEEC/NIS

The majority of CP Centres in CEEC/NIS were established through one of three different programs which are described below:

World Environment Center's Waste Minimisation Programme (Box 2). There are eleven Centres established by the WEC in CEEC: Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland (3 Centres), Romania, and Slovakia.

CP Centres established by the WEC initially were financed by external grants from the US Agency for International Development (USAID). The USAID grants were available to most of these Centres until September 1997, except for EMI-ECO, Estonia and the Czech PPC which have been financed from other sources starting in September 1996. Until recently only six of the Centres were still partly supported by the WEC: Slovak PPC and Romanian PPC (grant to WEC from Swiss Government); Kaunas PPC, Lodz PPC, Silesian PPC and PPC at Atmoterm Ltd. (grant to WEC from USAID). WEC terminated its activities in Lithuania and Poland in December 1998, in Romania and Slovakia, in March 1999. As a result, the Slovak PPC merged with the Slovak CP Centre in April 1999.

The remaining WEC-established CP Centres are financed form other sources. The Bulgarian Clean Industry Center is financed by the Bulgarian Industrial Association and by commercial services. The PPC at the Czech Environmental Management Centre is financed from contracts with industrial enterprises and the Czech Government. EMI-ECO, Estonia in 1997 has been financially supported by the Ministry of Environment of Finland, with a small part of its costs covered by companies participating in the Centre's programmes. The Latvian PPC is mainly financed from participation in international CP projects.

Box 2. World Environment Centre's (WEC) Waste Minimisation Programme.

The WEC is an independent, non-profit, non-advocacy environmental organisation which aims to promote sustainable development world-wide. Under WEC's programme, the concept of cleaner production is first demonstrated via pilot projects in a country and subsequently introduced to a broader number of industries. Training is provided to waste minimisation teams formed by an enterprise, and WEC then provides the majority of funding and expert technical assistance for implementation of the projects. Other elements of the programme include establishment of CP Centres and dissemination of the programme results to other facilities and industries. The WEC team includes a consultant, several industrial experts, and a WEC project manager. The team visits the enterprise five times during a one-year co-operative programme. Each visit is of one to two weeks duration. WEC programmes have been established in twelve CEEC/NIS. WEC carried out a few demonstration projects in Kazakhstan and Uzbekistan. WEC's activities are financially supported by USAID and the Swiss Government.

World Cleaner Production Society Programmes in CEEC/NIS funded by the Norwegian Government (Box 3). CP Centres have been established in Poland, Czech Republic, Slovakia and the Russian Federation. The Czech CPC and Slovak CPC broadened their operations under the support of the UNIDO/UNEP National Cleaner Production Centres (NCPC) Programme. In Lithuania, Norwegian Programme was carried out through Kaunas Pollution Prevention Center established by the World Environment Centre.

CP Centres established with financial support from the Norwegian Government initially financed their operations by external grants and partly from domestic sources. For example, the Polish CP Centre NIF-NOT and the Russian-Norwegian CP Centre have been partly financed from domestic environmental funds. Only the Russian-Norwegian CPC is still substantially supported by the Norwegian Government. The Polish CP Centre NIF-NOT is now fully financed from domestic sources, i.e. Polish National Fund of Environmental Protection and Water Management, and industry. The Czech Cleaner Production Centre,

which at the beginning was financed by the Norwegian Government, now is financed by: a UNIDO/UNEP grant; domestic and international projects (e.g. with the Czech Ministry of Environment, US EPA, PHARE); recovery of costs from benefiting enterprises (partly based on percentage of cost savings realised by the enterprise); and by contributions from municipalities. A similar financing situation exists for the Slovak CP Centre.

Box 3. World Cleaner Production Society Programmes.

The Norwegian Government finances the transfer of know-how through programmes in CP strategies and assessment in several CEEC/NIS through the World Cleaner Production Society[4]. The programmes aim to implement economically profitable and environmentally favourable restructuring of industrial processes. CP assessments are conducted in 100-500 production companies (demonstration companies) in each country concerned, over a period of 1-6 years. In addition, 200 to 800 qualified CP advisors are trained in each country. Specific educational goals of the programme are: (i) educate a minimum of 35-60 authorised local instructors in the first 1-2 programme cycles (English language); (ii) further educate in local language 200-750 authorised advisors during the following 2-5 years with training conducted by previously authorised local advisors. The programmes combine classroom study, group work, in-company project work, and in-company advice. Programmes have been established in the Czech Republic, Poland, Slovakia, Lithuania, and the Russian Federation.

UNIDO/UNEP National Cleaner Production Centre (NCPC) Programme (Box 4). The Programme provides grants to the Centres in the Czech Republic, Slovakia, and Hungary. The establishment of a National CP Centre in Croatia is under way, under the guidance of the Czech CP Centre in the framework of assistance provided by the Czech Republic. The Czech CPC has also implemented for UNIDO CP demonstration programmes in Uzbekistan.

Box 4. UNIDO/UNEP National Cleaner Production Centre (NCPC) Programme.

The NCPC Programme is a joint programme of the United Nations Industrial Development Organisation (UNIDO) and the United Nations Environment Programme (UNEP). UNIDO is responsible for overall administration, local liaison, and provision of industrial expertise, especially for sectoral industrial demonstrations. UNEP is responsible for providing strategic environmental expertise in training, information, and policy analysis. The objective of the Programme is to establish National Cleaner Production Centres which undertake six activities: awareness raising, training, in-plant assessments, information dissemination, investment promotion and policy advice. In CEEC, this programme provides grants to three CP Centres - in the Czech Republic, Slovakia and Hungary. UNIDO is also active in some other CEEC/NIS. The main current financial sponsors of the NCPC Programme are Austria and Switzerland.

A few other Centres have been established under local initiatives, for example two CP Centres in Poland: CP Centre SIMP at the Association of Polish Engineers and Technicians, and the Centre for Implementation of CP at the Central Mining Institute. The latter provides training using the Norwegian model while the CP Centre SIMP focuses on organising conferences and seminars on CP.

A few other Centres established in the region under local initiatives claim to be CP Centres. Generally, the activities of these Centres differ from those carried out by other CP Centres discussed in this paper. For example, Pridneprovie's Scientific-Educational and Informative Centre for CP (Ukraine) is a more science-

[4] NGO with the following member organisations: National Institute of Technology, Det Norske Veritas, Oestfold Research Foundation, the Norwegian Society of Chartered Engineers, the Norwegian Confederation of Business and Trade, InterConsult Group ASA and a few individual members.

oriented organisation, its main focus being on technological development; and the Moscow Centre for Cleaner Production (Russian Federation) mainly focuses on technology transfer. The CP Centre in Pavlodar (Kazakhstan), established in 1998, plans to carry out a broad range of activities in the environmental field. However, since the Centre has been established recently it is too early to draw any conclusions about its work on CP.

Centre Management and Counterpart Institute Arrangements

The CP Centres have different management structures, depending on how they were established. Each UNIDO/UNEP National CP Centre has an advisory board which consists of the key CP stakeholders in the country. A typical setup is: three representatives from education and research institutions, three from ministries, three from the enterprise sector (e.g. chamber of industry), a representative from the donor, and the NCPC director. Sometimes individual companies are represented. The advisory board guides the NCPC's activities and supports it when necessary.

Most CP Centres established by WEC do not have advisory boards. In some cases, the guiding function is carried out by the steering committee (or corresponding body) of the host institution, for example, the Bulgarian Clean Industry Center. The Russian-Norwegian CP Centre has a co-ordinating committee which consists of the Centre's founders, top managers of the Centre and representatives of the State Committee for Environmental Protection of the Russian Federation. The board at the Polish Cleaner Production Centre NIF-NOT, which consists of representatives from companies, universities, and the Federation of Engineering Societies, plays an active role.

Some Centres also have formal relationships with outside institutions that help guide their operations. Under the UNIDO/UNEP NCPC Programme, there is a counterpart institution arrangement, under which a long-term agreement is made between UNIDO and an institute in a developed country for continuous support to a particular new Centre. This includes sharing expertise in the field of CP and assisting the Centre in implementing all CP activities. For example, the counterpart institution for the Czech CPC and Slovak CPC is STENUM Graz, Austria. Similarly, CP Centres participating in the Norwegian CP Capacity Building Programme are supported by the Norwegian Society of Chartered Engineers (NIF). The Centres established by WEC are supported by the WEC or, if needed, its contracted experts.

3. SERVICES PROVIDED BY CP CENTRES

Services carried out by the Centres can be grouped into the following categories:

- training,
- demonstration projects,
- information dissemination,
- technical assistance for enterprises,
- policy dialogue on improving incentives for CP,
- facilitating the financing of CP investments,
- environmental management system development support, and
- other activities.

The scope of each service is discussed below, along with various examples of how the service is provided by various CP Centres in CEEC/NIS. Recommendations are also provided on how these services may be expanded or enhanced in the future.

3.1 Training

The training needs of different stakeholders can be characterised in the following way:

- general training or awareness raising in order to receive a basic understanding of the CP concept and the benefits and limitations inherent in it,
- specific training in order to manage certain tasks, such as policy analysis and surveillance, and
- participation in demonstration projects, which provide direct experience with the basic issues concerning practical implementation in industry.

CP training can be offered in two ways: (i) as an integral part of the formal education system in universities, or (ii) as continuing education courses. The former has a long-term perspective and may serve the training needs of future specialists, while the latter has a short-term perspective and has proven to be the most efficient way of training people currently working in industry. These two training approaches complement each other and both of them are necessary to build national capacity in CP.

Post-Education Training of Company Personnel and Consultants

Post-education training programmes carried out by CP Centres could be described under two main headings: long-term training; and short-term training.

Most of the Centres have *long-term* CP training programmes, which include on-site training and aim to create a pool of active consultants and trainers,as well as to build capacity in enterprises, so that they can continue to apply CP practices on their own. These programs are oriented towards providing theoretical knowledge and on-the-job training in industry.

Norwegian CP Programme is a comprehensive, industry-oriented programme based on a “train-the-trainer” approach. At the outset training is carried out by Norwegian experts, but progressively local experts trained in the programme continue to provide the training activities. This approach proved to be effective in creating an active core of CP advisors. For example, in the Czech Republic, the Association of Managers for Cleaner Production (AMCP) constitutes a core group of active experts on CP; the AMCP was established in 1993 by the graduates of the first long-term training programme under the Czech-Norwegian CP Project. In Poland, the programme is being continued by the Polish Cleaner Production Centre NIF-NOT which co-ordinates the work of the Polish Network for Environmental Management and the Polish Network of CP experts. This model is being used by all CP Centres established with the support of the Norwegian Government and by UNIDO/UNEP CP Centres. In Lithuania, the Norwegian training programme is being carried out through the Kaunas PPC.

The Centres established by the WEC carried out a number of demonstration projects which also included on-site training and active participation in a CP assessment of a facility. Between 1995-1996, 32 experts were trained in Lithuania within the “Waste Minimisation Opportunity Audits in Lithuanian Furniture Industry” project. Sixteen local consultants were trained in the WEC “Waste Minimisation Program for Latvian Industries” project. A similar number of experts were trained in WEC programmes in other CEEC, except for Poland where approximately 200 experts have been trained. The training within this programme is less comprehensive than the Norwegian training. To obtain additional experience, some CP Centres established by WEC trained their staff in the Norwegian CP Programme. For example, employees of the Lodz PPC (Poland) participated in the Norwegian - Polish CP Programme.

A long-term training programme emphasising on-the-job training is the most effective way to create domestic professional capacities. A train-the trainer approach is considered the most cost and time efficient way of fulfilling this need.

Short-term training programmes, which are up to five days in length, aim to familiarise participants with CP concepts by providing a general understanding of CP principles. For example, the Romanian PPC carried out a number of two-day workshops. These programmes are targeted mainly at government officials, business managers, etc. Some business managers who have been briefed on CP principles have later initiated CP pilot projects in their companies. In most CEEC/NIS there is a significant number of officials and experts trained in such programmes.

The quality of the training is very important, because badly trained experts harm credibility of the CP Centres as well as the CP approach in general. To make CP company training programmes effective they should be carried out in such a way that the knowledge acquired remains active in the companies, and CP application continues after the funded programmes expire. For this reason company training programmes require that training elements be tailored to company-specific issues. Using standard courses will not yield optimal results. Effectiveness of the training programmes could be increased by assessing beforehand the needs and expectations of the participants so that the training programme could be adjusted to these needs. Generally, real life experiences have a high motivational value and are a powerful influence in changing attitudes.

Education of company personnel often does not sufficiently include the top management. This issue could be addressed by organising workshops with the participation of western managers who share their CP experience. Managers are more likely to be convinced by other managers than by people outside the enterprise sector. Participation of both western and eastern managers also could help to facilitate future twining arrangements between enterprises. Alternatively, a short session for senior managers could be organised with a focus on the basics of CP and its benefits as well as obstacles, so that managers would gain a better understanding of the concept to facilitate more effectively further work of the enterprise team. In discussions with senior managers, it is crucial to make the “business” case for CP, that is, how it can enhance productivity, competitiveness, and financial performance.

CP Centres could also provide training programmes for staff in government authorities. Ministerial staffs (from environmental protection and economics) could be involved in special seminars regarding (i) the role of CP and waste minimisation technologies in optimising environmental protection efforts, and (ii) the possibility of developing public policy instruments supporting this approach. This would help to secure the commitment of the government to catalyse and support CP efforts on a national level.

Almost all CP Centres maintain contact with persons after they are trained, and some trained experts later participate in the Centres’ activities. Expert involvement has been very successful in convincing other enterprises and organisations of CP benefits, for example in the Czech Republic and Lithuania. However, contact with other trained experts, who are not available to participate in the Centres’ activities, is usually very limited despite that these experts could help the CP Centre in other ways, for example, in compiling case studies. Additionally, continued contact with trained experts would provide them with additional incentives to continue CP implementation in their companies. One option is for CP Centres to develop mailing lists and periodically provide trained experts with information and new materials.

Training of Future Specialists

If, in the future, CP programmes use universities in the education of specialists, e.g. engineers and economists, the process of gaining acceptance will be easier. It would eventually help to eliminate the need for awareness- raising programmes for specialists from different institutions.

CP could be integrated into university curricula in three ways:

- integration into general environmental course modules,
- integration into non-environmental modules, and
- development of individual Cleaner Production modules.

Many CP Centres have close relations with universities; indeed some are based at universities. Some CP Centres, particularly those established at universities, are involved in providing training courses for students, including both separate courses on CP and courses with a CP component. Examples include:

- The Czech CP Centre supported development of separate CP training modules for students at three universities: Technical Universities in Brno and Ostrava, and University of Economics, Prague.
- Hungarian PPC at Veszprém University is involved in a graduate program for environmental engineers and offers specialised courses on CP.
- Kaunas PPC at the Kaunas University of Technology (Lithuania) offers a separate course on CP for future engineers which was developed with the assistance of the International Institute for Industrial Environmental Economics at Lund University (Sweden).
- The Polish CP Centre NIF-NOT initiated courses on CP in several Technical Universities.

Courses fully or predominantly devoted to CP are generally fairly short (30-40 hours) with a limited number of students each year (10-20). In most cases the courses are not a part of the compulsory curriculum. Most of the people teaching CP at universities seem to be enthusiasts who are prepared to develop and launch courses without any financial support. International co-operation programmes have generally not supported the development of CP education at universities. Much needs to be done in this area in CEEC/NIS, and CP Centres could play an important role in supporting universities to integrate CP into educational programmes for future specialists.

Training courses for students preferably should include on on-the-job training at enterprises, for example, as has been done by the International Institute for Industrial Environmental Economics, Lund University in Kaliningrad and Roslavl (Russian Federation). Such courses would be mutually beneficial for both universities (students would receive hands-on experience in industry) and enterprises (innovative and cheap advice).

In addition to training of future specialists, universities participate in joint projects for industry with some of the Centres. For example, training centres established at some Czech universities (University of Chemistry and Technology Prague, Technical University Brno, Technical University Zlín, University of Mining - Technical University Ostrava) participate in activities of the Czech CP Centre.

Experience shows that CP Centres' alliances with universities improve the Centres' outreach and flexibility. However, some independent CP Centres, or those established in other organisations, underestimate the importance of co-operation with universities. Opportunities provided by such co-operation should be utilised more.

3.2 Demonstration Projects

Demonstration projects aim to demonstrate CP potential, i.e. the economic and environmental benefits of no-cost and low-cost CP measures in industry. The demonstrations are carried out in selected enterprises with the ultimate goal of catalysing interest in CP by participating and especially other enterprises.

CP Centres are closely involved in implementing CP demonstration projects in a broad spectrum of industrial branches. These projects are one of the core elements in most donor programmes. Within the Norwegian CP programme, prior to receiving their certification, trained experts prepare reports which include plans for three types of projects: (i) zero investment; (ii) payback on investment of less than 1 year; and (iii) long-term measures with larger investment requirements to be considered after options (i) and (ii) have been exhausted. The Norwegian CP Programme does not provide financing for investments, and companies have to find resources for implementation of the projects. A similar approach is used in the UNIDO/UNEP NCPC Programme. WEC's CP Programme also focuses on no-cost and low-cost projects[5], but this programme finances 20-100% of the investment needed depending on the investment type.

Some CP Centres are also involved in CP demonstration projects as part of other donor programmes. Examples include:

- The Czech CPC implemented a regional project in Ostrava in 1997 with financial support from the EU PHARE Programme. The project covered seven companies in the region and included training of municipal officials and development of local CP policies.
- The Latvian PPC is involved in implementation of the project "Capacity Building for Cleaner Technology in Latvia" with focus on demonstration projects sponsored by Danish EPA.
- The Kaunas PPC carried out a project "Implementation of CP Projects in Lithuanian Textile Industry" which was financed by the EU LIFE Programme. The project focused on no-cost and low-cost CP opportunities in 8 selected textile companies.
- The Russian-Norwegian CP Centre took part in CP demonstration projects in Nizhny Novgorod financed by the Dutch Ministry of Environment.

Experience from existing CP programmes shows that dissemination of CP from one company to other companies does not come automatically, even though the early economic savings can be remarkable in the first company. It is partly because efforts have been focused on the specifics of the project itself. The logical next step - the spreading to other companies - is not well-developed yet.

To increase the value added, demonstration projects in CEEC/NIS should consist of more than installing a piece of equipment: hardware should be seen as a means, not an end in itself. Demonstration projects should be presented as individual case studies, which include a discussion of the methodology, management approach, and training aspects, so that these concepts can later be applied elsewhere.

Presently, there is a shortage of local CP case studies, particularly good ones, in all CEEC/NIS. Generally, demonstration projects are written up with technical activity descriptions and very rarely do these cover managerial aspects of the projects. CP Centres should help to fill this gap.

Finally, only potentially viable companies should be selected for demonstration projects.

[5] Up to USD 25 000.

3.3 Information Dissemination

To achieve CP sustainability in CEEC/NIS, there is a need to continue training programmes and demonstration projects while also strengthening information output. Information dissemination is one of the core activities to be performed by CP Centres.

CP Centres indicate that they provide information targeted to specific audiences, mainly industry as well as national and local governments. Frequently, emphasis is placed on the dissemination of available case studies, technical and methodological analyses of reduced waste generation and discharge to the environment, as well as cost saving examples.

Virtually all CP Centres have libraries which mostly consist of available reference and guidance documents from western countries. Most of the Centres translate some documents into the local language or develop their own materials. Still, in many cases there is a lack of adequate materials in the local language.

A number of CP Centres publish magazines and newsletters. For example, the Slovak CPC publishes a newsletter in Slovak, and the Kaunas PPC (Lithuania) publishes a quarterly journal in both English and Lithuanian with a focus on cleaner production.

There are attempts by a number of CP Centres to create databases for information dissemination. The PPC at Atmoterm Ltd plans to create an information centre which will provide on-line access to the latest information on CP, including sources in the USA and Oxford (UK), which could be used by the 70 largest industrial plants in southern Poland. Similarly, the Slovak CPC jointly with the Slovak PPC is developing an Information Centre on Cleaner Production and Pollution Prevention on the Internet. A database at the Bulgarian CIC covers different benchmarking indicators related to companies' activities. Some other Centres are also active in this area.

Most of the Centres organise seminars, workshops and conferences focused on information dissemination and exchange. Some CP Centres organise half-day lectures, introducing preventive strategies to a wide audience.

The effectiveness of CP Centres in disseminating information could be reviewed, because in many countries there is still a significant shortage of materials in the local language and industry is generally unaware of CP. To build demand for CP, the Centres should work more actively and effectively on marketing CP. In addition to development and dissemination of case studies, possibilities for information dissemination and marketing include:

- organising seminars and workshops,
- presentations at seminars and workshops organised by others,
- direct contacts with enterprises,
- brochures on CP in general,
- industry-specific CP leaflets,
- general articles in local publications,
- "Idea catalogues" for different industrial sectors,
- benchmarking reports based on surveys of input material use by specific sectors or process types.

More comprehensive publications should be put into a useful format for the recipients and could include:

- procedures for carrying out general CP work: a manual and general training material, and
- technical solutions for a particular branch of industry, for instance, collected in a handbook.

3.4 Technical Assistance for Enterprises

Very often enterprises, especially SMEs, require on-site technical assistance from external parties in increasing efficiency of their operations. Virtually all CP Centres provide pollution prevention and waste minimisation assistance directly to enterprises. These tasks are implemented through environmental audits, identification of wastes and evaluation of different possibilities for its reduction at the source, and assistance in development of environmental management systems in enterprises.

Some of CP Centres, particularly those established by the WEC, have or are creating mobile laboratories which provide on-site measurement services for industry. For example, the Kaunas PPC (Lithuania) can use its laboratory to estimate energy losses in ventilation, air conditioning and heating-cooling systems, to identify heat losses in complicated or dangerous places (boilers, pipe networks, reactors), to detect leaks in steam, compressed air and other industrial systems, etc.

Enterprises are often unaware of the full costs of their waste streams. They normally consider these costs to be equal to treatment costs, and this creates severe obstacles for CP application. Support could be provided for enterprises in developing and implementing a managerial accounting system which quantifies environmental and other relevant costs and provides regular information for the top management on how much is being spent and why.

A helpline (for telephone advice and short on-site visits) could be a useful service (Box 5) provided by CP Centres. However, substantial costs might be involved in establishing a helpline, because additional staff and involvement of internal and external experts might be needed. Nevertheless, CP Centres could investigate the need for and opportunities of establishing a helpline.

Box 5. Environmental helpline of the Environmental Technology Best Practice Programme, UK *(*ETBPP)

Experience of the ETBPP shows that the helpline is extensively used by industry. Many questions, especially about regulations, can be answered by the helpline staff. More specialised questions, such as technical inquiries, are passed on to advisors inside the organisation or to contracted external specialists. Advisors are allowed to spend a defined period of time answering the question free of charge to the inquirer. In addition to access to direct advice over the telephone, small- and medium-sized companies may request a site visit from a helpline counselor, also free of charge. The counselor will advise on particular issues or give a more general assessment of opportunities for waste minimisation. The helpline is financed by the UK Government.

To be effective in encouraging industry to use CP practices and investments, it is important to understand the needs and requirements of industry and the drivers which act as incentives or disincentives to use CP practices and make investments. A CP Centre should be credible to industry in terms of its technical know-how, but also understand the wider needs and requirements of industry, including its commercial and other pressures. It is very important to seek entry-points, e.g. environmental problems, EMS certification, economic gains, image improvement, instead of trying to sell a standard product.

To increase the effectiveness of CP Centres' assistance to enterprises, it is essential to reach key people within companies who are in a position to make changes, to ensure success of the project, and to see that CP investments are considered in line with other investments. Additionally, it is very important to convince top managers that assigning environmental tasks to general managers is often more effective than using special environmental managers.

Additionally, one should consider what could be achieved within different types of enterprises and sectors. Medium-sized companies could initially provide the easiest entry-point for CP. They have financial resources, are not too complex, and offer a reasonable return between input and impact. Moreover,

dynamic firms in competitive markets will respond well to incentives and information. Static firms which are shielded from competition or otherwise not responsive to incentives require a different approach. This category includes enterprises which are state-supported and/or in declining sectors.

CP Centres could develop partnerships with enterprises: a cleaner production "club" arrangement could be a good way of creating a permanent network of customers. For an annual fee, the members of the "club" could have continuous access to a CP Centre's services.

Finally, CP Centres should establish good relations with industrial associations and branch organisations, because these institutions are usually in regular contact with their members through national and regional newsletters, technical bulletins, courses and seminars; these represent good opportunities to diffuse the concept of CP, can encourage participation in programmes, and can highlight the results of demonstration projects as well as organise training courses.

3.5 Policy Dialogue on Improving Incentives for CP

Governments in CEEC/NIS should establish a policy framework which provides appropriate incentives for enterprises to adopt preventive environmental management practices and to increase their efficiency. Some CP Centres assist in this regard by exchanging information between themselves and government ministries. Ideally, such co-operation would go further, and as a first step, a CP Centre could organise a meeting with policy makers in a country to present benefits deriving from CP.

CP Centres could provide governments with policy analysis and advice on the instruments that are most effective for promoting CP initiatives (these instruments are discussed in more detail in Section 4.1). The Centres could also try to identify legislative and other obstacles to CP in their countries and pinpoint issues which require particular action.

One tool for examining governmental performance in establishing a CP policy framework (and for identifying government policy approaches which may act as barriers to CP) is the OECD Guide for Government Self-Assessment. This Guide has already been used by the Czech CP Centre to analyse existing policies in the Czech Republic.

Only a few CP Centres provide policy advice to the governments in their counties. In particular, the Czech Cleaner Production Centre is developing a national CP policy and programme for the Ministry of Environment of the Czech Republic. The Centre submitted a comprehensive policy proposal in November 1996 and continues to follow up this proposal. According to the Czech CPC, this activity is of great significance for stimulating further dissemination and application of CP on a sustainable basis in the Czech Republic. Similarly, the Kaunas PPC (Lithuania) is involved in development of a National Strategy for Cleaner Production. The Slovak CP Centre prepared two reports on CP policies and strategies which were submitted to the Ministry of Economy.

The CP Centres' relations with the Ministries of Industry and Economy (or a corresponding body) in their countries are mainly limited to exchange of information on a relatively general level. Only in a few cases do the relations seem to be more substantial. For example, the Czech CP Centre developed a CP manual under a project financed by the Ministry of Industry. The Polish Cleaner Production Centre (NIF-NOT) has an agreement with the Ministry of Industry and Trade about the implementation of CP projects in industry. In Slovakia, representatives of the Ministry of Economy participate in many activities run by the Slovak CP Centre.

Several Centres have closer relations with the Ministries of Environment (or corresponding) in their countries. In some cases joint projects have been carried out as well as joint workshops and consultations in preparation of environmental legislation.

In some countries, local or regional governments could be more effective, or complement, activities at the national level. Additionally, local authorities represent a force that can exert a number of pressures on companies for continuous efforts for better eco-efficiency. Finally, local programmes/projects coordinated by municipalities could be the most effective way to promote CP on a wide scale, because of their advantage in reaching small- and medium-size enterprises.

However, in only a few countries do CP Centres have close relations with local authorities. For example, the Russian-Norwegian CP Center works in close contact with territorial bodies of the State Committee of Environment of Russia which are in charge of participant selection for CP training programmes. The Czech CP Centre, within regional CP projects in Dicin and Zlin, managed to obtain a commitment from the respective municipalities to support financially the continuation of the projects; in the Ostrava region, the Centre is training municipal officials and supporting them in development of local CP policies. In Lithuania, the Kaunas PPC organised a series of seminars for a number of municipalities.

3.6 Facilitating the Financing of CP Investments

The availability of financing for CP investments is in many instances a necessary condition for implementation of CP and promotion of environmentally sound economic development. Ideally, enterprises should raise the money themselves to finance CP investments, particularly low-cost measures. However, enterprise capacity to do so is constrained in many CEEC/NIS by the high cost of commercial capital and the limited flexibility of domestic financing institutions with regard to the types of projects that they finance and the credit terms. (See Section 4.3 for a more detailed discussion of financing issues.) CP Centres can assist with financing of projects in two ways. First, they can advise environmental financing institutions, such as environmental funds, on how to select and evaluate CP projects. Second, they can work with enterprises that require financing to help them properly prepare a project for submittal to a funding institution, from both a technical and financial perspective.

A few CP Centres have activities focused on the facilitation of CP investments. The Czech CP Centre has been actively working in this area for a few years. This programme component has been supported by a UNIDO Associate Expert and is focused on the development of financing tools for cleaner production activities. The project objective is to provide Czech firms with better access to external financial resources for their CP investments and to give them extra incentives to initiate CP. CP audits would be required to make sure that loans are extended only for the least costly and most beneficial CP options. The Czech CPC has achieved an agreement with the Ministry of Environment and the State Environmental Fund (SEF) on the establishment of a special purpose revolving fund for CP at the SEF. The Centre is involved in project evaluation and provides required technical assistance to companies applying.

The Kaunas PPC in Lithuania and the Russian-Norwegian CP Centre in the Russian federation are envisaged to play an important role in project identification, preparation, appraisal and monitoring within a revolving facility established by the Nordic Environment Finance Corporation (NEFCO) for financing of priority cleaner production investments in these countries. In Lithuania, 10 investment projects have already been financed in 1998.

CP Centres can also help to match the supply and demand of financial resources for CP projects. On the supply side, adequate training could be provided to officials in environmental funds and the banking sector. Financial experts could be invited to CP training programmes organised by CP Centres, or special short training courses could be developed. At a minimum, CP Centres should provide these institutions with focused information on the financial benefits from implemented CP projects. On the demand side, the key issue in financing investments is the development of project preparation capacity, because managers in transition economies frequently require information and training in preparing projects for loan financing.

A survey carried out by the European Bank for Reconstruction and Development (EBRD) showed that the most significant constraint to SMEs in CEEC is inexperience in preparing business plans. Therefore, EBRD is considering a pilot CP investment financing project in co-operation with CP Centres in Poland. The key features of the project would include assistance in the preparation of business plans, assistance in project implementation and production of a replicable model.

CP Centres could play an important role in overcoming barriers and facilitating CP investments, particularly in supporting establishment and operation of revolving facilities and financial intermediaries for international financial institutions. To play such role, it would be crucial for CP Centres to develop/strengthen their own capacity in the identification and preparation of projects appropriate to the needs of financial institutions. Additional external support could be provided to CP Centres or other appropriate institutions to build such capacity.

3.7 Environmental Management System Development Support

An assessment carried out by OECD in 1997 showed that Environmental Management Systems (EMS), and especially EMS standards, have quickly become an issue for companies in CEEC, particularly for large exporters. Generally, the need for companies to obtain certification under EMAS or ISO 14 001 is creating demand for CP services. However, it should be pointed out that enterprises often perceive EMS only as a certificate that has to be obtained for overcoming a new trade barrier rather than a tool to increase their efficiency and improve environmental performance. In such cases, the potential of EMS is not being fully utilised.

EMS and CP integration could help to increase effectiveness of environmental management systems and ensure that EMS leads to continuous improvement in environmental performance. For example, The Polish CP Centre NIF-NOT developed a concept of "CP Environmental Management System". The system consists of the following elements: participation in a CP Programme, development of a CP declaration, development of an action plan, implementation and auditing. Companies successfully implementing these elements receive a CP Certificate and are included in "Polish CP Companies Register". This certificate is considered as a first step towards certification against ISO 14 001.

In some CEEC, projects have been developed to promote the introduction of EMS with an emphasis on CP. The Czech CPC carried out a few demonstration projects in this area. The first project started in 1996 at Znovín Znojmo, a small wine producer, in co-operation with STENUM Graz with financial support from the Austrian Government. The enterprise was certified against ISO 14001 in 1997. Another project was implemented in three service enterprises in Zlin in 1998, and other demonstartion projects are under development in four industrial enterprises. The Slovak CP Centre jointly with STENUM Graz started a pilot project on CP and EMS in February 1998. The main goal of the project is to implement EMS with CP as a major objective following ISO 14001 in four companies.

Some CP Centres deliver training in EMS, e.g. the Slovak CPC, jointly with Det Norske Veritas and with financial support from UNIDO, organised a four-day course to train 20 EMS external auditors in January 1998. The Bulgarian CIC organised a number of two-day training seminars for various industrial branches and individual companies; CIC also provides training for mid-level government employees.

In addition to expertise in CP, most CP Centres are building their capacity in EMS particularly in EMS standards, aiming to have some of their staff trained and certified as auditors on EMS standards. For example, twenty staff members from all the Polish PPCs and Kaunas PPC (Lithuania) are being trained in ISO 14 001 provided by WEC with USAID financial support.

3.8 Other Activities

Some CP Centres are also involved in other miscellaneous activities. For example, the Bulgarian CIC participates on a subcontractual basis in the performace of environmental impact assessments and environmental liability assessments in co-operation with consulting teams. The Centre also plans to set up a data base on water and air discharges, solid waste and polluted soils, and to support the establishment of a National Pollution Release and Transfer Register (PRTR). It will also manage "The Waste Exchange Programme" launched by the Centre as part of the Bulgarian Industrial Association's information network "Industry Net". Environmental Impact Assessment studies are also conducted by the Romanian PPC.

The Czech CP Centre participated in the project "Implication of the Integrated Pollution Prevention and Control (IPPC) Directive and the Best Available Technology (BAT) Concept for the Czech Republic" which was financed by PHARE Programme. Based on an analysis of the current practices in the Czech Republic, and using experience of the EU countries, the Centre contributed to the development of an approximation programme for IPPC and BAT in the country.

The Hungarian CP Centre takes part in the government's project concerning the environmental requirements for Hungarian membership in the EU. The project covers issues such as state of the environment, environmental policy and international trade, environmental regulations, nature conservation, etc. The Centre also plans to work on the communal waste management concept.

CP Centres' efforts to expand the range of their activities could be considered as a positive development as long as it does not jeopardise the core activities such as training, information dissemination and demonstration projects of CP.

4. NECESSARY CONDITIONS FOR ADVANCEMENT OF CP IN CEEC/NIS

Market conditions in CEEC and especially in the NIS, are not always favourable for introducing CP. In a transition to a market economy, many enterprises struggle to survive, facing unpredictable development of markets for their products and experiencing social pressures; employees frequently are not motivated and have no incentives for improvement. Market instabilities cause problems for pursuing projects in industry. The level of production is extremely difficult to predict, which makes it difficult to assess the dimensions of equipment needed, or whether there is any reason to invest in the company at all.

The 1997 EBRD Transition Report made the following observations with regard to enterprise management: "It is crucial to detach enterprises from their dependence on government support and to base their survival on performance in the market place. While many countries have hardened enterprise budget constraints by eliminating budgetary subsidies, this measure has sometimes been compromised by governments' willingness to allow tax and energy tariff arrears or by access to soft loans from banks. Continued government support of enterprises, whatever form it takes, often reflects resistance to the structural change and restructuring that is needed. Moreover, if forcing enterprises to rely on their own performance is to lead to enhanced efficiency, enterprises must operate in a competitive environment."

As countries strive to address these overall economic challenges, the climate for CP will necessarily improve. In addition, work in several areas specifically related to CP will help to promote CP over time. These areas are discussed in the following sections.

4.1 Appropriate Policy Environment

A major obstacle to broad implementation of CP in CEEC/NIS is lack of adequate incentives for industry. As previously discussed, the government has a key role to play in the promotion of CP in CEEC/NIS. Governments should establish an economic and environmental policy framework that provides appropriate incentives for enterprises to be more efficient and minimise negative environmental practices (Box 6). In particular, governments should undertake reforms which promote an internalisation of environmental costs, and/or which promote efficiency through greater competition, for example, removing subsidies on production inputs such as water, energy, and raw materials; ensuring that enterprises are subject to "hard" budgetary constraints; promoting competition; trade liberalisation; etc. Without these policies, enterprises lack the proper incentives to take advantage of no/low cost pollution reduction measures and increased resource efficiency, because the resulting benefit does not have enough value to the enterprise.

Box 6. Elements of a policy framework emphasising CP

The types of instruments which can be used to create demand for cleaner production include (i) legal or regulatory (command and control) instruments, (ii) economic instruments (incentives and deterrents), and (iii) other instruments such as persuasion, consultation, information, training (persuasive instruments). The key points are:

- Environmental standards/norms/limits should promote CP. In this context, permits can play an important role, particularly if they emphasise continuous improvement, rather than formalistic compliance. The situation in most CEEC/NIS is that environmental legislation provides incentives for end-of-pipe techniques rather than process change. Integrated, transparent regulation is needed. Voluntary agreements also could be used to promote CP.
- Economic instruments can play an important role in promoting CP. Measures which subsidise implementation of end-of-pipe measures should be avoided. Also, subsidies which encourage the wasteful use of energy, water and raw materials should be phased out for environmental and economic reasons. In addition, measures to create incentives for enterprises to apply CP should be used, i.e. research and development schemes, soft loans, etc.
- Governments should have a clear policy of raising public awareness in environmental issues and particularly, in preventive environmental strategies. Information on the state of environment and data on pollution from enterprises should be available to the public. Various mechanisms such as Pollution Release and Transfer Registers (PRTR), EMS standards, waste minimisation audits, and environmental reporting could be used as tools to promote CP.

In some CEEC/NIS new policies and regulations are being developed. However, lack of enforcement remains a critical constraint. An effective enforcement and monitoring framework are crucial to provide incentives to enterprises.

Governments should strive to find an appropriate mix of policy measures that best achieve the above policy objectives in their country. In doing so, CEEC/NIS could use the OECD "Policies to Promote Technologies for Cleaner Production and Products: Guide for Government Self-Assessment."

Governments, at the national, regional, and local level should engage relevant stakeholders to commit themselves to strengthening environment management in enterprises, which will in turn could promote CP. In addition to enterprises and enterprise organizations, this may include trade unions, environmental citizens' organizations, universities, and other educational establishments, consumer organizations, and engineering organizations. The establishment of clear, quantitative targets, with a timeframe, can focus the efforts. Targets could initially take the form of benchmarks or performance indicators for different sectors.

4.2 Effective Enterprise Management

In order for industry to respond to incentives for CP, it is necessary to have effective management structures in place. However, many obstacles still exist in the internal environment of the enterprise, such as lack of information, resistance to change, and concern about opportunity costs of implementing CP Programmes (Box 7).

Box 7. The main enterprise-related obstacles for CP in CEEC/NIS

Obstacles for CP in the internal environment of the enterprise could be divided into two groups:

- Obstacles in getting industrial plants interested in preventive strategies (schematic thinking which implies application of "end of pipe" solutions only; risk to interfere with operating technology, believing that the only way to improve the state of environment in the plant is to allocate significant funds; discrediting of the idea of technical improvement (rationalisation) in the period of centrally planned economy, etc.).
- Problems restricting application of CP (belief shared by personnel that they have no possibility to influence the decisions concerning production processes; supervising managers are not used to transferring information to lower-rank personnel; underestimating impact of good housekeeping measures, etc.).

Enterprise development programmes, sponsored by governments or donors, can help enterprises see the links between good environmental practices and development of new markets.

The Technology, Environment, Competitiveness and Change Management (TECCH) initiative of UNIDO and the International Centre for Science and High Technology (ICS) seeks to make a direct relationship between industrial competitiveness and environmental management for the SME sector, and to facilitate implementation of support structures to build SME capacity in this area in developing and transition economies. In particular, it promotes business planning and capacity building and helps SMEs to recognize that the environmental issue is transforming the competitive parameters in which an enterprise operates. Under this initiative developed guidelines suggest that incorporating the environmental issues across all factors of productivity and competitiveness leads in itself to innovation. As programs of this type proliferate in CEEC/NIS, they will foster a mindset among enterprises that is conducive to the adoption of CP practices.

Similarly, there is an increasing global emphasis being placed on effective corporate governance practices in both developed and developing countries, particularly for companies whose shares are publicly owned and traded. Draft OECD guidelines on the topic of corporate governance address five main areas, many of which could have an impact on how an enterprise handles its environmental affairs: the role of stakeholders in corporate governance; the equitable treatment of shareholders; disclosure and transparency; the rights and responsibilities of shareholders; and the duties and responsibilities of corporate boards. Naturally, a management approach that involves input from various stakeholders, such as labour groups, suppliers, consumers, and citizens groups, is more likely to be responsive to environmental concerns. In addition, transparency and accountability with regard to production costs, such as spending on energy and natural resource inputs, can motivate management to minimise these expenditures through implementation of CP. Thus, the adoption of good management and corporate governance practices in CEEC/NIS will greatly facilitate the introduction of CP in CEEC/NIS enterprises.

For those enterprises that implement CP, periodic evaluation of CP programmes should be carried out as part of good management practice. This reveals the cost effectiveness of the activity, and can be used as a guide when making future environmental investment decisions.

4.3 Enterprise Access to Financing for Implementation of CP

Although many CP investments are attractive from both an environmental and an economic perspective (Box 8), the financing of projects is often complicated by circumstances that exist on both the demand and supply side.

Box 8. Cleaner production investments

Cleaner production projects are initially low-cost, small "win-win" investments, with both economic and environmental benefits. They frequently promise higher benefit-cost ratios and quicker pay-back times than large-scale environmental investments and should, therefore, be given priority by both domestic and external financing mechanisms. Once "no-cost/low-cost" or "good housekeeping" measures have been exhausted, additional environmental and productivity gains will require larger-scale investments.

Cash flow generated from successful implementation of basic CP and environmental management practices by an enterprise may be used to finance their more expensive investments. If financial assistance for investments comes from outside institutions, ideally the institution should require a CP assessment prior to supporting any industrial investment. An assessment can help to improve the quality of project preparation, reduce overall investment costs, and stimulate demand for better environmental management in enterprises.

On the demand side, enterprises in CEEC/NIS (especially SMEs) have insufficient experience in preparing applications for project financing. Companies often experience difficulty in putting proposals on paper that would be understandable to funding institutions. Lack of knowledge in evaluating the financial aspects of investments also blocks implementation of projects. Very often industrialists do not know about funding possibilities. Additionally, difficulties in securing guarantees may prevent enterprises from obtaining loans. Finally, competing investment opportunities could also limit investments.

On the supply side, there are obstacles in capital markets: banks are weak, they lack environmental expertise and offer unattractive loan terms to enterprises. Generally, officials in financial institutions are unaware of the financial and economic benefits which can result from CP projects. Additionally, currently complex and costly administrative requirements for extending small loans encourage financial institutions to favour big loans; therefore, it is difficult to receive financing for small projects. Generally, domestic environmental funds set up specifically for environmental projects are oriented to subsidise end-of-pipe and municipal projects.

External financing may play a role in leveraging and complementing domestic financing. However, loans provided by IFIs are generally much larger than the size of typical investments associated with good environmental management practices by enterprises. CEEC/NIS governments should consider working with IFIs with a view to the latter establishing credit lines with domestic commercial banks. This would enable credit to be extended to enterprises for financially viable environmental investments. Such programs can also help to build environmental project capacity in commercial banks. In some countries, donors and/or international financial institutions (IFIs) have established financial intermediaries to facilitate small loans. However, there are still only a few such intermediaries in CEEC and there is little experience with the implementation of economically viable CP projects.

The Nordic Environment Finance Corporation (NEFCO) has recently set up a Revolving Facility for financing, on favourable terms, priority CP investments in Lithuania and Northwestern Russia. The Facility is targeted to long-term CP investments, with payback periods of greater than one year and not more than 3 years, that yield environmental and economical benefits. Projects must be commercially viable with an identifiable and secure stream of earnings that can be used to repay the loan. CP Centres will be a tool for project identification. The Centres will also play a role in the preliminary technical, environmental,

and financial appraisal of proposed projects. Borrowers are expected to finance part of the costs with their own financial resources, normally at least a 10 percent share. The repayment period of the loan will be linked directly to the investment's payback time, and local banks will be appointed to handle payment transactions on behalf of NEFCO.

UNEP Industry and Environment recently launched a new activity entitled "Strategies and Mechanisms for Promoting Cleaner Production Investments in Developing Countries," closely tied to its Cleaner Production Programme. The activity is aimed at developing more effective interaction between the financial and the manufacturing sectors in order to achieve sustainable production. The initiative will focus on five countries at different levels of industrialisation (none in the CEEC/NIS region) to demonstrate how to facilitate financing of cleaner production investments. Financing instruments and enabling policies and strategies will be developed based on concrete experience, with the goal of motivating the financial sector to pursue cleaner production investments as a matter of routine.

4.4 Public and Private Institutions to Provide CP Services

To ensure that CP continues to be promoted and implemented in CEEC/NIS, it is necessary to explore possible alternatives for future provision of CP support services to enterprises. The services discussed in Section 3.0, currently performed by CP Centres in the region, can generally be divided into two groups:

- commercially viable services, and
- public services.

Commercially Viable Services: These are activities with cost-recovery potential, that is, those which could most likely be carried out on a commercial basis and paid for directly by a client, which may be an enterprise, government, or foreign agency. Cost recovery could be ensured through service fees or recovery of costs based on savings realized by the client due to implementation of CP.

Activities that fall into this group include waste minimisation audits, assistance in developing EMS, delivery of training programs, laboratory services, and participating in the financing schemes of CP investments. In OECD countries, these types of commercially viable activities are performed by a variety of entities, including private consulting companies and non-profit organizations. The activities of one such organization, Groundwork Blackburn in the UK, illustrates a variety of ways in which CP services can be sold on a commercial basis (Box 9).

Box 9. Groundwork Blackburn, UK

Groundwork operates through a network of 44 Trusts and delivers various environmental programmes on a commercial basis. Groundwork Blackburn provides a comprehensive package of assistance:

- environmental reviews:
  - identification of the current environmental position of the company,
  - identification of opportunities for improved environmental performance,
  - identification of problem areas and potential savings,
  - provision of constructive advice on the environmental way forward;
- environmental management systems, including assistance up to the point of certification or registration on BS 7750, ISO 14001, and EMAS;
- training programmes:
  - business and environment,
  - implementing an environmental management system,
  - compiling an environmental effect register,
  - environmental audit training,
  - environmental communications programmes, etc.

Public Services: There remains, however, CP support services that are not well-suited to be carried out on a commercial basis, even though they are necessary for stimulating demand and building capacity for CP. They are particularly vital in CEEC/NIS, where the concept of CP is not widely known. These services can be viewed as public service functions, since they benefit the community at large. For example, CP introductory training courses, demonstration projects, preparation and distribution of CP case studies, and development and distribution of informational materials.

The existing CP Centres are well-positioned to carry out these functions, because of their expertise in CP and their established network of contacts with enterprises. In some OECD countries, these activities often are financed by the government. For example, activities carried out by the UK Best Practices Programme (Box 10) are financed by the UK Government.

Box 10. Environmental Technology Best Practice Programme, UK

The Programme is a government initiative. It promotes the use of better environmental practices that lower costs for UK industry and commerce. The Programme provides information and practical advice on techniques and technology to minimise waste by organising workshops and seminars, and providing an ever-growing library of free publications that includes:

- guides giving practical information on waste minimisation,
- case studies of how individual companies are realising cost savings by improving their environmental performance,
- benchmarking guides on the environmental performance of particular industry sectors,
- information on the latest developments in cost-effective waste minimisation techniques and technology.

Additionally, the Programme manages an Environmental Helpline which can provide enterprises with free confidential advice and free site visits.

The Programme also provides targeted technical information for nine specific industry sectors/ pollutants: foundries, metal finishing, volatile organic compounds, textiles, glass, paper and board, printing, food and drink, and chemicals. This information enables companies to readily identify solutions appropriate to their business.

Sustainability of CP Centres

Three main aspects should be considered when discussing the sustainability of existing CP Centres:

- general management,
- institutional capacity, and
- financial resources.

As donors decrease support for CP Centres, the establishment of effective management structures, that are representative of and responsive to various stakeholders, becomes increasingly important. The management structure will need to be tailored to the types of activities provided by a Centre, whether commercial or public service. Some existing Centres already have advisory boards with diverse representation, as noted in Section 2. This will become increasingly important as Centres seek to serve a wider constituency and to build partnerships with various groups, as discussed in the next section. Donors will be more likely to support public service activities for Centres whose management structure is participatory and transparent.

Good management also entails periodic assessment of the effectiveness and efficiency of Centre activities. There could be several criteria for judging and assessing the quality of Centre services, ranging from the extent of coverage of their activity plan to the extent of penetration of cleaner production in manufacturing industries. Generally, two approaches to evaluating CP programmes could be used:

- *Activity description*. Cleaner production programmes have relied heavily in the past on self-evaluation case studies to illustrate and communicate programme success. The main advantage of this approach is its simplicity and ease of administration. However, CP programmes have not devoted the significant resources necessary for independent, objective and detailed analyses. Additionally, there is rarely a systematic follow-up analysis of CP implementation, and broader policy and institutional impacts and problems affecting the programme are not being analysed. Moreover, activity descriptions have not been standardised, which results in collections of descriptions that contain inconsistent and dissimilar information.
- *Programme impact analysis*. This approach depends on establishing quantitative goals for the cleaner production programme and evaluating the programme against those goals. Such an approach is more expensive to implement than self-reporting, because it requires consistent collection of data on environmental performance over the period of the programme. Also, it may be difficult to establish the link between the programme and any changes in the environmental performance of an industry or sector.

Performance monitoring needs to consider the timescale over which impact is being made, i.e. (i) short-term (to assess effectiveness of programme management) and (ii) long-term (to assess impact of the overall programme). It also needs to include mechanisms for verifying the impacts claimed.

With regard to the Centre's own operations, a number of different performance indicators could be used to assess their effectiveness, for example:

- ratio between project related costs and fixed operating costs (e.g., office costs, salaries),
- ratio between number of enterprises which initiate CP application as a result of CP Centre's promotional activities and the number of enterprises approached by the CP Centre,
- ratio between number of trained experts who participate in the follow-up activities and total number of participants in the initial training carried out by the Centre.

In addition to general management skills, it is also important to develop and maintain other types of institutional capacity, so that Centre staff possess the necessary expertise to provide effective CP services. Currently, some donor programmes are being implemented with very extensive involvement of western experts. In such a situation, it is difficult to expect that a CP Centre will quickly reach necessary institutional capacity and will become an effective organisation after technical assistance from the donor side ends. Working toward this goal, Centres should seek to establish and maintain specialised expertise through participation in training programs, seeking funding from donors when possible. In addition, requests could be made directly to industrial organisations or specific companies in western countries for access to experts on a low or no-cost basis, who would then work in partnership with local technical specialists similar to some of the ongoing donor co-operation models. Possible avenues for such partnerships include: (i) twinning arrangements under the Aarhus Business and Environment Initiative Group, to be established under the EAP Task Force and co-ordinated by the Regional Environment Center (REC); and (ii) the USAID Project Ecolinks which is designed to support environmental partnerships with and among various groups in CEE.

Expertise in environmental management systems (EMS) is increasingly in demand in CEEC/NIS, and this provides CP Centres with an opportunity for a commercial activity, if Centre staff can receive training in implementation of EMS.

Concerning financial resources, many CP Centres have so far been publicly funded through international donors, but as previously noted, this stable source of financing is diminishing. CP Centres increasingly have to consider how to identify and access many different sources of income (e.g., government funded projects or co-financing schemes, training and assessments funded by clients or subsidised by third parties). A mixture of public and private funding is possible for CP Centre activities, but special care should be taken not to introduce conflicts of interests between these two sides.

In most cases,clients or donors prefer to fund individual projects which can achieve a set of objectives and provide outputs for an agreed price. CP Centres increasingly have to pursue project-related funding because untied funding is generally only available for the start-up of a Centre, and is increasingly unattractive to donors at a later stage. Instead of seeking general, "untied," funding, CP Centres should consider putting together funding proposals that consist of several discrete public service activities, that can be viewed as a public service "project." Such a proposal can be presented to donors, the government, or even domestic and international industrial associations for grant funding.

Many Centres provide firm-specific services to enterprises at no charge or with an artificially low charge. In keeping with the principles of a market economy, CP Centres in the region should look towards gradually increasing (or initiating) service fees for commercial services to a level that would eventually allow for full cost recovery. Because clients stand to benefit from CP cost savings or the increased trade opportunities resulting from improved environmental management systems, they should be made to realize the value in paying for CP services. One possible fee model is that used in several countries by energy service companies (ESCOs), whereby the fees paid to the service provider, (in this case the CP Centre), are based on the level of cost savings realized by the client from implementation of recommended projects. In the case of CP, the savings could take the form of reduced energy and resource costs, lowering of pollution charges, or reduction in waste treatment costs.

It is important to note that such "consultancy income," from client fees, will not sustain all of the CP Centres' current activities. If industry is the only source of income, CP may not remain the most important mission of the Centre (it will likely branch into other profitable consulting activities), and important aspects of promoting CP in the country will be discontinued. For example, a CP Centre might become financially self-sustainable by restricting its activities to firm-specific CP and EMS projects and other commercial activities. Should this happen, however, the Centre would lose its mission and become more of a private consulting firm not really interested in transferring its know-how to others. A pure financial consideration would also mean that the Centre would no longer be able to play a catalytic role to promote CP in its country of operation. This strongly suggests the need for government support.

Some public funding for CP Centres is viable as long as the funding organisations see CP as a worthwhile use of public money. To be attractive to funding partners, CP Centre should meet several criteria: (i) be competent and demonstrate capacity to achieve results, (ii) demonstrate capability to understand and achieve client's goals, and (iii) have close and effective work relations with major stakeholders. Additionally, CP Centres have to present (market) themselves more effectively to potential funders.

4.5 Partnerships Among CP Stakeholders

A number of important stakeholders are involved with the promotion of CP in CEEC/NIS: industry, national government and local authorities, universities, CP Centres, consulting firms, trade unions, environmental citizens' organisations, financial organisations/institutions, donors, and international organisations.

It is important to establish networks among these parties for the sharing of information, transfer of knowledge, and development of a receptive financing environment for the use of CP methods. CP Centres are uniquely positioned to take the lead in networking and developing initiatives that involve different stakeholders, because of their knowledge base and understanding of all related issues. In fact, many CP Centres are already assuming this role as noted in Section 3, which highlighted CP Centres' relations with industry, government, universities, and financial institutions. Following is a discussion of how CP Centres could build additional partnerships, both within and outside of the country in which they operate.

Among CP Centres

Information and experience exchange among CP Centres are important elements to increase capacity of the Centres, particularly their technical know-how.

Most of the Centres have some relations with other Centres nationally and internationally. According to the Centres, exchange of experience and information about CP projects is the most important aspect of co-operation among the Centres. The closest relations have been established among the Centres working under similar donor programmes, i.e. among UNIDO/UNEP Centres, including the Centres in other regions[6], and among the Centres established by the WEC. To improve co-operation among all CP Centres supported by different donor programmes, OECD organised a first meeting of a Network of Cleaner Production Centres in CEEC/NIS in April 1997, in Kaunas, Lithuania. The meeting was organised within the framework of the EAP Task Force's work programme on Environmental Management in Enterprises and was hosted by the Kaunas PPC. A second meeting of the Network was organised by the UK consultant company ETSU in co-operation with OECD in February 1998, in Prague, Czech Republic, with support from the UK Know-How Fund, to discuss the development of business plans for CP Centres.

Co-operation among CP Centres functioning in the same country is particularly important. Coordinated efforts provide opportunities for more effective dissemination of the CP concept to enterprises and other stakeholders. However, in some countries such opportunities for co-operation are not being utilised.

Consulting Firms

Environmentally oriented consulting firms are important multipliers for the CP approach and should be one of the most important target groups for a diffusion-oriented strategy for the implementation of CP. However, very few CP Centres co-operate with consulting firms.

For example, the Hungarian CPC has reached an agreement with two organisations dealing with similar issues (Követ and Környezetvédelmi). The agreement between the three organisations aims at the co-ordination of work and information exchange. The Czech CP Centre co-operates closely with Association of Managers for CP which involves many consulting companies and tries to disseminate CP information to firms which offer end-of-pipe technologies without a preceding CP assessment or offer EMS support without incorporating CP procedures.

In addition to environmental consulting firms, CP Centres could establish partnerships with companies providing general management consulting services. Considering that enterprises in CEEC/NIS have many managerial problems that impede CP application, joining efforts with these companies could be very effective in terms of improving the economic and environmental performance of enterprises.

[6] UNIDO/UNEP National Cleaner Production Centres in Brazil, China, Costa Rica, El Salvador, India, Mexico, Nicaragua, Tanzania, Tunisia, Zimbabwe, and Vietnam.

Trade Unions and Environmental Citizens' Organisations

Primarily, trade unions and environmental citizens' organisations could support information dissemination on CP. Additionally, although trade unions and environmental citizen's organisations are still evolving in many CEEC/NIS, they are becoming important stakeholders. For example, experience from OECD countries has demonstrated that, with adequate information and training, unions can and often do play an important role in motivating both industry and government to implement CP projects and policies.

Trade unions have few links with CP Centres, and in most CEEC/NIS are unaware of their activities. Although individual union representatives within enterprises have in some instances participated in company-based training programmes (as members of CP task groups), there is little evidence of any formal relationship between CP Centres and unions at the industry, regional or national level.

Most of the Centres have some relationships with environmental citizens' organisations (ECOs), mostly involving exchange of information. ECOs, through public pressure on enterprises, could help to increase demand for better environmental management in enterprises and promote the concept of CP. However, ECOs in CEEC/NIS generally have not been involved in CP and closer links should be developed with CP Centres.

Donors and International Organisations

Considering that the overall amount of CP support in CEEC/NIS is rather small, coordinated donor efforts offer an opportunity to reach more easily a "critical mass", thus providing a wider impact. In particular, this could help to avoid unnecessary duplication of CP activities.

CP Centres could serve donor CP programmes in several areas (Box 11) However, in some cases, the donor agencies prefer to hire external consultants.

Box 11. Areas in which CP Centres might enhance donor CP programmes:

- CP Centres can provide specific expertise in environmental assessment in enterprises, optimisation of production processes, environmental management systems and policy advice.
- CP Centres can provide administrative support: facilities, overcoming language barriers, translation services, helping to establish contacts with branch organisations, assist in marketing and promoting donor programmes.
- The Centres have a good knowledge of their country's needs, especially in the areas of local environmental legislation and local culture, and they can help to design and implement CP programmes and to disseminate information/results.
- CP Centres can facilitate contacts and help to implement CP programmes in neighboring countries.
- The Centres can play an intermediary role between interested parties, such as donors and recipient industries.

Most of the CP Centres do have some relations with different international organisations (UNEP, UNIDO, WCPS, WEC, OECD, etc.) involving joint projects or information exchange. Some CP Centres are associated members of the International Network for Environmental Management (INEM).

5. RECOMMENDATIONS FOR NEW CP CENTRES

This report has examined various issues surrounding the implementation of CP in CEEC/NIS, as well as the current role of CP Centres and how this role has evolved over time. Some of the most important issues relate to how the CP Centres were established, what services they provide, and how they receive funding. With this experience in mind, the following recommendations are presented concerning the establishment of new CP Centres.

CP Centres will be most effective in those countries where the political and economic environment is adequate to promote cost efficient behaviour on the part of enterprises.

The presence of in-country demonstration projects and domestic capacity for CP prior to the establishment of CP Centre is an advantage, because it enables the Centre staff to become knowledgeable and to start activities on an operational level directly, without having to spend a lot of time gaining full understanding of the CP concept.

CP Centres' chances for success and long-term viability are greatest if the support of the host government is obtained when the Centre is being established.

The host institution for CP Centre should be selected carefully and should preferably have well-established contacts with industry. Additionally, the CP Centre should have an independent status within its host organisation. A contract between the CP Centre and the host institution should clearly indicate that decision-making authority rests with the board and administration of the Centre. Generally, the host institution should be well placed to involve all CP stakeholders; it could be key to the success of the CP Centre.

Experience from CEEC implies that without a thorough analysis of the strengths and weaknesses of individual organisations in a country, it is practically impossible to judge objectively which organisation is best suited to serve as a host institution for the CP Centre, e.g. a university or industrial association. A Centre at a particular type of organisation in one country could be more effective than in another. This leads to the conclusion that success of the Centre mainly depends on local conditions as well as on the enthusiasm and dedication of the persons involved.

Experience to date suggests that in most cases, a CP Centre as an independent, non-governmental organisation is an effective mechanism in terms of promoting and co-ordinating CP activities in the country and should be the preferred option when establishing a CP Centre. A legal status of foundation could be used to underline its non-profit character. Such an arrangement allows it to carry out public service functions effectively, helps to maintain the neutrality between government and industry, and helps involve other stakeholders which is crucial for the Centre to achieve its objectives.

In large countries, consideration should be given to establishing regional or local CP Centres. Their functions preferably should be decentralised, but effective networking is necessary.

It could be useful for a new CP Centre to have a counterpart Centre in another country with adequate experience and capacity to support it as necessary during the start-up period. For new Centres in CEEC/NIS, there may be a particular advantage to working with successful CEEC Centres which have probably faced similar issues. Once Centres have established their activities and gained experience, the need for counterpart institutions will decrease.

Training, demonstration projects and information dissemination are essential elements of awareness raising and capacity building crucial for the sustainability of CP in CEEC/NIS. These activities are generally not commercially viable and should be considered a public service requiring government support. Therefore, a

CP Centre providing these services cannot be expected to fully fund its operations from commercial activities.

A well functioning and active advisory board is an important reference and guiding body for the Centre in a long-term perspective. An advisory board consisting of key stakeholders in the country could also help to achieve their commitment to CP, because they would be directly exposed to its benefits.

CP Centre staff should be capable of all important functions: possessing general and project management, as well as technical, financial and marketing skills. Depending on the size of the Centre and the local circumstances many of these functions can be performed by more than one person, but even in this case the functional roles should be distinct. Lines of authority and responsibility should be well defined for effective management of the Centre. For some CP Centres with relatively few people the structure is often self-evident, but clarity in function, role and communication is still essential.

CP Centres should develop realistic business plans with clear and measurable targets. A business plan provides clarity on an organisation's future direction, identifies the objectives for the organisation and sets targets by which the organisation can judge its success. Acting in an ad-hoc and mainly reactive fashion will not enable Centres to work as effective organisations, and effective planning is essential if Centres are to conduct work requested by their clients. The key elements of the business plan are the following: mission statement, short-term and long-term objectives, external assessment (definition of market, main competitors, target clients, opportunities and threats), internal assessment (organisation and products/services), strategies, action plans, and finances (projected costs and revenues).

Measuring effectiveness and assessing performance is essential in all aspects of the work of CP Centres. Performance monitoring is also very important to ensure the quality of CP Centres outputs; the ability to demonstrate effectiveness in operations increases a CP Centre's credibility leading to increased confidence among the CP Centre's stakeholders.

REFERENCES

1. Ministry of Environment and Energy, Denmark and Danish Environmental Protection Agency, *3rd European Roundtable on Cleaner Production: Summary Report.* Denmark, 1996.
2. 4th European Roundtable on Cleaner Production: Final Report. Oslo, November 1997.
3. Surya Prakash Chandak, "National Cleaner Production Centres: Their Establishment and Growth". In *Industry and Environment*, Volume 19 No.3, UNEP IE, Paris, July-September 1996.
4. Czech Cleaner Production Centre, *Annual Report*. Prague, 1996.
5. Czech Cleaner Production Centre, *Business Plan*. Prague, July 1998.
6. Vladimir Dobeš, "Five Key Factors for Ensuring Sustainability of Cleaner Production Programmes within a Country". In *4th European Roundtable on Cleaner Production*, Oslo, November 1997.
7. Vladimir Dobeš, National CP Programme in the Czech Republic. Prague, 1996.
8. Andrzej Doniec, "Obstacles in Application of Cleaner Production in the Polish Industry". In *Cleaner Technologies and Cleaner Products for Sustainable Development*, NATO ASI Series, Environment - Vol.2, Verlag Berlin Heidelberg, 1995.
9. ETSU, Workshop on Business Planning for Cleaner Production Centres in Central and Eastern Europe: Workshop Materials, Prague, February 1998.
10. Matthias Gelber, "ISO 14001 and EMAS: Introduction, Implementation, Requirements, International Developments, Application in Central and Eastern Europe". In *2nd Eco-Baltic Conference: Conference Reader*, Gdansk, October 1997.
11. Jürg M. Grütter, *Comparative Analysis of Cleaner Production Centres*. On Behalf of Swiss Federal Office of Foreign Affairs, July 1998.
12. Hungarian Cleaner Production Centre, *Business Plan*. Budapest, 1998.
13. P. Kisch, E. Ryden, and T. Lindhqvist, The International Institute for Industrial Environmental Economics at Lund University, *Evaluation of UNIDO/UNEP National Cleaner Production Centre Programme*. Prepared for UNIDO, Lund, 1996.
14. Thomas Lindhqvist and Zinaida Fadeeva, The International Institute for Industrial Environmental Economics at Lund University, *Cleaner Production in Universities in CEEC/NIS*. Prepared for OECD, Lund, 1997.
15. Romuald Michalek, "Experiences in Establishing Cleaner Production Activities in Central and Eastern Europe". In *UNEP 4th High Level Seminar on Cleaner Production*, Oxford, September 1996.
16. Romuald Michalek, "World Environment Center's Cleaner Production Programmes Worldwide". In *Proceedings of the First Cleaner Production International Conference Rydzyna' 96*, Gliwice, November 1996.
17. Olav S. Nedenes, "Experiences in Establishing Cleaner Production Activities in CEECs and China". In *UNEP 4th High Level Seminar on Cleaner Production*, Oxford, September 1996.
18. Olav S. Nedenes, "Norwegian Transfer of Know-How Programmes on Waste Minimisation/Cleaner Production to Central and Eastern European Countries". In *Promoting Cleaner and Safer Industrial Production in Central and Eastern Europe*, OECD, Paris, 1995.
19. NEFCO, "NEFCO Revolving Facility for Cleaner Production Investments". In *4th European Roundtable on Cleaner Production*, Oslo, November 1997.
20. Zygfryd Nowak, Polich *Cleaner Production Programme – NGOs in Action*, UNEP Industry and Environment, October 1993.

21. Zygfryd Nowak, Cleaner Production in Poland: Aiming at a Joint Industrial and Environmental Policy, UNEP Industry and Environment, December 1994
22. Zygfryd Nowak, Polish Cleaner Production Centre NIF-NOT, "The Role of CP Centres: The Polish Example". In *Cleaner Production*, Newsletter, Nr. 6, Katowice, Autumn 1997.
23. Zygfryd Nowak, Polish Cleaner Production Centre NIF-NOT, *Cleaner Production in Poland*. Katowice, September 1996.
24. OECD, Best Practice Guide for Cleaner Production Programmes in Central and Eastern Europe. Paris, 1995.
25. OECD, EAP Task Force, Policy Statement on Environmental Management in Enterprises in CEEC/NIS. Paris, 1998.
26. OECD, EAP Task Force, Progress in Achieving Basic Capacity Level for Cleaner Production in CEEC/NIS. Paris, 1998.
27. OECD, EAP Task Force, Report from the First Meeting of a Network of Cleaner Production Centres in CEEC/NIS in Kaunas, Lithuania. Paris, 1997.
28. OECD, EAP Task Force, Strengthening the Role of Workers and Trade Unions in Promoting Cleaner Production in Central and Eastern Europe. Paris, November 1997.
29. OECD, Policies to Promote Technologies for Cleaner Production and Products: Guide for Government Self Assessment. Paris, 1995.
30. OECD, Technologies for Cleaner Production and Products, Towards Technological Transformation for Sustainable Development. 1995, Paris.
31. OECD, Washington Waste Minimisation Workshop, Volume I: Which Policies, Which Tools? Paris, 1996.
32. Pollution Prevention Centre at the Institute of Environmental Engineering, Kaunas University of Technology, *Business Plan*. Kaunas, May 1998.
33. Dariusz Prasek and Mark Hughes, "The EBRD's Approach to the promotion of Cleaner Production Technologies". In *Workshop on Business Planning for Cleaner Production Centres in Central and Eastern Europe*, Prague, February 1998.
34. Håkan Rodhe and Thomas Lindhqvist, *Danish Cleaner Production Projects in Central and Eastern Europe 1991-1995*. Danish Environmental Protection Agency, Copenhagen, 1996.
35. Jurgis Staniškis, "Comparative Analysis of Different CP Programmes and Projects in Lithuania". In *4th European Roundtable on Cleaner Production*, Oslo, November 1997.
36. Jurgis Staniškis, "CP Programmes and Projects in Lithuania". In *Proceedings of the First Cleaner Production International Conference Rydzyna' 96*, Gliwice, November 1996.
37. UNEP IE, Government Strategies and Policies for Cleaner Production. Paris, 1994.
38. UNIDO, National Cleaner Production Centres Programme. Vienna, January 1997.
39. Frans Verspeek, "Capacity Building for Transfer of Cleaner Production Practices and Technologies". In *Proceedings of the First Cleaner Production International Conference Rydzyna' 96*, Gliwice, November 1996.
40. Gulbrand Wangen, Det Norske Veritas, *Capacity Building in Cleaner Production in the Baltic Region*. Nordic Council of Ministers, Copenhagen, 1996.
41. WBCSD and UNEP IE, Eco-Efficiency and Cleaner Production, Charting the Course to Sustainability.

ANNEX I: ESTABLISHMENT AND HOST INSTITUTIONS OF CLEANER PRODUCTION CENTRES

CP Centre	Table 1. CP Programme	Date of establish-ment	Host institution
Clean Industry Center, Bulgaria	WEC	1995	Bulgarian Industrial Association
Czech Cleaner Production Centre, Czech Republic	Norwegian, UNIDO/UNEP	1994	The Centre is an independent organisation
Pollution Prevention Center, Czech Republic	WEC	1995	Czech Environment Management Center
Pollution Prevention Center, Hungary	WEC	1995	University of Veszprem
Hungarian Cleaner Production Centre, Hungary	UNIDO/UNEP	1997	Department of Environmental Economics and Technology, Budapest University of Economic Sciences
Technical Assistance Centre for Pollution Prevention and Waste Minimisation, Estonia	WEC	1994	The Centre is an independent organisation
Pollution Prevention Center, Latvia	WEC	1994	The Centre is an independent organisation
Kaunas Pollution Prevention Centre, Lithuania	WEC	1994	Institute of Environmental Engineering, Kaunas University of Technology
Polish Cleaner Production Centre NIF-NOT, Poland	Norwegian	1991	Polish Federation of Engineering Associations (NOT)
Pollution Prevention Center, Lodz, Poland	WEC	1994	at Lodz Technical University
Pollution Prevention Center, Katowice, Poland	WEC	1995	Faculty of Materials Science, Metallurgy and Transport, Silesian Technical University
Pollution Prevention Center at Atmoterm Ltd., Poland	WEC	1995	Atmoterm Ltd.
Pollution Prevention Center, Romania	WEC	1995	The Centre is an independent organisation
Russian-Norwegian Cleaner Production Centre, Russian Federation	Norwegian	1996	International Centre of Social and Labor Problems
Slovak Cleaner Production Centre, Slovakia	Norwegian, UNIDO/UNEP	1995	Slovak Technical University

ANNEX II: FINANCIAL AND INSTITUTIONAL SITUATION OF CP CENTRES

CP Centre	Budget, USD			Financing source(s) for 1998	Staff	
	1996	1997	1998		full-time	part-time
Bulgarian Clean Industry Center	30 000	30 000	30 000	Commercial services, host institution	4	2
Czech Cleaner Production Centre	130 000	190 000	220 000	UNIDO/UNEP Czech Government, US EPA, commercial services	5	3
Czech Pollution Prevention Center	51 700	29 500	31 500	Contracts with enterprises and government	2	1
Hungarian Pollution Prevention Center	43 589	36 727	n.a.	n.a.	-	3-4
Hungarian Cleaner Production Centre	-	n.a.	n.a.	UNIDO/UNEP, commercial services	10	n.a.
Technical Assistance Centre for Pollution Prevention and Waste Minimisation (EMI-ECO, Estonia)	70 000	95 000	105 000	Ministry of Environment of Finland, Estonian Environmental Fund, commercial services	6	-
Pollution Prevention Center, Latvia	32 077	29 065	24 000	International projects, commercial services	1	4-5
Kaunas Pollution Prevention Center, Lithuania	80 000	162 000	140 000	WEC, commercial services	6	1
Polish Cleaner Production Centre NIF-NOT	n.a.	n.a.	n.a.	Polish Environmental Fund, Norwegian government	5	8
Pollution Prevention Center at Lodz University, Poland	n.a.	63 000	n.a.	WEC; Voivodship Environmental Fund and from the City Council for particular purposes (e.g. part of seminar costs)	0	5
Pollution Prevention Center at Silesian University of Technology, Katowice, Poland	25 000	60 000	25 000	WEC, commercial services	0	6
Pollution Prevention Center at Atmoterm Ltd., Poland	n.a.	n.a.	n.a.	WEC, commercial services	10	0
Romanian Pollution Prevention Center	120 000	90 000	75 000	WEC, commercial services	5	9
Russian-Norwegian Cleaner Production Centre	40 000	140 000	160 000	Norwegian Government, regional environmental funds	4	25-30
Slovak Cleaner Production Centre	72 000	89 000	55 000	UNIDO/UNEP, commercial services	5	n.a.

ANNEX III: CLEANER PRODUCTION CENTRES IN CEEC/NIS

CLEAN INDUSTRY CENTER AT THE BULGARIAN INDUSTRIAL ASSOCIATION, BULGARIA

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Internet: http://www.bia-bg.com/AboutBIA/clean_industry.htm

ESTABLISHMENT

The Clean Industry Center (CIC) was established within the framework of the Bulgarian Industrial Association (BIA) in September 1995. The Center started to operate under a Co-operation Agreement with the World Environment Center (WEC), sponsored by USAID, which ended in September 1997. The Center has the legal status of a non-profit organisation, like BIA - the main industry association that represents the companies, entrepreneurs and employers of the state, private and municipal sectors.

MISSION

Following the BIA's policy, the Center has adopted as a main priority and long-term goal to support national, local, and branch industry associations and enterprises in achieving sustainable development, overall minimisation of negative impact on the environment and raising production efficiency. The CIC focuses on fostering the restructuring of industry using pollution prevention measures, waste minimisation, and low-cost solutions to environmental problems as an alternative of "end-of-pipe" pollution controls.

The CIC will support local industries to successfully implement modern Environment Management Systems in order to minimise their environmental impact, to meet and satisfy community needs and regulatory requirements, and to meet newly emerging trade requirements in highly competitive international markets.

The CIC will facilitate a dialogue among industry, government and society, by encouraging, strengthening and supporting the capabilities of the various industrial sectors in the formulation and implementation of their own environmental policies.

ANNUAL BUDGET

Year	Source of Revenues	Total Budget, USD
1996	WEC, BIA	30 000
1997	WEC, BIA, commercial services	30 000
1998	BIA, commercial services	30 000

STAFF

The CIC has four full-time employees. The Center uses different services on a contractual basis such as gas measurement, specific expertise, bookeeping etc. The CIC's staff is certified for conducting Environment Impact Assessment according to the requirements of the existing regulations. It is intended to hire additional full - time people in order to expand promotional and commercial activities.

PARTNERS

The CIC works in close co-operation with the Ministry of Environment, Ministry of Industry, Government Body on Standardisation and other institutions responsible for the implementation of the national industrial and environmental policy. As a part of BIA, the CIC maintains strong interaction and co-operation with the manufacturing industry and senior enterprise managers through the regional and branch industrial associations.

The CIC strives also to expand its international contacts and co-operation with recognised institutions and organisations. Currently the Center has developed close relations with International Network for Environmental Management (INEM), Prince of Wales Business Leaders Forum, Environment Directorate of the OECD, local representative offices of UNDP, REC, Bundesumweltamt, Germany and other international institutions.

ACTIVITIES

At first, the CIC mostly supported the implementation of the WEC Program for Waste Minimisation and Pollution Prevention. Gradually the Center has broadened its activities and scope of work. In this respect, the CIC is implementing a broad range of CP activities and modern EMS (ISO 14000 series) promotion and provides a number of commercial services for companies of all sizes, including small and medium-sized enterprises (SMEs).

CIC conducts a number of training programmes on waste minimisation, modern EMS (EMAS and ISO 14 001). Technical assistance, including pollution measurements, calculation of the losses and recommendations for waste minimisation and pollution prevention measures, is offered to companies. The Center participates on a co-operative and subcontractual basis in conducting environment impact and site assessment of past damages (environmental liabilities) for privatisation purposes, in co-operation with university and consulting teams.

The CIC has organised several seminars on WM and P2 and the WEC has launched several demonstration projects in selected Bulgarian enterprises, some of which are:

- Neftochim - Bourgas, the largest petroleum and chemical facility consisting of an oil refinery and numerous downstream chemical operations. The waste minimisation project envisages reduction of the hazardous VOC emissions from equipment leaks.
- Pharmacia AD - Dupnitza, one of three state owned pharmaceutical plants in Bulgaria, manufacturing numerous medical and health care products. The project is targeted to improve process control in the Vitamin C production, reducing waste generation and increasing the yield.
- Svilosa Co - Svishtov, the only rayon manufacturer in Bulgaria, targeted for export. The project's aim is the improvement of the air quality in the spinning hall by reducing the carbon disulfide and hydrogen sulfide releases.
- Sopharma - Sofia, with four product lines: pharmaceutical products, photochemical products, biotechnical products and finished products including tablets, ampoules, etc.

Several other companies have been involved in the 1997 waste minimisation impact program (Lead and Zinc Complex, Jsc- Kurdjaly, Verila Jsc - Sofia).

The Center has prepared a study on "Barriers to the Investments in Environmental Protection in Bulgaria" under an agreement signed with Umweltbundesamt, Germany (for more information please visit http: www@bia-bg.com).

The Center has organised several seminars on EMS (ISO 14 000 series) in the Danube River Basin - the Northern part of Bulgaria. The seminar programme started with a seminar for the representatives of the Regional Industrial Associations of BIA at the beginning of December 1996. However, experience shows that the costs for the manuals, total logistics for organising the seminars, and instructors' fees would only partly be covered by the participating companies.

Another prospective task is investment promotion of environmental projects for the improvement of the existing technologies, including raw material savings, energy efficiency, waste minimisation and recycling, emission abatement and monitoring as well as the introduction of new clean technologies.

The CIC conducts permanent public relations campaigns in order to present the full range of its activities and services. In that respect, the information has been disseminated to a number of international and domestic institutions and companies. The Center has had presentations in the mass media including the national and regional radio and TV stations and special trade fairs (Plovdiv, Bulgaria, Terra-Tec International exhibition, Leipzig).

The business opportunities of the Center are related to development of demand-oriented activities, as follows:

- to conduct Waste Minimisation/CP programs,
- to provide a number of technical services including gas analysing equipment at different industrial facilities,
- to conduct "The Waste Exchange Program" launched by the Center as a part of the BIA's information network called "Industry net".
- to keep informed and serve the needs of the Bulgarian stakeholders related to the implementation of EMAS, International Standard on Environment management systems - ISO 14000 series,
- to organise the education and training of trainers and support the establishment of a network of auditors, consultants and respective state bodies,
- to co-ordinate and assess the environmental management programs of industrial companies,
- to set up a data base on water and air discharges, solid waste and polluted soils, and to support establishment of the National Pollutants Release and Transfer Register (PRTR),
- to organise an information exchange on clean technologies, resource saving, waste minimisation and energy efficient techniques,
- to select, support and monitor demonstration environmental projects,
- to facilitate investment promotion and intermediation between national and international financial institutions and donors on one side, and companies on the other side, willing to invest in the environment protection and respective projects,
- to publish and disseminate the outputs of seminars, case studies, pilot and demonstration projects etc.

RESULTS ACHIEVED

The results achieved in WM/CP oriented activities could be summarised in the following figures:

- number of experts trained in a short - term programmes including EMS (up to 5 days) = more than 150,
- total reduction of waste (t/year) = 170,
- total reduction of waste water (m3/year) = 570,
- total reduction of air emissions (m3/year) = 2500,
- total financial benefits per year (USD/year) = 322 000.

PUBLICATIONS

1. Modern Environment Management Systems. A Guide for Implementation of ISO 14 001. Sofia, 1997. (Published by CIC in Bulgarian, with support of UNDP Sofia Representative Office and REC).
2. Practical approaches for implementation of EMS. Sofia, 1997 (Published by WEC with support of CIC, 126 pages, in Bulgarian and English).
3. Waste Minimisation Manual, A 10 Step Program for Success. Sofia, 1997 (Published by WEC with support of CIC, available in Bulgarian and English).
4. Waste Minimisation Status Report - 1996 (Published by WEC with support of CIC, in Bulgarian and English).
5. Overcoming the Barriers to the Investments in Environment Protection in Bulgaria. Sofia, 1997 (Published by CIC with support of Umwelbundesamt, Germany, in German and Bulgarian).
6. Industrial Restructuring and Environmental Protection Investment in Bulgaria. Sofia 1998 (in French and Bulgarian).

CZECH CLEANER PRODUCTION CENTRE

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ESTABLISHMENT

The Czech Cleaner Production Center (CCPC) was established in 1994 within the framework of the Czech-Norwegian Cleaner Production Project (1992-1995), which was financed by the Norwegian Government. The CCPC has broadened its operations under the support of UNIDO/UNEP National Cleaner Production Center (NCPC) Programme which it joined at the beginning of 1995.

MISSION

The CCPC's principle is to catalyse and co-ordinate, as a non-profit and independent organisation, the efforts to promote CP in the Czech Republic. The purpose is to achieve wide-scale and sustainable application of CP in the country, thereby improving resource productivity at firms and reducing environmental damage caused by industry.

ANNUAL BUDGET

Year	Source of Revenues	Total Budget, USD
1996	UNIDO/UNEP, commercial services, projects, grants	130 000
1997	UNIDO/UNEP, commercial services, projects, grants	190 000
1998	UNIDO/UNEP, commercial services, projects, grants	220 000

STAFF

The CCPC has 5 full-time and 3 part-time staff at its central office in Prague, 1 full-time and 1 part-time employee in the regional office in Brno, and 1 - in Ostrava.

Additionally, the Association of Managers for Cleaner Production (AMCP) serves as associates of the CCPC for providing training and advisory service to industry. The AMCP was established by the Czech graduates of the first training programme under the Czech - Norwegian Cleaner Production Project.

PARTNERS

The following organisations represent the steering committee of the CCPC:

- Confederation of Industry of the Czech Republic,
- Ministry of Environment of the Czech Republic,
- Ministry of Industry and Trade of the Czech Republic,
- University of Chemistry and Technology Prague (VŠCHT Praha),
- University of Technology Brno (VUT Brno),
- United Nations Industrial Development Organisation (UNIDO) & United Nations Environmental Programme (UNEP).

The following organisations also attend the steering committee as observers:

- Association of Managers for Cleaner Production (AMCP),
- World Cleaner Production Society (WCPS),
- World Environment Center (WEC).

ACTIVITIES

Demonstration Projects

Capacity building of CP in the Czech Republic is the foremost agenda of the CCPC. Demonstration projects, as well as training programmes, are the core activities to this end. Following are the types of projects under management: capacity building projects, regional projects, CP and EMS projects, sector-specific projects, and firm-specific projects.

The CCPC places a particular emphasis on regional projects as well as CP & EMS projects. Regional projects have been carried out since 1995/96, when the first three Local Authority Projects were implemented: (1) Industrial Waste Minimisation in Decín, (2) EKOPROFIT Zlín - Otrokovice, and (3) Cleaner Production for the River Svitava. Projects (1) and (3) were focused on small and medium-sized enterprises.

The CCPC managed these pilot projects with assistance from the UNIDO/UNEP NCPC Programme. For projects (1) and (2), STENUM, an Austrian organisation specialising in training and consulting in the area of environmental management, took a role as a counterpart organisation. STENUM introduced its experiences from the EKOPROFIT Graz, a successful regional project implemented by the Municipality of Graz, Austria.

Another regional project was implemented in Ostrava in 1997 with financial support from PHARE. It included training of municipal officials and development of local CP policies.

Recently two projects have been finalised: in Decín (continuation of the project Industrial Waste Minimisation), and in Zlín „From CP to EMS“ (continuation of the project EKOPROFIT). The project in Zlin was a pilot regional project of integrated implementation of EMS and CP. There were three companies involved - two municipal companies (technical services and water supplies and sewerage) and a small building company. STENUM Graz provided continuous support under the UNIDO/UNEP NCPC programme. Both projects were financially supported by the municipalities Decín and Zlín.

Presently a regional project in Moravská Trebová is being implemented.

Training

The training programmes, both lectures and on-the-job CP training, constitute a core part of the demonstration projects mentioned above. The distinctive approach of the CCPC is to forge professional capacities within companies, so that they can continue to apply CP practices on their own even after the external assistance is over.

The CCPC offers short-term training courses on CP as well. CCPC also works for establishing CP curriculum at universities.

Policy Advice

The CCPC submitted a comprehensive policy proposal in November 1996 to the Ministry of Environment in the Czech Republic under a project called “Cleaner Production Programme”. The CCPC continues to follow up on the proposal. The objectives are:

- to reach a broad consensus on CP Policy and Programmes,
- to get CP Policy and Programmes endorsed by the government,
- to implement CP Programmes.

In 1998 CCPC participated in the project „Implication of the IPPC Directive and the BAT Concept for the Czech Republic“ which was financed by PHARE. Based on analysis of the current practices in the Czech Republic and using experience of EU countries, CPC proposed an approximation programme for Best Available Techniques in the Czech Republic.

Financing Mechanisms

The CCPC proposes financing mechanisms for CP measures needing investment. The CCPC achieved an agreement with the Ministry of Environment and the State Environmental Fund (SEF) on establishing a special purpose fund for CP at the SEF in January 1998. The CP fund at the SEF facilitates CP measures which otherwise would be foregone.

The CCPC provides technical assistance to SEF. It is the first programme where not only improvement is assessed, but also the method how the improvement was achieved. The level of introduction of EMS is reflected in the evaluation criteria. In 1998 four companies received financial support from the programme.

International Co-operation

The CCPC implemented CP projects in Croatia and Uzbekistan to assist in building basic capacities for CP in those countries. The projects were co-ordinated by UNIDO. In addition, the CCPC Director has been appointed as one of five members of the Executive Committee of the European Roundtable for Cleaner Production. One of his missions is to represent the interests of parties in the Central and Eastern European Countries.

Information Dissemination

The CCPC continues to be a source of information through publications, seminars, presentations and site visits. Among other activities in this area, the following are emphasized in particular:

- to organise a national CP roundtable conference as a platform for promotion of CP to the broader public, and for exchange of knowledge and experiences among all CP stakeholders, and
- to develop and publish CP manuals.

RESULTS ACHIEVED

The table below is a summary of the achievements since the introduction of CP methods to the Czech Republic:

Year	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**
Number of long-term projects	1	1	2	4	1	4
Number of participating firms	7	6	10	23	7	21
Number of people trained	27	31	64	74	21	71
Environmental effects						
VOC emission reduced (ton per year)	0	1 982	151	335	10	237
Waste water reduced (thousand m^3 per year)	0	5	7	907	3438	77
Non hazardous waste reduced (ton per year)	51	9 216	6481	413	30	630
Hazardous waste reduced (ton per year)	8 172	110	1 335	595	198	574
Financial savings at firms (million CZK per year)	9,7	30,5	43,9	103,9	20,5	39,1

PUBLICATIONS

1. Cleaner Production as a component of EMAS. Manual for the State Administration, Prague, 1997.
2. Cleaner Production - Pollution Prevention. Manual for Enterprises, Prague, 1998.
3. Implementation of Cleaner Production and Development of Municipal CP Policy. Manual for Local State Administration, Prague, 1998.

POLLUTION PREVENTION CENTER, CZECH REPUBLIC

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ESTABLISHMENT

The Czech Pollution Prevention Center (PPC) was established in 1995 within the World Environment Center's Waste Minimisation Programme financially supported by the USAID. The Center is an independent unit within the Czech Environmental Management Center (CEMC).

MISSION

Czech Pollution Prevention Center is a specialised consulting and training centre that aims to remove barriers between industry, government and the public in the field of environmental protection and reduce the negative impact of industrial activities.

ANNUAL BUDGET

Year	Source of Revenues	Total Budget, USD
1996	WEC	51 700
1997	WEC, contracts with enterprises and government	29 500
1998	Contracts with enterprises and government	31 500

STAFF

The Center has 2 full-time and 1 part-time employee, including the director.

PARTNERS

The following organisations co-operate with PPC:

- Confederation of Industry of the Czech Republic,
- Ministry of Environment of the Czech Republic,
- Ministry of Industry and Trade of the Czech Republic,
- Czech Cleaner Production Center (CCPC)
- University of Technology Brno (VUT Brno)
- United Nations Industrial Development Organisation (UNIDO) & United Nations Environmental Programme (UNEP)
- Technical University Ostrava
- World Environment Center (WEC)
- World Business Council (WBC)
- Environmental Management Office Prague
- Tecon Ltd. Prague (UNIDO CR joint program)
- INEM – International Network for Environmental Management
- FMI – Foundation for The Metal Industry and Environment, Holland

ACTIVITIES

Activities of the PPC are focused on the following strategic areas:

- Consulting - providing assistance for the implementation of environmental management systems (ISO 14000, EMAS) and their individual elements (environmental audit, safety management, etc.).
- Technical assistance - training, information provision and technical support for preventative measures in production, that contribute to environmental protection as well as cost-saving in companies (i.e. principles of pollution prevention, waste minimisation, cleaner production).
- Financial service - prospecting and provision of assistance to entrepreneurs so that they may gain the financial means to realise technical prevention measures in production (domestic and foreign subsidies, bank resources, etc.).
- Contacts support - analysis and information services for entrepreneurs and state administration in harmonising the Czech and EU legislation; assistance with negotiations between industry and government in preparing new environmental legislation.

RESULTS ACHIEVED

Through the co-operation of CEMC and WEC (World Environment Center, USA), a number of waste minimisation projects have been carried out in 8 Czech industrial companies. A total of 23 concrete technical problems have been solved.

The savings from waste charges avoided in total - 15 709 000 Czech crowns per year, and savings from improvement in production process - in total - 8 673 Czech crowns per year.

The projects helped participating enterprises to reduce pollution emissions. The following are approximate figures of pollution reduction per year:

- 25 tons of ammonia,
- 80 tons of acetatic acid,
- 5 tons of petrol,
- 47 tons of volatile organic compounds,
- 4000 tons of wastes from foundries,
- 16 tons of mercury,
- 1800 tons of sludges with mercury content,

PUBLICATIONS

1. Methods for Implementation of Waste Minimization Program No 1, Prague, 1995.
2. Methods for Implementation of Waste minimization Program No 2, Prague, 1995.
3. Results of Waste Minimization Program Projects, Prague, 1995.
4. Pollution Prevention Projects – methodology, Prague, 1995.
5. Cleaner Production, Pollution Prevention, Prague, 1996.
6. Technical Procedures for EMS, Prague, 1996.
7. Waste Minimization Program, Prague, 1996.
8. Pollution Reduction – Saving Money, Prague, 1996.
9. Implementation of Waste Minimization Program in SMEs, Prague, 1997.
10. Guidelines for Implementation of the Technologically Enhanced Environmental Management Systems in the Czech SMEs, Prague, 1997.
11. Preliminary Study of Application of the Directive 96/61/EC in the Czech Republic, Prague, 1998.

POLLUTION PREVENTION CENTER AT THE UNIVERSITY OF VESZPRÉM, HUNGARY

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ESTABLISHMENT

The Pollution Prevention Center was established in 1995 within the World Environment Center's Waste Minimisation Programme financially supported by the USAID. The Center is an independent unit within the University of Veszprém.

MISSION

The mission of the Pollution Prevention Center is to contribute to sustainable development by strengthening waste minimisation and management of industry-related environmental and safety practices in Hungary. To achieve this mission the Center:

- establishes partnerships among industry, government and non-governmental organisations to achieve mutually beneficial goals,
- serves as a bridge for the exchange of information and expertise among industry, government and non-governmental organisations, and
- strengthens the environmental management capacity of participating companies.

The Pollution Prevention Center at the University of Veszprém has been established with the primary objectives to introduce a new way of thinking and culture in Hungary, to initiate actual operational measures, and to introduce new technological solutions or processes to prevent and/or to reduce environmental pollution. This is especially important in the context of adoption of the ISO 14000 series in Hungary, which will lead companies into significantly more responsible environmental protection programs.

ANNUAL BUDGET

Year	Source of Revenues	Total Budget, USD
1996	WEC	43 589
1997	WEC	36 727
1998	n.a.	n.a.

STAFF

The Center has three part-time staff.

The director of the organisation is Prof. Dr. Ákos Rédey, the head of the Department of the Environmental Engineering and Chemical Technology at the University of Veszprém. In addition to his chemical engineering diploma, he has earned an MSc degree in environmental management.

Administration is provided by Dr. Rita Földényi, an associate professor at the Department of Environmental Engineering and Chemical Technology at the University of Veszprém.

PARTNERS

The PPC in Veszprém has close links with other Departments of the University of Veszprém. The Center is in good cooperation with research institutes and enterprises, as well as with the Ministry of Environment and Regional Policy.

The Center has excellent links with other institutions which can assist in managing successful consultations and courses. The graduate and postgraduate students at the School of Environmental Engineering of the University of Veszprém can be involved in this work as well.

ACTIVITIES

The Center organised three seminars on waste minimisation (September 1995, November 1995, April 1996).

Technical assistance was provided to the following companies:

- Alkaloida Chemical Company, Tiszavasvári,
- Budapest Chemicals Works, Budapest,
- Tiszai Vegyi Kombinát Rt., Tiszaújváros,
- Nitrokémia Rt., Fûzfõgyártelep,
- Magyar Viscosagyár Rt., Nyergesújfalu,
- United Chemical Plant, Budapest,
- BorsodChem, Kazincbarcika,
- MEDIKÉMIA, Szeged.

PUBLICATIONS

1. Manual: A 10-Step Program for Success.
2. World Environment Center/ Status Report - 1996, Waste Minimisation Program, Monetary & Environmental Benefits.
3. Attila Vonyó, Imre Magyar, László Füle. Implementation of a New Solid Waste Management System in Zirc, Hungary.
4. Katalin Csosz. Environmental Effects of Aluminium Smelter Industry, Presentation of Inota Aluminium Ltd. Considering technologies causing air pollution.

HUNGARIAN CLEANER PRODUCTION CENTRE

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ESTABLISHMENT

The Hungarian Cleaner Production Centre (HCPC) was established in 1997 within the UNIDO/UNEP National Cleaner Production Centres Programme. The Centre is an independent, non-profit organisation and is hosted by the Budapest University of Economic Sciences (Department of Environmental Economics and Technology).

MISSION

The HNCPC serves as a central co-ordinating and catalytic clearing house determined to:

- contribute to sustainable industrial development in Hungary,
- improve the environmental performance and competitive advantage of industry by means of CP,
- increase nation-wide awareness of CP and sustainable development, and therefore
- reach an overall reduction of environmental pollution.

The mission of the HCPC is reduction of environmental pollution, continuous improvement of the environmental situation of the Hungarian economy; stimulation of entrepreneurial innovation through CP; and serving as a central information point for preventive environmental protection in small and medium-sized enterprises.

ANNUAL BUDGET

Year	Source of Revenues	Total Budget, USD
1997	UNIDO/UNEP	n.a.
1998	UNIDO/UNEP, commercial services	n.a.

STAFF

The Centre has a core staff of 5 people including the director, the vice-director and the manager of the office. It also employs project managers who are responsible for individual projects.

PARTNERS

- A broad network of experts working at Hungarian university departments and other educational and research institutions providing basic know-how and innovation capacity (Academy of Sciences, OMFB, etc.)
- Public administration (i.e. Ministry of Environment and Regional Policy, Ministry of Industry and Trade, municipalities)
- Industrial and service sector (Chamber of Commerce, industrial associations, individual companies)
- National Cleaner Production Centres (e.g. Czech, Slovak, Austrian), International Information Networks (e.g. INEM - International Network for Environmental Management), institutes and universities around the world (Economic University of Vienna, Technical University of Graz, etc.)
- UNIDO
- STENUM Graz.

ACTIVITIES

The HCPC works on a non-profit basis and helps companies, consulting firms and policy makers to understand the concept of cleaner production and to put it into practice.

The Centre intends to reach its objectives through concentrating its activity on the following:

- Developing information systems about cleaner and environmentally benign technologies and new developments in this field, aimed at disseminating this information throughout the country. Collected information includes:
  - environmentally relevant technology information (state of the art, state of science),
  - information about technical and organisational problem solutions in the field of CP (e.g. environmental management systems),
  - information about consulting services, expertise and literature,
  - information about current/expected international and Hungarian legislation and guidelines in the field of cleaner production and consumption.
- Developing educational programmes, organising training programmes/courses.
- Organising and co-ordinating in-plant demonstration projects, dissemination of the results among other companies. Special emphasis is given to solving environmental problems of small- and medium-sized enterprises. The HCPC helps SMEs with consulting and advice, but a financial contribution from the companies is also expected.
- Providing policy advice and preparing environmental policy papers in order to help the establishment of the basis for the expansion of preventive technologies.

Guiding principles of HCPC include networking, sustainability, advocating state-of-the-art, non-profit operation, regional approach and differential pricing for services.

TECHNICAL ASSISTANCE CENTRE FOR POLLUTION PREVENTION EMI-ECO, ESTONIA

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ESTABLISHMENT

EMI-ECO, Estonia was established by WEC in 1994 at the Estonian Management Institute within the World Environment Center's Waste Minimisation Programme financially supported by the USAID. In 1998, the Estonian Management Institute was closed and the Center was reorganised into a private non-advocacy, non-profit organisation.

MISSION

The Technical Assistance Center for Pollution Prevention in Estonia contributes to sustainable development in Estonia by disseminating expertise in eco-efficient management of resources, and publicising the measurable economic and environmental benefits resulting from pollution prevention and environmental management activities. The Centre also provides confidential on-site technical assistance, as well as training and information to industries, government and other institutions.

ANNUAL BUDGET

Year	Source of Revenues	Total Budget, USD
1996	WEC, commercial services	70 000
1997	WBCSD, commercial services	95 000
1998	Ministry of Environment of Finland, Estonian Environmental Fund, commercial services	105 000

STAFF

Name	Responsibility	Expertise
Dr. Anne Randmer	Director	Environmental management systems and environmental audits, integrated environmental permits
MSc. Juhan Ruut	Technical Expert	CP, integrated environmental permits (incl. implementation of BATs)
Dipl. Eng. Kai Helm	Technical Expert	Environmental management systems and environmental audits
MSc. Tea Nõmmann	Technical Expert	Environmental management systems and environmental audits
Dipl. Eng. Elmu Potter	Technical Expert	CP: energy saving projects
Dr. Valdu Suurkask	Technical Expert	CP and P2: water saving and waste water projects

PARTNERS

To fulfil its mission and provide services at the highest quality, EMI-ECO is a member of an international network of CP Centres. The Centre also works in co-operation with international funding and donor institutions, e.g. PHARE, EBRD, NEFCO, World Bank, Environment Fund of Estonia, UNDP, UNEP, UNIDO.

ACTIVITIES

EMI-ECO develops and conducts the following comprehensive training programs:

- post-graduate course on environmental legislation (EU, and national) for industries, municipalities and government,
- basics of CP (awareness raising and promoting the "win-win" approach) for industries, municipalities and government,
- advanced CP (preparation of implementation projects in industries),
- on-site technical assistance (implementation of CP projects in industries),
- basics of environmental management systems (ISO 14000, EMAS awareness raising) for industries, municipalities and government,
- advanced environmental management (implementation of environmental management systems based on ISO 14000 and EMAS).

To fulfil its tasks, EMI-ECO has a CP and environmental management library and a database of environmental regulations (national and international), BAT-notes (best available technique guidelines), best practice guidelines and CP case studies, as well as a set of equipment to conduct on-site sampling of emissions and measurement of resource consumption.

EMI-ECO provides on-site technical assistance to industries by:

- preparing CP projects and conducting feasibility studies,
- assisting with practical implementation of CP projects (project management),
- assisting industries in preparation of integrated pollution prevention and control permits (in line with the EU's IPPC Directive 96/61),
- carrying out follow-up activities of implemented CP projects,
- assisting in finding financial resources for CP projects,
- helping industries in loan negotiations with financial intermediaries (acting as a local screening facility)
- facilitating joint implementation projects (in the frame of the Climate Change Convention),
- evaluating BAT possibilities and carrying out action plans to introduce BAT,
- assisting in implementation of internationally recognised environmental management systems.

The industries that fall under the Integrated Pollution Prevention and Control Directive's (EU Directive 96/61) obligations are considered to be the first priority target group for EMI-ECO.

It is foreseen that EMI-ECO will act as screening facility for industrial restructuring project applications (including CP projects) that are submitted for funding to international financial institutions (EBRD, WB, NEFCO, NIB).

During 1996-1998, EMI-ECO played a leading role in working out the CP programme for Estonia's National Environment Strategy and National Environmental Action Plan.

During 1998-1999, EMI-ECO is actively involved in implementation of the EU Directive 96/61, Integrated Pollution Prevention and Control (preparing and carrying out training programmes for regional environmental authorities, conducting pilot projects in industries).

RESULTS ACHIEVED

EMI-ECO has assisted 11 industries (i.e. metal finishing, chemical, dairy, meat processing, oils shale refining, leather tanning, pulp and paper) to implement more than 60 CP projects over its period of activities. The types of projects included process control improvement, equipment modification, changes in operating practice, process modification, and raw material substitution. The total investment of 250 000 USD resulted in savings of 800 000 USD to the enterprises.

The environmental benefits of the projects are summarised in the following table:

Air Pollutant	**Emission Reduction (tons/year)**
Hydrocarbons	0.4
Hydrochloric acid	36.0
SO_2	46.4
CO	3.9
Water Pollutant	**Discharge Reduction (tons/year)**
Chemical oxygen demand (COD)	1,084.0
Wastewater (containing metals and other contaminants)	860,000.0
Waste Material	**Disposal Reduction (tons/year)**
Miscellaneous hazardous waste	1,780.0
Lost production (paper)	334.0
Raw Material	**Savings (tons/year)**
Fresh water	860,000.0
Fuel oil	180.0
Solvents and other organic	4,430.0
Hydrochloric acid	36.0
Pulp fibre	13.0

PUBLICATIONS

1. Facility Pollution Prevention Guide, EPA/600/R-1992/088. Tallinn, 1995 (in Estonian).
2. Economic and Environmental Benefits of Industrial Waste Minimisation in Estonia, Latvia and Lithuania. The World Environmental Center. Tallinn, 1996 (in Estonian).
3. WEC Waste Minimisation Program for Estonian Industries. Tallinn, 1996 (in Estonian and English).
4. Cleaner Production as a Key to Raise Productivity and be Successful on the Market. Environmental Engineering Magazine. Tallinn, 1997 (in Estonian).
5. Dissemination of Cleaner Production Principles in Estonia – how slow it is? Proceedings of 4th European Cleaner Production Roundtable. Oslo, 1997.
6. Changes in Environmental Permitting Principles – integrated and BAT-oriented approach. Environmental Engineering Magazine. Tallinn, 1999 (in Estonian).

LATVIAN POLLUTION PREVENTION CENTER

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ESTABLISHMENT

The Latvian Pollution Prevention Center was established in December, 1994 within the World Environment Center's Waste Minimisation Programme financially supported by the USAID. Since the WEC finished its activities in September 1997, the LPPC has been registered as a non-profit company with limited liability.

MISSION

The Latvian Pollution Prevention Center (LPPC), as an independent, non-profit organisation, educates, promotes and introduces advanced waste minimisation, cleaner production programs and environmental management systems in manufacturing plants. Activities are designed to generate measurable environmental and economic benefits, hence sustaining the overall development of Latvian industry.

LPPC services will help Latvian enterprises to:

- enter the growing market of environmentally-friendly goods,
- meet EU environmental standards, which require stricter emission permits and use of more modern technology,
- be competitive in western markets adopting EMS and ISO 14 000 standards, and
- improve health and safety conditions for employees.

ANNUAL BUDGET

Year	Source of Revenues	Total Budget, USD
1996	Sponsors (WEC)	32 077
1997	Sponsors (WEC), consulting services	29 065
1998	Consulting services, international projects	24 000

STAFF

Only the Director of the Latvian Pollution Prevention Center works on a full-time basis. Additionally, an accountant is employed on a part-time basis and 3-4 consultants work on a project basis.

PARTNERS

In country:

- Industrial enterprises,
- Latvian Association for Environmental Management,
- Latvian Association of Mechanical Engineering and Metalworking Industries,
- Non Governmental Organisations Center ,
- Latvian Chamber of Commerce and Industry,
- Latvian Technical University,
- FEMIRC-Latvia (Fellow Member to the Innovation Relay Centers),
- Latvian Waste Management Association,
- Private environmental consulting companies.

Abroad:

- International Network for Environmental Management - INEM (Germany),
- European Society for Environment and Development - ESED (Belgium)
- Other European PPCs,
- Finish, Danish, UK Environmental Consulting Companies,
- Know-How Fund, UK,
- International organisations (UNEP, UNIDO, OECD, etc.).

ACTIVITIES

Latvian Pollution Prevention Center is involved in the following activities:

- consulting and training in waste minimisation/cleaner production, EMS,
- technology transfer,
- consulting for Latvian environmental legislation related to industrial activities,
- finding partners for local and East-West cooperation,
- experience exchange seminars for industrial enterprises,
- translation and dissemination of technical and training information on CP
- international contacts and co-operation with environmental organisations.

Presently, the LPPC provides consulting services for projects sponsored by the Danish, Finnish and UK governments:

- Capacity Building for Cleaner Technologies in Latvia,
- Project to assist Latvia in approximation of EU Laws concerning Industrial Pollution Prevention and Control and Environmental Management in Industry,
- Environmental Management System in the Pharmaceutical Industry in Latvia,
- Raising Awareness on Cleaner Production in Latvian Industry,
- Ligatne Paper Mill Environmental Project.

Additionally, the Center is involved in elaboration of the terms of reference for bilateral Latvian-Finnish environmental projects:

- Daugavpils Regional Environmental Project,
- Training Course for Industries in CP/WM and participation in project implementation.

The Center also organises Experience Exchange Workshops in WM/CP for electroplating industries and disseminates technical information on environment friendly water-based degreasers.

RESULTS ACHIEVED

16 local experts were trained in short-term programmes. In addition, approximately 100 employees of recipient organisations have been trained in CP during the implementation of the projects.

The Centre carried out 19 waste minimisation projects in different industrial sectors (metal finishing, chemical, cement manufacturing, textile, dairy). Total investments in the projects in the amount of 262 375 USD resulted in annual savings of approximately 1 044 000 USD to enterprises.

Environmental benefits from projects in 1995 and 1996 are summarised in the following table:

Results Achieved	1995	1996
Total reduction of waste (t/year)	139.7	152.3
Total reduction of wastewater (m^3/year)	163.600	167.350
Total reduction of air emissions (t/year)	392.2	418.2
Raw material savings (t/year) Fresh water (m^3/year) Fuel oil (t/year)	42.6 126.400 9.890	42.6 130.150 9.890

PUBLICATIONS

1. Pollution Prevention Opportunities. Riga, 1993 (in Latvian).
2. Pollution Prevention Opportunities. Riga, 1993 (in Latvian).
3. Facility Pollution Prevention Guide, EPA/600/R-92/088. Riga, 1995 (in Latvian and Russian).
4. Economic and Environmental Benefits of Industrial waste minimisation in Estonia, Latvia and Lithuania, The World Environmental Center. Riga, 1996 (in Latvian).
5. Video, 17 min. WEC Waste Minimisation Program for Latvian Industries. Riga, 1996 (in Latvian, English and Russian).

POLLUTION PREVENTION CENTRE AT THE INSTITUTE OF ENVIRONMENTAL ENGINEERING, KAUNAS UNIVERSITY OF TECHNOLOGY, LITHUANIA

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ESTABLISHMENT

Based on a co-operation agreement with the World Environment Centre, the Pollution Prevention Centre was founded at the Institute of Environmental Engineering (APINI) in April 1994.

MISSION

The Kaunas PPC aims to become the primary centre in Lithuania for providing industrial sectors with relevant research, technical assistance and training on various environmental subjects (e.g. EMS) and critical management skills (e.g. problem solving and raising funds), all with the ultimate goal of introducing cleaner production techniques, preventing pollution, and achieving economic savings. These industry-aimed services will be supplemented by educational efforts for related governmental organisations, NGOs, and academia.

ANNUAL BUDGET

Year	Source of Revenues	Total Budget, USD
1996	WEC, consulting services	80 000
1997	WEC, consulting services	162 000
1998	consulting services	140 000

STAFF

Name	% time on PPC	Responsibility	Expertise
Jurgis Staniskis	75%	Professor, Director, dr.hab.	CP, EMS, environmental engineering
Jonas Kapturauskas	100%	Project Manager	Dr., CP
Audrius Sileika	100%	Project Manager	Dr., EMS, auditing
Darius Pamakstys	100%	On-site Assessment	MSc., engineering & data base services, EMS
Irina Kliopova	100%	On-site assessment Library	MSc., CP, financial engineering
Zaneta Stasiskiene	100%	Marketing	Engineer, CP, financial engineering
Jolita Kruopiene	30%	Chemist	MSc., ecological engineering

PARTNERS

Partners in Lithuania:

- USAID – Lithuania,
- Chemonics – EAPS Project,
- Lithuanian Confederation of Industrialists,
- Lithuanian Ministry of Economics,
- Lithuanian Ministry of Environment and its Regional Departments,
- Kaunas Municipality,
- Lithuanian Universities,
- Lithuanian Cleaner Production Society.

Partners abroad:

- International Institute for Industrial Environmental Economics, Lund University, Sweden,
- World Cleaner Production Society, Norway,
- World Environment Centre,
- Danish EPA, East Environmental Fund,
- Technical University of Denmark,
- EU LIFE,
- US EPA,
- International Network for Environmental Management (INEM),
- OECD,
- Regional Environmental Centre, Szentendre,
- EU TEMPUS,
- Baltic University Network, Uppsala University, Sweden,
- IVAM, Amsterdam University, The Netherlands,
- UNEP,
- CP Centres in CEEC,
- Yale University, USA.

ACTIVITIES

CP Projects and Programs since 1993:

- Waste Minimisation Opportunity Audits to Introduce Cleaner Technologies in Lithuanian Industry (1993-1995). *Partners*: Rendan AS (Denmark), Lund University (Sweden); 8 companies.
- Waste minimisation demonstration projects implementation in Chemical industry (1993-1996). *Partner*: World Environmental Centre (WEC, USA); 6 companies.
- The First Norwegian - Lithuanian Cleaner Production Training Program (1995-1996). *Partner*: World Cleaner Production Society (Norway); 14 companies.
- Implementation of Cleaner Production in Lithuanian Tanneries (1996-1998). *Partners*: Chemcontrol AS (Denmark), UAB “Ecobalt” (Lithuania); 5 companies.
- Implementation of Cleaner Production Project in Lithuanian Textile Industry (1996-1998). *Partner*: IVAM, University of Amsterdam (The Netherlands), 8 companies.
- The Second Norwegian - Lithuanian Cleaner Production Training Program (1997-1998). *Partners*: World Cleaner Production Society (Norway), Det Norske Veritas (Norway); 14 companies.

- Cleaner Production Dissemination seminars in NIS (Armenia, Azerbaijan, The Kyrgyz Republic, Kazakhstan, Moldova). (1997). *Partners*: OECD, ERM (UK).
- The project Cleaner Production Centre Networking in CEEC - Experience Transfer and Development Assistance (1998). *Partners*: Regional Environmental Centre (REC), Czech Cleaner Production Centre.
- The Third Norwegian - Lithuanian Cleaner Production Training Program (1998-1999). *Partners*: World Cleaner Production Society (Norway), Det Norske Veritas (Norway); 15 companies.
- Financing of Cleaner Production projects (1998 - 2000) - 11 Lithuanian companies to date. *Partners*: Nordic Environmental Finance Corporation (NEFCO).
- The demand for environmental technologies, services and their providers (1997 - 1998). *Partner*: The Regional Environmental Centre for Central and Eastern Europe.
- Capacity Building in Environmental Auditing in Lithuania (1998 - 1999). *Partners*: Det Norske Veritas (DNV), 13 Lithuanian companies.
- Strengthening the Framework and Administration of Lithuanian Laws on Waste Management and on Environmental Management of Industry (1997-1999). *Partners*: COWI, Miljokemi (Denmark); 6 companies.
- Environmental Due Diligence Training of EBRD's Financial Intermediaries (1999). *Partners*: Jacobsen Engineering LtD., UK; 2 Lithuanian Banks.
- Implementation of Cleaner Technology in Lithuanian Slaughter Houses (1998-2000). *Partners*: COWI, (Denmark) COWI Baltic (Lithuania); 8 companies.
- The Fourth Norwegian - Lithuanian Cleaner Production Training Program (1999) *Partners*: World Cleaner Production Society (Norway), Det Norske Veritas (Norway); 15 companies.

The Centre delivers lectures for university students. The course "Cleaner production approach and its implementation in Lithuanian industry" was developed in 1994 and was delivered during the last three years. Approximately 15 students per year attended the course.

In 1997 the Kaunas PPC also started implementation of small technical assistance projects, for example:

- Contract with Kaunas Municipality "Principles of automated monitoring and management system for air pollution".
- Contract with AB Kraft Jacobs Suchard Lietuva "Analysis and evaluation of process effluents and wastes".
- Subcontract agreement between Electrotek Concepts, Inc. and the Kaunas PPC.

The Kaunas PPC established a specialised portable and mobile laboratory which is used for technical assistance to enterprises in sampling and monitoring of environmental parameters related to pollution generated by enterprises, analysis and technical-economic evaluation of flow and energy losses in production processes, detecting the sources and emissions of pollutants.

The mission for the Kaunas PPC according to its business plan will be achieved by concentrating on the following four strategic efforts:

- Technical assistance (incl. CP/WM opportunity assessment, research, laboratory services etc.) in Lithuania and other CEEC/NIS.
- Environmental management (incl. training, auditing, consulting in EMS and standards, certification).
- Financial intermediary (incl. training in "Financial Engineering", preparation of bankable CP projects and loan applications, project monitoring and supervision, project progress reports).
- Education (including courses on CP and EMS for undergraduate and postgraduate students, co-ordination of Ph.D. studies in environmental engineering).

RESULTS ACHIEVED

There are no total figures on environmental and economic benefits for all projects. Some data on emission reduction and raw material savings from 13 waste minimisation projects in chemical companies in Lithuania, funded by USAID, is presented in the table below. The total investment of 167 490 USD (by both US AID and enterprises) resulted in savings of 473 130 USD.

Air Pollutant	**Emission Reduction (tons/year)**
sulphur dioxide (SO_2)	62
particulates	60
nitrogen oxides (NO_x)	41
carbon monoxide	35
Raw Material	**Savings (tons/year)**
fuel oil	3 140
solvents and other organics	170
methane	490

PUBLICATIONS

1. Manual on Waste Minimisation and Environmental Management, 1995.
2. Training Material for Norwegian - Lithuanian Cleaner Production Training Program, 1996.
3. Strategy, Planning and Business Analysis as Basis for Pollution Prevention (training material), 1996.
4. Implementation of Cleaner Production Projects in Lithuanian Textile Industry (manual), 1997.
5. Implementation of Cleaner Production Projects in Lithuanian Food Industry (manual), 1997.
6. Implementation of Cleaner Production Projects in Lithuanian Textile Industry. Case Studies, 1998

POLISH CLEANER PRODUCTION CENTRE NIF-NOT, POLAND

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ESTABLISHMENT

The Polish Cleaner Production Centre NIF-NOT was established in 1991 through the Polish-Norwegian Cleaner Production Programme. The Centre is an independent structure within the Polish Federation of Engineering Societies. It serves as secretariat of the Polish Cleaner Production Club, which is an organisation within the Federation co-ordinating the Polish Cleaner Production Programme and the activity of the Polish Cleaner Production Movement.

The Polish CP Centre co-ordinates the work of 8 regional centres.

MISSION

As a mission for the Polish CP Programme, the Centre has chosen:

- extensive implementation and dissemination of the CP concept throughout the country, and
- "keep active all the time" approach for all participating companies and engineers, to secure and deepen the results achieved.

ANNUAL BUDGET

Year	Source of Revenues	Total Budget, USD
1996	Norwegian Government	n.a.
1997	The Polish National Environmental Fund	n.a.
1998	The Polish National Environmental Fund, services to enterprises	n.a.

STAFF

The Centre employs 5 part-time staff at the central office in Katowice and 8 part-time staff in the regional centres (one for each regional centre).

PARTNERS

The Centre has permanent contacts with the Ministry of Environment, Natural Resources and Forestry through the Secretary of State responsible for Cleaner Production. Agreements of co-operation are signed with regional and local authorities throughout the country. The Centre has close contacts with a number of universities.

ACTIVITIES

The Polish CP Programme has a 3-level development scheme:

1. lecturing on environmental strategies and policies, including EMS,
2. designing and implementation of a CP case/demo project, and
3. building a Policy Framework and the Cleaner Production Environmental Management System (CP EMS).

The first two levels are organised in so-called CP Schools (until now 36 CP schools; each one for 20-30 companies). Level 1 and/or 2 has been completed by around 1800 participants from about 900 companies and institutions (local government, schools, universities, consulting companies).

Level 3 (started in 1996) is a voluntary EMS scheme addressed to production and service companies. After successful completion of the School, companies can start this scheme by applying for a CP Company's Certificate, issued by:

- The Federation of Engineering Societies,
- The Polish Monitoring and Certification Centre, and
- The Governmental Agency for Techniques and Technology.

There are 199 companies that received the CP Certificate as of the end of 1998. The owner of the Certificate is entitled to:

- use the Polish CP logo,
- priority recommendation for environmental credit lines,
- register in Official CP Companies Register, active within the UNEP CP Network.

Based upon the results of the Polish CP Programme, the Polish Parliament in 1997 introduced a CP strategy into the revised Environmental Law. As a future activity, a so-called "CP 2000 Action" is planned, aiming at introducing the CP strategy in all Polish companies by the end of the century.

RESULTS ACHIEVED

In 32 CP Schools organised by the end of 1997, 1083 CP experts have been trained and 550 demonstration projects implemented. The average results of 10 randomly selected CP schools are the following:

- solid waste reduction by 38%,
- liquid waste reduction by 52%,
- gaseous waste reduction by 41%,
- water use reduction by 45%,
- Energy (electricity) saving of 26%.

PUBLICATIONS

1. Organisation and Running of Cleaner Production Schools, Katowice, 1993.
2. Environmental Protection and Cleaner Production (materials distributed to CP school participants) - Polish CP Programme, Katowice, 1991-1997.
3. Cleaner Production - Handbook of UNEP IE, Paris, 1995.
4. Articles in CP Bulletin, Polish Edition of the UNEP CP Bulletin, 1994-1998.
5. Guidelines: How to Apply for a "Company' CP Certificate" - Application for voluntary CP EMS for companies from the production and service sector, Katowice, 1996.
6. Handbook for CP in Surface Finishing, Katowice, 1998.
7. Library of 550 CP Case projects from various branches of industry, 1991-1997.
8. Guidelines: How to Apply for a "Company' CP Certificate" - Application for voluntary CP EMS for companies from the production and service sector, Katowice, 1996.
9. Handbook for CP in Surface Finishing, Katowice, 1998.
10. Library of 550 CP Case projects from various branches of industry, 1991-1997.

POLLUTION PREVENTION CENTER AT THE TECHNICAL UNIVERSITY OF LODZ, POLAND

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ESTABLISHMENT

The Pollution Prevention Center (PPC) was established in August 1994 within the World Environment Center's Waste Minimisation Programme financially supported by USAID. The Center is an independent unit at the Lodz Technical University.

MISSION

The Centre provides advisory services that will help enterprises reduce waste streams, improve production efficiencies, contribute to overall development of their business and introduce the Environmental Management Systems (EMS). It would ultimately bring significant economic savings and environmental benefits, including compliance with local regulation, for high growth Polish enterprises.

ANNUAL BUDGET

Year	Source of Revenues	Total Budget, USD
1996	WEC, commercial services	n.a.
1997	WEC, commercial services	63 150
1998	WEC, commercial services	n.a.

STAFF

The administrative team consists of three managers: a director, a co-ordinator, and an office manager. In addition, two student interns provide assistance. All employees of the Centre work on a part-time basis.

The Center's staff is comprised of faculty, assistants, and students at the Technical University of Lodz. The staff has expertise in chemical and process engineering, environmental economics, and environmental management. The staff has participated in numerous environmental training workshops, e.g. a series of workshops focusing on environmental auditing and environmental management systems sponsored by the WEC. The PPC staff is also trained and equipped to conduct energy saving audits.

PARTNERS

The main partners of the Center are the World Environment Center and the International Network for Environmental Management (INEM).

There are two other PPCs in Poland that are also being developed with the assistance of the WEC: Atmoterm Ltd. in Opole and the Silesian Technical University PPC in Katowice. The Centre initiated a dialogue with them, in anticipation of a possible partnership on certain projects where collective strengths and expertise can be combined to provide a more effective service working as a team.

ACTIVITIES

The PPC at the Technical University of Lodz has several functions, such as conducting basic research in clean technologies, organising workshops and seminars on cleaner production, conducting environmental waste audits, and carrying out waste minimisation programs. The Centre has also translated a number of technical documents on cleaner production and waste minimisation to Polish. The Centre has worked with several industrial sectors, i.e. the electroplating, tannery, chemical, and dairy processing.

To date, the PPC carried out the following activities:

- Environmentally Friendly Technology Seminar (October 1995).
- Waste minimization project in the Meat and Dairy Industries (December 1995).
- Poland-wide conference - "Cleaner Technologies for Protective Coatings" (October 1996).
- Training workshop - Waste minimization for tanning industry (January 1997).
- Waste minimization project in tanneries (April 1997).
- Waste minimization project in the electroplating industry (June 1997).
- Meeting of executives from electroplating industry in Lodz region (February 1998).
- Second Poland-wide conference "Cleaner Technologies for Protective Coatings" (November 1998).
- Poland-wide conference: "Management-Effectiveness-Environment" (February 1999).

Currently, the PPC is involved in the following projects:

- Experimental project "Study of process of heavy metal ion removal from industrial waste water using an active porous material".
- Evaluation of introduction of cleaner production possibilities for Polish industry.
- Studies on advanced recycling of electrical and electronic equipment.
- Studies on advanced separation techniques in food processing industry.

As a unit affiliated with an academic institution, the PPC endeavors to spread the idea of sustainable technological development in the sphere of industrial activity. For example, "Environmentally Friendly Technology" was the title of the first seminar organized in 1995. Its purpose was to encourage industry representatives and academics in Poland to think about environmentally sound production processes. University representatives and authorities from five countries delivered fundamental lectures.

The PPC is looking to expand its boundaries for the future by promoting innovative concepts for waste minimization to industries in Poland. From the beginning, the Center's primary interests within the domain of sustainable production/consumption were low waste technologies and eco-design. Recently, the PPC started developing a study on the industrial ecology concept. The Center also plans to introduce the idea of eco-industrial parks to Poland. In addition, the Center is starting projects in the field of electronics and electrical equipment (EEE) recycling.

RESULTS ACHIEVED

The projects implemented with the assistance of the Centre resulted in total reduction of waste by approximately 490 t/year and total reduction of waste water by approximately 70 000 m^3/year.

POLLUTION PREVENTION CENTER AT SILESIAN TECHNICAL UNIVERSITY, POLAND

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ESTABLISHMENT

The Pollution Prevention Center was established in 1995 as a result of an agreement of co-operation between the World Environment Center and the Faculty of Materials Science, Metallurgy and Transportation of the Silesian Technical University. The Center is an autonomous entity closely related to the university, but is fully financed from outside sources.

MISSION

The mission of the Center is to provide professional, reputable services including: pollution prevention, cleaner production and environmental management training; and technical advisory and information services for managers of metallurgy and other kinds of heavy industry, especially for enterprises located in the Upper Silesia region.

ANNUAL BUDGET

Year	Source of Revenues	Total Budget, USD
1996	WEC, commercial services	25 000
1997	WEC, commercial services	60 000
1998	WEC, commercial services	25 000

STAFF

The staff team consists of 6 part-time employees.

PARTNERS

- World Environment Center, New York,
- International Network for Environmental Management,
- Network of Polish and other Pollution Prevention Centers in CEEC,
- Universities.

ACTIVITIES

The Center specialises in training, information dissemination and consulting services on pollution prevention, waste minimisation, environmental management systems and energy efficiency for managers of heavy industry, especially metallurgy, chemical and power engineering.

RESULTS ACHIEVED

Over the last 5 years, the PPC Katowice has organised 6 seminars dealing with pollution prevention and summarising the waste minimisation program in 11 metallurgical and foundry enterprises. Companies participating in the program saved about 3.7 million USD per year, with an average investment payback time of about three months. Last year, the Center put a special emphasis on environmental management issues. The UNEP/ICC/FIDIC Environmental Management System resource kit was translated into Polish. It can be used now as a train-the-trainers handbook. Based on this manual, a series of workshops on EMS has been scheduled for 1999.

PUBLICATIONS

1. Environmental Management System. Training resource kit. Habex, Gliwice 1998.
2. Barglik J. Restructuring of METALODLEW S.A. Regarding Environment Friendly Activities. Proceedings of the second Eco Baltic Conference. Gdansk, 1997.
3. Barglik J. - Less Pollution, More Money. Technical Magazine Ecoprofit 2/97.
4. Proecological investments in selected heat power plants. Materials of American-Polish Post Diploma Studies. Issue no 41, Katowice, 1997.
5. Pollution prevention strategy. Materials of American-Polish Post Diploma Studies. Issue no 56, Katowice, 1998.
6. J. Barglik Pollution Prevention Center at Silesian University of Technology. Cleaner Production in Poland, no 1/97.

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ESTABLISHMENT

The PPC Opole at ATMOTERM was established in January 1995 as a result of a co-operation agreement between the World Environment Center and the Polish Environmental Consulting and Environmental Software Company - ATMOTERM Ltd.

MISSION

The mission of the PPC is to provide professional, reputable services for enterprises, located throughout Poland, which will enhance their ecological as well as economical viability. The goal is achieved through delivery of state-of-the-art solutions in environmental information technology and management.

ANNUAL BUDGET

Year	Source of Revenues	Total Budget, USD
1996	WEC, commercial services	n.a.
1997	WEC, commercial services	n.a.
1998	WEC, commercial services	n.a.

STAFF

The Centre employs 10 full-time staff members.

PARTNERS

- World Environment Center, New York,
- International Network for Environmental Management,
- PPC Katowice, Lódz,
- Pollution Prevention Centers in Lithuania, Latvia, Estonia,
- Universities (Environmental Engineering).

ACTIVITIES

The PPC is a division of a larger consulting company. After 3 years of close co-operation with the World Environment Center it has achieved full self sustainability. The parent company is located in one of the most polluted Polish regions - Silesia. It has its branch offices throughout Poland and employs over 70 full-time staff consultants and software developers. The PPC uses all company resources including conference facilities, internet server, and environmental information centre. PPC has it own measurements equipment: combustion gases analyser, ultrasonic leak detector, vapour gases portable detector, and waste and waste water analyser (spectrophotometer).

Since 1995, the PPC staff has worked in various industrial assignments, including:

- over 200 emission gases measurements,
- implementing ISO 14001 in more than 10 enterprises (sectors: construction, automotive, chemicals, pulp and paper, printing),
- implementing waste minimisation demonstration projects (fertiliser industry in Poland).

The Center also provides training in:

- EMS Implementation,
- Environmental Law,
- Environmental Impact Assesment.

Over 400 enterprises and institutions participated in training programmes by the end of 1998.

The first main task realised by the PPC Opole was a mailing campaign promoting waste minimisation projects in Poland, (demonstration of the environmental and economic benefits of waste minimisation and pollution prevention at the source within the technological process). The PPC selected over 800 Polish industry plants from different sectors (chemical, pharmaceutical, non-ferrous metals, meat processing, dairy industry) to receive the mailing.

In November 1995, the WEC and PPC Opole organised a chemical industry seminar in Opole on the results achieved from waste minimisation and cleaner production in Poland. The main purpose of this seminar was to share efforts, ideas and experience with other chemical plants, as well as to convince them to organise waste minimisation and cleaner production programs at their sites.

In February 1996, the WEC conducted a waste minimisation workshop for Polish environmental experts on the methods and philosophy of waste minimisation. The three-day training was held at Opole PPC and was conducted by US experts, as well as volunteers representing US industry and consulting companies.

The PPC Opole prepared a Polish report summarising the results of 52 waste minimisation projects implemented at 18 Polish companies representing the chemical, pharmaceutical, non-ferrous metals, meat processing and dairy industrial sectors. The report presents significant economic benefits realised in the participating companies. By decreasing the use of resources such as water, energy, and raw materials, and by reducing the generation of waste materials, the companies significantly improved their productivity, environmental performance and worker health and safety.

In 1997 the Center established the Internet Database Server which covers effective operating of all programmes connected with pollution prevention, including waste minimisation. The database is designed to provide companies with information on technological and methodological issues, as well as domestic and international CP cases studies.

Industrial projects carried out by the Center include: waste minimisation in the cooling process, measurement for adjustment of paint shop grates burning, environmental audits, waste management permits, waste and waste water management reviews, and environmental impact assessments.

PUBLICATIONS

1. Results of Waste Minimisation Demonstration Projects in Polish Industry, 1996 (description of 52 waste minimisation projects).
2. Results of Waste Minimisation Demonstration Projects in Polish Industry, 1999 (description of 90 waste minimisation projects).

POLLUTION PREVENTION CENTER, ROMANIA

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ESTABLISHMENT

The Romanian Pollution Prevention Center (PPC) was established in September 1995 within the World Environment Center's Waste Minimisation Programme financially supported by the USAID.

MISSION

The Center aims to become a leading environmental, not-for-profit consulting firm in Romania, offering industry the best value for a wide variety of technical consulting services. In light of the dramatic changes occurring in Romania, our main strengths will continue to be flexibility, a diverse yet relevant set of technical skills and credentials, and an approach that is very customer responsive. The Romanian PPC will provide this wide array of customer oriented services at affordable prices, but with a high quality of technical expertise and professionalism. The ultimate goal of all these consulting services will be to reduce pollution and to improve the performance of Romanian industry.

ANNUAL BUDGET

Year	Source of Revenues	Total Budget, USD
1996	WEC	120 000
1997	WEC, commercial services	90 000
1998	WEC, commercial services	75 000

STAFF

Full time:

- Vladimir Gheorghievici, Metallurgical Process Engineer,
- Dumitru Smaranda, Chemical Engineer,
- Eliza Tudorascu, Mathematician,
- Adriana Dreghici, Environmental and Energetic Engineer,
- Corina Draghici, Ecologist.

Part time:

- Constantin Rosca, Metallurgical Process Engineer,
- Adrian Murariu, Metallurgical Process Engineer,
- Sorin Cantuniari, Business Administration Student,
- Victor Petcu, Metallurgical Equipment Engineer,
- Daniel Bologea, Electronics Student,
- Adrian Smaranda, Automatics Student,
- Carmen Nantu, Environmental Engineering Student,
- Alina Musuroi, Energetic and Environmental Engineering Expert,
- Mihaela Vasilescu, Ph.D. in Ecology of Water Supplies.

Additionally, the Pollution Prevention Center has good associate experts able to cover the technical and environmental issues of the main industrial sectors, including small and medium-sized enterprises.

PARTNERS

In country:

- Petrodesign
- CEPIEM
- LACECA
- IMNR

Abroad:

- World Environment Center
- Price Waterhouse
- Malcolm Pirnie

ACTIVITIES

The PPC could assist industrial plants' efforts in improving their performance by ensuring necessary information for access to partners able to deliver the best management practices, low-waste technologies and the related possible financing sources existing in the world market.

The Centre is involved in the following activities:

- organising several seminars on Waste Minimisation with up to 450 participants,
- follow - up programs for 8 large industrial plants from different sectors,
- seminars on Environmental Management Systems,
- seminar on Energy Conservation,
- conducting environmental impact assessments,
- assistance with access to international environmental information,
- providing information and contacts with similarly oriented non - governmental and other organisations worldwide, and
- developing and keeping good contacts with all reliable institutions and organisations, experts and associations with similar activities, for cost-effective collaboration.

The Center is certified to perform environmental audits and mass balances. Over 20 contracts in these areas have been signed with private and state-owned companies in the period autumn 1997 - summer 1998. The Center also carried out environmental impact assessments in several Romanian companies.

The Center sold over 200 copies of an "Energy Conservation Manual", 150 copies of a manual on Environmental Management Systems and 150 copies of a "Waste Minimisation Manual", all translated or developed by the Center.

Finally, the Center established a laboratory capable of making analyses of air, water and soil pollution levels. The laboratory is in the process of certification.

The Pollution Prevention Center intends to accomplish the following goals:

- provide eco - efficiency programs to industry,
- provide to industrial plants access to technical, environmental and economic information through its library and data base,
- provide to industrial plants contacts with experts, organisations and companies, domestic and worldwide, able to deliver technical, economic and financial information regarding necessary improvements for management , technology and pollution control techniques,

- provide to industry at competitive costs environmental services like audits, mass balance, environmental impact assessment, technical consulting, and laboratory measurements of different pollutants, with portable or stationary monitoring equipment,
- environmental resources management for different programs or projects.

RESULTS ACHIEVED

Number of people trained in short-term programs:

- on environmental consulting activity: 16 (in 1995)
- on waste minimisation: 86 (in 1996)
- on environmental management systems: 60 (in 1997)

PUBLICATIONS

The Center published the following manuals in Romanian:

1. Waste Minimisation, 1997.
2. Energy Conservation, 1997.
3. Environmental Management Systems, 1997.

RUSSIAN - NORWEGIAN CLEANER PRODUCTION CENTER, RUSSIAN FEDERATION

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ESTABLISHMENT

The Russian - Norwegian Cleaner Production Center (RNC) was established in 1996 by the Norwegian Society of Chartered Engineers and the International Centre of Social and Labor Problems, Russia. The Centre carries out organisation and co-ordination of the CP programmme-related activities.

ANNUAL BUDGET

Year	Source of Revenues	Total Budget, USD
1996	Norwegian Government, regional environmental funds	40 000
1997	Norwegian Government, regional environmental funds	140 000
1998	Norwegian Government, regional environmental funds	160 000

STAFF

The Center employs 5 full-time staff members. Additionally, 25-30 persons are involved part-time in regional programmes.

PARTNERS

- State Committee for Environment and Natural Resources of the Russian Federation,
- Regional Administration,
- Norwegian Society of Chartered Engineers,
- World Cleaner Production Society, Norway,
- NEFCO,
- UNEP,
- UNIDO,
- OECD,
- Det Norske Veritas (DNV), Norway,
- Energy Saving International (ENSI), Norway,
- Savings Bank of the Russian Federation.

ACTIVITIES

Originally, the Programme was implemented only in the north-western region of Russia, including the Arkhangelsk, and Murmansk Regions and the Republic of Karelia. Since 1996 the Programme was extended over the Kaliningrad and Leningrad Regions, St. Petersburg and the Vologda Region. In 1997-1998 two Programmes were implemented in the Republic of Komi, one of which is in the town of Usinsk, the center of the oil production industry of this Republic. In 1998, the Programme was implemented in the Moscow Region.

In order to develop the Programme in the central region of the European part of Russia, information workshops were held in the Yaroslavl, Vladimir, Smolensk, Kaluga, Kursk and Novgorod Regions and in the Republic of Sakha (Yakutia). The Programme is also planned to be implemented in one of the most economically stable, but ecologically bad regions - Republic of Bashkortostan in the South Urals.

Since April 1998 under the NIF support, RNC has been implementing the CP Programme of the second level - Financial Engineering (FE). The "FE" Programme is entirely based on the established CP Programme, as the projects from participants who completed the first level CP Program are being used for further development. The "FE" Programme is focused on the development of project proposals, sp they can meet the requirements of international financial institutions.

In 1998 two "FE" Programmes were implemented on projects designed at enterprises of the Barents Region of Russia, and in early 1999 one "FE" Programme on projects of St. Petersburg and the Leningrad Region.

RESULTS ACHIEVED

To date, 781 specialists from various industry and farming branches have been trained under the CP Programme.

Region	Number of experts trained					
	1995	1996	1997	1998	I quarter 1999	Total
Arkhangelsk region	16	53	49	17	29	164
Murmansk region	8	38	43	53	25	167
Republic of Karelia	14	21	22	48	23	128
Vologda region	-	-	21	45	58	126
Kaliningrad region	-	-	32	22	-	54
St.Petersburg and Leningrad region	-	-	24	65	-	89
Republic of Komi	-	-	-	18	26	44
Moscow region	-	-	-	9	-	9
TOTAL:	**38**	**112**	**193**	**277**	**161**	**781**

At enterprises where local cleaner production programs were implemented, such as JSC “Pechenganikel” (town of Zapolyarny), State Center for Atomic Ship Building (Severodvinsk), JSC “Arkhangelsk WPPP” (Novodvinsk), JSC “Severstal” (Cherepovets), 60, 30, 35 and 47 specialists respectively, were trained.

The total number of enterprises covered by the CP Program from 1995 to the 1st quarter of 1999 amounted to 406, among them by years: 1995 - 36, 1996 - 53, 1997 - 115, 1998 - 132, the 1st quarter of 1999 - 70.

Within the "FE" Programme, 16 project proposals were designed and seven of these proposals have been adopted (by 01/02/1999) for financing by the NEFCO Investment Committee.

PUBLICATIONS

1. Training material on Cleaner Production.
2. Brochures in Russian and in English (1996) and in Russian (1999).
3. Videos about CP activities in the Russian Federation.
4. Reports for European Round Tables on Cleaner Production in Oslo (1997) and Lisbon (1998).
5. The article “It is Profitable to Concern oneself with Ecology”, newspaper “Komsomolskaya Pravda”, 19th March 1999.
6. SCRIPT “ Objectives and Perspectives of the “Cleaner Production” Program Development in the Russian Federation” (1997).
7. “From Knowledge to Action”. In the special issue “A Decade under the Token of Environmental Protection” devoted to the Norwegian-Russian co-operation in the field of environmental protection.
8. “Co-operation in the Name of Environment Preservation”, in the brochure “Norway - Western Neighbor”, May 1998.

SLOVAK CLEANER PRODUCTION CENTRE

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ESTABLISHMENT

SCPC was established in 1994 in the framework of the Slovak-Norwegian Cleaner Production Project. The Centre has broadened its operations under the support of the UNIDO/UNEP National Cleaner Production Center (NCPC) programe in January 1995. Today, SCPC is an independent non-profit organisation with the legal status of civic association. In April 1999 the Slovak PPC, established by the WEC in 1995, became a part of the SCPC.

MISSION

SCPC is to be a national focal point for cleaner production activities to support a proactive, preventive and integral approach in solving industrial pollution problems. Slovak Cleaner Production Centre aims to:

- promote and support CP implementation into existing business operations,
- increase public awareness of CP, and
- change the attitudes of policy makers.

Slovak Cleaner Production Centre, being an independent not-for-profit professional organisation, acts as an interface among industry, consulting companies, government, academia, NGOs, and all interested and involved parties.

ANNUAL BUDGET

Year	Source of Revenues	Total Budget, USD
1996	UNIDO/UNEP, Norwegian and Dutch projects, participant fees.	72 000
1997	UNIDO/UNEP, Norwegian and Dutch projects, participant fees.	89 000
1998	UNIDO/UNEP, Norwegian and Dutch projects, participant fees.	55 000

STAFF

The Centre's full time staff include:
Director Viera Fecková, PhD.,
Training Manager Mgr. Jana Bálešová,
Secretary Dana Schnablová,
Project Manager Ing. Chlumský,
Information Centre Manager, Ing. Jaroslav Burjaniv,

In addition, the Centre employs project managers, consultants, lecturers, interpreters and translators on a part-time and project basis.

PARTNERS

- Slovak University of Technology,
- Slovak Agency for Energy;
- Ministry of Environment, Ministry of Economy, Chamber of Commerce – branch in Prešov, and other state and local institutions,
- Municipalities and their Departments of Environment Protection,
- National Agency for Development of SMEs,
- Technical Universities Košice, Tren•ín, Trnava,
- Slovakia-based consulting companies, i.e. ASPEK Bratislava, CERTOS Pieš•any, Enviconsult ilina, TopEnvitech Nitra, AJS management Bratislava, QES Poprad, IVASO Pezinok, BV Slovakia Bratislava, DNV Slovakia,
- Slovak Technical Committee for EMS and National Accreditation System,
- STENUM, Graz, Austria,
- The Czech Cleaner Production Centre,
- International consulting companies (KWI Vienna, TEBODIN, BKH, IVAM Holland, DNV Norway),
- International organisations (UNEP, UNIDO, EBRD, UNDP, REC),
- Association of Chemical and Pharmaceutical Industry – "Responsible Care" Programme.

ACTIVITIES

The services of the SCPC are designed specifically for each client. The main components of the services provided are the following:

- training and education,
- information,
- technical assistance and in-plant assessments.

The specific service is designed from one or more of these three elements. The focus area is cleaner production - CP Assessment, Environmental Management Systems, H&SMS Health and Safety Management Systems, Responsible Care, Life Cycle Assessment, Life Cycle Impact Assessment and other more or less complex tools.

The Slovak Cleaner Production Centre:

- supports CP project implementation, especially in SMEs,
- offers and provides the necessary education and training to increase environmental awareness and solve particular problems,
- collects and disseminates information from national and foreign sources to support CP projects and further develop the Centre,
- continually improves the quality of services in order to improve the environmental performance of the Centre and its clients/partners.

RESULTS ACHIEVED

- 69 CP projects were performed in companies,
- 186 CP experts were trained,
- 2 of CP and EMS projects are in progress in 7 companies,
- 47 people were trained in the field of EMS,
- 1 project on H&SMS was implemented,
- 12 people were trained in health and safety management systems,
- The lowest estimate of the identified immediate total economic savings (in finished projects) is 29,3 million SKK with important decreases of emissions, waste water and solid wastes of all categories,
- The Information Centre of Cleaner Production and Pollution Prevention was established,
- SCPC become a co-ordinator of ISO TC 207 work for the country; the agreement with the Slovak Institute for Technical Normalisation was reached in September.

PUBLICATIONS

1. From Cleaner Production to EMS - 1998-1999, Information brochure for enterprises.
2. Zdenek Beránek Introduction to Cleaner production - learning material for training, February, 1998.
3. From Cleaner Production to EMS - learning material for training, February, 1998.
4. Manual for Internal Auditors, Ji•í Chlumský, June, 1998.
5. Mária Tomaškovi•ová, A Manual of Internal Auditor of EMS - Legislative Requirements, June 1998.
6. Newsletters of SCPC - three issues.
7. Cleaner production - Principles and Implementation Manual.
8. Annual Reports 1995 - 1998.