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IN-DEPTH EVALUATION OF SELECTED UNIDO ACTIVITIES ON
DEVELOPMENT AND TRANSFER OF TECHNOLOGY

Component 1

The UNIDO/UNEP National Cleaner Production Centres (NCPCs)

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Abstract

The UNIDO/UNEP NCPC Programme confirms that the methodology on which the CP is built is an effective tool for identification and prioritization of technology changes which yield both environmental and economic benefits. However, the Programme has also confirmed that dissemination and application of the CP concept among SMEs on the basis of its own economic merits does not occur easily, so there is a need to support the dissemination of the concept through promotional (awareness raising, training) activities, policy measures and access to financing.

The Programme has contributed to the dissemination and application of the CP concept in the countries supported by the Programme. Its effectiveness can be observed mainly in awareness raising, training of CP assessors, introduction of the CP concept in curricula of educational institutions and, in some countries, integration of CP in the environmental policy framework. Actual impact in terms of environmental and economic benefits at the industry level has been rather modest compared to the potential which exists in the whole industrial sector of the target countries.

Given the constraints explained in the report (such as limited access to financing) the technological changes induced by the Programme are primarily in the lower order of complexity and investment so that most of the implemented changes are not spectacular. This is compounded by the fact that majority of the companies supported by the Programme are SMEs.

For the same reasons these changes call for limited transfer of technology by industry. The Programme has transferred the CP methodology to the countries supported by the Programme and it also entails transfer of some technical know how to industry and to the NCPCs through external consultants participating in in-plant assessments. It appears that more frequent transfer of technology has occurred among stakeholders within the countries. Access to finance is the critical factor of implementing more complex technology changes with significant transfer of technology.

Success at company level depends also on the level of management in the company. The best candidates for CP application are companies introducing or planning to introduce ISO 9000, EMS or ISO 14000, that is the more advanced segment of the SMEs. CP can achieve significant improvement also in highly polluting enterprises which do not belong to this category. However, a certain level of management and financial stability should be a prerequisite for any intervention. Complementing CP advisory services or integrating them with other management advisory services could overcome this problem. Thus, effectiveness and impact of the NCPC Programme could be enhanced if supported by (through integration with) some other UNIDO service modules. However, in order to achieve actual synergy effects it is necessary to ensure that interventions under different UNIDO services are directed towards the same target groups.

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Acronyms

BINAS	- Biosafety Information Network and Advisory Service
CP	- Cleaner Production
EMS	- Environmental Management System
EST	- Environmentally Sound Technology
ETAS	- Environment Technology Assessment System
EU	- European Union
LCA	- Life Cycle Analysis
NCPCs	- National Cleaner Production Centres
PPCs	- Pollution Prevention Centres
TQM	- Total Quality Management
WEC	- World Environment Center

Introduction

1. NCPCs represent the key platform for providing UNIDO services in support of cleaner production. In view of the framework within which the evaluation is conducted (development and transfer of technology) the evaluation is focused on the role the NCPCs play in the transfer and development of technology. However, the issues addressed in this evaluation touch upon some other generic aspects of the NCPC programme which are not confined to the transfer and development of technology alone.

2. In addition to the review of documents available at the UNIDO Headquarters the evaluation is based on interviews of national directors of the NCPCs (during their annual meeting in Prague in March 1999) and information provided by them on selected aspects of their activities. Evaluation of one NCPC (in the Czech Republic) included interviews of other stakeholders (Ministry of Environment, Confederation of Industry, State Environment Fund, the Czech Environment Management Centre, Association of Cleaner Production Managers and a consulting company) and visits of two enterprises assisted by the NCPC in introducing cleaner production measures. The report reflects a number of comments made on the draft report by UNIDO Programme management, UNEP staff, some directors of NCPCs (in particular Slovakia), several UNIDO staff members and some CP assessors (consultants) with extensive field experience.

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1. BACKGROUND INFORMATION

1.1 The cleaner production concept

3. As defined by UNEP, A cleaner production (CP) is the continuous application of an integrated preventive environmental strategy applied to processes, products and services to increase overall efficiency and reduce risks to humans and the environment.¹

4. For *production processes*, CP includes conserving raw materials and energy, substituting toxic/hazardous processing materials by more benign ones and reducing the quantity and/or toxicity of all emissions and wastes before they leave a production process.

5. For *products*, the approach focuses on the reduction of environmental impact during the entire life cycle of a product, from raw material extraction to the ultimate disposal of the product, by appropriate product design.

6. The NCPCs focus on the production processes in existing establishments and facilities primarily in the industrial sector. When applied in this restricted way the cleaner production is very similar to other concepts described as pollution prevention, waste minimization, or cleaner technologies. All of them share emphasis on elimination or reduction of waste and pollution at the source where it is generated. At the same time, rationalization of processes resulting in reduction of inputs, reduction of waste disposal costs and better product quality bring financial benefits to the enterprises.

7. While the concept of cleaner production is shared by many development cooperation agencies, there are some differences in its promotion by their development cooperation programmes. These differences are influenced by different objectives pursued by the agencies but they also reflect some differences in the emphasis which is given to either of the two objectives built in the concept: financial benefits (cost saving, higher output) and environmental effects (reduction of pollution). When stressing the financial benefits cleaner production is viewed as one of rationalization/rehabilitation measures to be applied by management (in pursuance of its own economic interests), and external support of the development cooperation agencies is focused on developing technical capabilities to identify such cost saving measures. (Usually through the analysis of material and energy flows, but any quality management measures which reduce input requirements and increase product quality imply cost savings/improved profitability and reduction of waste.) When stressing environmental effects the cleaner production is viewed as an element of a broader concept which recognizes that environmental objectives are objectives in their own right and their pursuance not only requires establishment of a conducive policy framework but it also justifies government subsidies or external support both to raise general awareness of the concept and to promote introduction of cleaner production in industrial establishments.

8. While the former approach implicitly stresses the viability of the concept on the basis of its own economic merits and trusts its dissemination once a critical mass of expertise (consultancy services) is created, the latter approach stresses the need to support the dissemination of the concept also through promotional (awareness raising, training) activities and policy dialogue. UNIDO supported NCPCs follow primarily the latter approach.

¹ www.unepie.org/Cp2

9. The cleaner production is one of the strategies aiming at environmentally sustainable development. Focus on direct interventions in industry, clearly apparent a few years ago, has been modified or partly enhanced by development and growing importance of other strategies within the broader concept of CP, such as:

- S recognition of the role of management systems in introducing environmentally - sound technological change (EMS);
- S focus on product design and development based on life cycle analysis (LCA);
- S focus on safer production (management of hazardous materials);
- S focus on creating environment conducive for cleaner production rather than individual interventions at enterprise level.

These trends influence current and future NCPC activities.

1.2 Scope of the UNIDO/UNEP NCPC Programme

10. The Programme is a joint initiative by UNIDO and UNEP with UNIDO acting as executing agency and UNEP providing professional support (methodology and information).

Up to now the UNIDO/UNEP Programme has supported establishment and operations of 15 NCPCs. The first tranche of NCPCs (China, India, Mexico, Tanzania, Zimbabwe, the Czech Republic, Slovakia, Brazil) started operations in 1995, joined shortly thereafter by Tunisia (1996) and Hungary (1997). All these Centres have already acquired extensive experience. More recently a number of new NCPCs have been set up (Vietnam, Costa Rica, El Salvador, Nicaragua, Guatemala) and preparatory work is on-going in several other countries (such as Croatia, Ethiopia, Morocco, Mozambique).

11. The NCPC Programme is implemented on the basis of a growing number of project documents supporting individual NCPCs or a group of them as well as some methodological activities (see Annex 1). The total budget allocated for the preparation and implementation of this technical cooperation programme since 1991 amounts to approximately USD 10 million. Most of the budget (more than 80%) is funded by a number of donor countries (Switzerland, the Netherlands, Austria, Norway and the Czech Republic), the remaining part by UNEP (8%), UNIDO (7%) and through self-financing (Brazil).

12. The budget for the 10 old NCPCs including initial preparatory work amounted to USD 4.7 million with most of the money already spent (expenditures amounting to USD 4.2 million). The evaluation draws primarily on the experience of the NCPCs in this category.

13. Taking into consideration that unlike some other large UNIDO programmes the NCPC Programme includes very limited delivery of equipment so that most of the support consists of expertise, training and a discretionary budget, the scope of the Programme can be considered as significant.

1.3 Purpose of the NCPC Programme

14. The ultimate objective of the Programme (the Development Objective) is widespread application of the CP approach at all decision-making levels in industry. The purpose of the NCPC Programme is to build national capacity to conduct activities and provide services in support of CP dissemination and application. The capacity is built both in the NCPCs themselves, in the associated institutions and primarily in the mass of professionals trained by the NCPCs to apply the CP methodology. Thus the NCPCs are:

- S a tool and not a goal in itself;

S the most visible UNIDO tool that contributes to the Development Objective, but not the only one.

15. It should be noted that there are other UNIDO projects supporting CP applications. Either they represent demonstration of CP methodology in a group or cluster of enterprises (example: prototype waste minimization in clusters of SMEs in Pakistan, clean technology in the fisheries industry in Chile) or the CP approach is an integral part of a broader set of services provided to industry (example: pollution control in the tanning industry in South-East Asia, integration of waste minimization in management advisory services in Tunisia). Usually these projects aim at application and demonstration of the CP approach with a limited number of enterprises, without extensive institutional capacity building but with some capacity building achieved through involvement of local partners in the implementation of projects. There are also technical cooperation projects (in fields such as quality management, rehabilitation, etc.) which implicitly may apply the basic CP principles without applying the methodology in a systemic way.

16. On the basis of some preparatory and verification work carried out by UNIDO in one country in Asia, a concept of an Environment Technology Assessment System (ETAS) was elaborated in 1998. The concept is similar to the NCPC Programme but it has a broader coverage (including end-of-pipe technologies) and explicitly includes advice on the choice of technology. Broader coverage of advisory services should be ensured through networking with other partners. As the concept has not been implemented so far, the experience can not be evaluated.

1.4 Types of activities/services of the NCPCs

17. According to the Programme documents for the first tranche of NCPCs, a standard UNIDO/UNEP NCPC, once established and operational, was expected to conduct at least the following core activities: training, in-plant assessments, dissemination of information and policy dialogue. Based on the experience with these NCPCs, the newer NCPCs are expected to conduct these core activities plus assistance on investment in cleaner production. An overview of actual and planned activities of the NCPCs was compiled in the course of the 4th Annual Meeting of NCPCs in Prague (March 1999). The listing of services/activities (see Annex 2) is a product of collective deliberations of the NCPC Directors.

18. The information on each NCPC in Annex 2 was entered and verified by its Director. However, at least in some cases the understanding of activities presented in the list by individual NCPC Directors may not be identical. Furthermore, one can surmise that some entries might have been influenced by what the others do/ we plan to do.

19. It is apparent that there are justifiable differences between the new NCPCs (Nicaragua, El Salvador, Costa Rica) and the old ones. In the case of Croatia the Centre has not been established yet; the current activities in fact represent a plan for the immediate future (assuming that the NCPC would be established soon).

20. All NCPCs are engaged in the following core activities: short-term training (up to 5 days) and dissemination of generic information on cleaner production. All are engaged in conducting in-plant assessments (combined with training and demonstrations activities). Most NCPCs are engaged in policy dialogue with different ministries or regional authorities (preparation of or comments on policy papers, etc.). Many of them also conduct training courses longer than 5 days and provide information on CP technology.

21. It should be noted that in the list - similar to other programme documents - the awareness raising function is submerged under training and information dissemination. This makes training and information services very heterogeneous. It is, therefore, preferable to single out awareness raising (with short seminars up to one day duration and dissemination of general CP information) into a distinct activity. This will result in more precise definition of training as professional training in CP methodology used in in-plant assessments as well as in more precise definition of information as technology information needed for in-plant assessments

and CP application. (The most recent project documents do it already.)

22. Current involvement in non-core activities is less intense. The most significant is cooperation of the ~~Aold@~~ NCPCs with educational institutions in introducing CP subjects in their curricula. Some of the ~~Aold@~~ NCPCs state to have included in their activities EMS, environmental benchmarking, environmental accounting and energy efficiency (conservation). Only a few indicate involvement in more complex activities such as LCA and ecodesign and only three of them provide also occasionally advice on End-of-Pipe (EOP) treatment if it complements the CP measures. No NCPC is reported to have been involved in hazardous waste management (even though other information suggests that at least the NCPC in Brazil was involved in this area). It is worth noting that only some of the ~~Aold@~~ NCPCs have advised companies on financing and transfer of technology related to CP.

2. RESULTS AS REPORTED BY THE NCPCS

2.1 Current activity reports

23. NCPCs are expected to report to UNIDO and UNEP semi-annually on their activities. On the basis of these reports a standard NCPC Activity Report for the whole Programme is compiled by UNIDO. Summary of the key indicators from the First Quarter 1999 Activity Report is taken over and presented in Table NCPC 1.

24. Aggregation of data at UNIDO HQs is encumbered by delays and incomplete information submitted by the NCPCs. This is confirmed by the fact that the report issued in the first quarter 1999 presents indicators as of July 1998. The data presented in the table also suggests that there exists different interpretation by individual NCPCs of the contents of some of the reported activities. This applies both to Number of plants that participated in in-plant assessments, Number of trained assessors and Number of participants at seminars and workshops. Interviews with individual NCPCs in the context of this evaluation also indicate frequent discrepancy between information provided in the course of these interviews and the key indicators contained in the Activity Report. Therefore the information provided in the table NCPC.1 has to be considered with caution. Particularly the number of trained assessors should not be interpreted as the number of assessors who actually are qualified to conduct in-plant assessments: these numbers are much lower (see section on Capacity building).

25. Collection of information for this evaluation confirmed that most of the NCPCs do not have a well established management information system which would provide information on the activities, their costs and impact. For example, it was difficult for some NCPCs to provide information on the implementation of CP options by enterprises. (It should be, however, highlighted that some NCPCs have a very good overview: NCPC Mexico was able to report on the percentage of implementation of every CP option.) None of the NCPCs have a good overview of how many CP assessors trained by the NCPC actually conduct regularly in-plant assessments and what is the impact of their work (how many CP options were identified by them, how many were implemented, etc.). The environmental and economic impact of the implemented CP options are not measured in a standard way.

2.2 Proposal of performance and success indicators

26. Preparation of a set of indicators for the NCPCs was under way independently of this evaluation but the findings of the evaluation influenced the structure of indicators. Taking into consideration the current deficiencies of the reporting system, the purpose of the indicators was suggested to be as follows:

- S to assist UNIDO HQs in monitoring the performance and the success of individual NCPC and, at the aggregated level, of the whole NCPC programme;
- S to serve the NCPCs as a management tool to measure their performance and improve it.

A set of approximately 30 indicators was elaborated by UNIDO HQs with consideration of a proposal made by the Swiss Bundesamt für Aussenwirtschaft (the donor for most of the new NCPCs) and inputs provided by this evaluation. It should contribute to standard monitoring of core activities of the NCPCs. The newest NCPCs will be required to submit the data to HQs. The indicators will be sent also to the old NCPCs (no more funded by UNIDO) for information and possible use for their own internal monitoring.

27. In order to be able to aggregate data from individual NCPCs into programme-wide indicators the data from individual NCPCs need to be provided preferably in absolute and not in relational terms.

28. Once the standard indicators with absolute data on performance and success of NCPCs are available it will be possible to work with them as with elements of structures serving other purposes, for example benchmarking of selected activities, aggregate comparison of the NCPCs on the basis of a limited number of key indicators, using multicriterial evaluation with weighted criteria, etc. However, given the current deficiencies of the reporting system the primary purpose of compiling information at this stage should be to get a reliable overview of what is going on at least in the core activities.

Table NCPC 1: Key Indicators of the Progress of the Ongoing NCPC Programme (as of 1st July 1998)

Country	Start of operation with UNIDO	Overall assessment of progress	Number of plants participated in in-plant assessments		Number of trained assessors		Number of participants		Newsletters issued	Number of publications/papers	Press coverage		
			on-going	completed	on-going	completed	seminar	workshop			TV	Radio	Press
Brazil	July 95	Satisfactory, as planned	12	20	6	43	3,550	1,285	2	6	X	X	X
China	June 95	Highly satisfactory, more than planned	5	93	23	350	9,500	4,400	35	15	X	X	X
Costa Rica	December 1998			5	6		100				X	X	X
Czech Republic	November 94	Highly satisfactory, more than planned	32	78	67	303	45	110	-	7	X	X	X
El Salvador	January 1999												
Hungary	May 97	Highly satisfactory, more than planned	16	-	6	11	400	30	1	10	X	X	X
India	July 95	Satisfactory, as planned	9	9	-	65	835	1,032	4	5	X	X	X
Mexico	December 95	Satisfactory, as planned	2	27+)	4	32	3,016	581	4	3	X	X	X
Nicaragua	September 1998												
Slovakia	February 95	Satisfactory, as planned	8	107	-	264	-	179	3	14	X	X	X
Tanzania	August 95	Satisfactory, as planned	15	17	15		180	50	1	9	X	X	X
Tunisia*	January 96	Satisfactory, as planned	8	-	15	-	50	50	-	4	X	X	X
Viet Nam	July 98	Just started	-	-	-	-	-	-	-		-	-	-
Zimbabwe	April 95	Satisfactory, as planned	12	6	4	11	520	250	3	3	-	X	X
All Centres		Satisfactory, more than planned	119	362	146	1,079	18,916	7,967	53	76	X	X	X

Note: The exact figures in the table above should be taken with some reservations as the Centres have used slightly different definitions, e.g., to distinguish between seminars and workshops (* = up to Dec. 97)

+) 10 of the 27 plants (5 electroplating, 5 foundries) were assessed on a less strict methodology, while 4 plants (chemical) were assessed in an even deeper format than UNIDO methodology.

3. SELECTED ISSUES

3.1 Demand for CP-services

29 This is the key issue of the Programme because it justifies or jeopardizes the very relevance of the Programme.

3.1.1 Demand for CP programmes at policy level

30 Given the increasing importance of environment protection among the policy objectives of Governments and sufficient evidence provided by the CP programmes that it is possible to reconcile environmental and economic objectives, the demand at policy level for CP programmes has been considerable. This is reflected not only in Government interest in and political support for donor-funded technical cooperation programmes in this field but also in policy measures adopted by some Governments to support dissemination of the concept and implementation of CP measures by enterprises. For example, the Czech Ministry of Environment included CP among those programmes which are eligible for a subsidy from the State Environment Fund. Companies implementing CP measures/projects are eligible to apply for a subsidized (soft) loan up to 70 percent of the required investment (with the upper limit of USD 1 million per loan).

31 At the same time, however, the budgetary constraints in most developing countries and countries in transition do not allow them to back the CP concept by allocation of resources large enough to carry out promotional and other dissemination activities. It is only in some countries (such as India) that the Government allocates distinct budgetary resources to finance promotion and dissemination of the programme. Thus, in most countries, local ownership of the CP dissemination programmes (demonstrated by financial commitments) is difficult to achieve and the role of external (donor) funding remains essential. To a great extent this supply driven component in the CP programmes reflects the differences in actual policy priorities between the developed and developing countries.

3.1.2 Demand at the company level

32 The interest in the CP programme and the related effective demand for CP advisory services at the company level are rather low. This applies particularly to SMEs. There are a number of reasons for this behavior. First, for many of them environmental objectives are not yet truly integrated in the company objectives/strategy, partly because of inadequate enforcement of environmental standards by the authorities. Second, the expected financial benefits which would result from implementation of the non-investment CP measures may not seem robust enough to deserve staff time and organizational effort required for conducting in-plant assessments. Risks associated with interference in established technologies and processes and time required for identification and elaboration of CP measures may also fend off the company management. Third, the implementation of investment options requires either use of their own capital, which the SMEs are usually short of, or a loan which, however, is difficult to access for a number of reasons: amount of loan not big enough to be of interest for a commercial bank; non-compliance with banks' lending criteria in terms of collateral, financial standing, etc; complicated procedures and strict criteria to access soft loans from the Government funds.

33 There is one more factor which curtails the interest of both the investor and the bank in investing in CP measures: difficulty to quantify all economic/financial benefits because they may affect multiple areas, long time horizons and probabilistic nature. In addition to reduction of direct operating costs the CP measures may result in reduction of indirect costs (regulatory compliance costs, pollution control equipment operation costs, etc.),

reduction of liability costs (probability of future penalties and fines, etc.) and achievement of less-tangible benefits (safer working environment, corporate image, etc.). Some agencies try to support the decision-making processes on CP investment by elaborating and disseminating the concept of total cost assessment² and UNEP has launched a project³ which also should, inter alia, develop instruments to support economic analysis and decision-making on investment. However, the methodological problem of total cost assessment is compounded by the fact that standard accounting systems do not track environmental costs well so that even the reduction of some operating costs may not be reflected in the accounting system. All these constraints apply and are difficult to overcome particularly in the case of SMEs and CP measures with small size of investment (and an impact not big enough to observe the difference).

34 When under time pressure to drastically reduce pollution in order to comply with environmental norms, companies very often cannot (or feel they cannot) avoid the end-of-pipe treatment of waste. Established consulting companies and suppliers of such waste handling technologies, pursuing their own commercial interests, tend to ignore or marginalize the CP approach. The decision making at the company level is influenced not only by cost considerations but also by "easiness" of the end-of-pipe treatment from the management point of view (no need to change production process, trust in established approaches and technologies, etc.). According to one association of industry in a country preparing for EU membership, insistence on rapid implementation of EU environmental standards prompted huge investment in end-of-pipe technologies which - at least partly - could have been used more efficiently in the rationalization of the technology processes themselves.

3.1.3 NCPC response

35 All the above constraints do not attenuate the validity of the CP concept as such but they influence the strategy of its implementation. A number of NCPCs have tried different approaches or plan to develop new activities/services (see Annex 2) in order to overcome the problem of low demand for CP advisory services by SMEs. They can be consolidated and summarized as follows:

- S High importance is still to be attached to awareness raising; entrepreneurs/managers with positive experience/results are to be used as advocates (Ambassadors[®]) of the concept/ programme; cooperating with and using somebody else's activities (such as workshops, fairs, etc.) as a platform to raise awareness of the CP concept (by presentations as guest speakers);
- S Dialogue with policy makers in order to introduce/upgrade supporting policy measures;
- S Introducing the CP concept in the curricula of educational institutions;
- S Partnership with local administration bodies to promote the concept at enterprise level;
- S Focusing on companies introducing/planning to introduce EMS since they are particularly suitable candidates for CP in-plant assessments;

² Facility Pollution Prevention Guide, EPA/600/R-92/088, 1992

³ Strategies and mechanisms for promoting cleaner production investments in developing countries",

S Incorporating advice on end-of-pipe technology as complementary measures.

36 Some of the above principles suggest that the CP programme should not be targeted at the whole SME population but rather at its more advanced segment usually in the medium size category. This applies particularly in the case that the CP programme is to be introduced as a tool in association with EMS: as the Czech experience shows, most of the companies introducing EMS have already been certified for ISO 9000. However, there have been also some success stories with very small companies in which the outstanding personality of the manager and his/her full command of the production process played a key role in introducing the CP concept.

37 This also implies that the Programme should be targeted at financially sound companies or at least at companies which are not threatened by bankruptcy; companies deep in debt have hardly any chance to access a loan for implementation of investment measures and, as a rule, the programme does not address their key problems of survival, usually related to marketing or financial restructuring. It is only in the case of companies threatened to be closed down by an environmental authority due to non-compliance with environmental standards or in companies with potential of CP measures yielding large economic benefits that a CP programme can help such companies to stay in the business. Otherwise a CP initiative may even take the effort and focus away from the more serious need to restructure. Admittedly, as there is usually a correlation between economic and environmental performance, this approach may cut out companies with high pollution records. However, there is no reason to identify CP measures in companies which cannot implement them or which are going to close down.

38 There is, however, a large segment of SMEs which belong neither to the first (advanced) nor to the second (bound to close down) category. Effectiveness of CP application in this segment of SMEs could be enhanced if CP initiatives are complemented by or built in other support programmes aiming at restructuring, competitiveness, etc. This may increase chances of acceptance or implementation of CP measures. For example, in the case of company restructuring/rehabilitation the costs and benefits of CP measures could be built in the business plan associated with the restructuring strategy. This approach requires cooperation with other consulting services in the field or, if not sufficiently developed, with other programmes of technical cooperation addressing the above problems of restructuring, rehabilitation, management, etc. If not conceived as a component of an integrated programme from the very beginning, the NCPC may initiate preparation of other (complementary) technical cooperation programmes as offered through UNIDO service modules.

3.2 Capacity building

3.2.1 Staffing of NCPCs

39 The number of staff varies between 1 (Zimbabwe) and 15 (China). Industrial experience and profound knowledge of an industrial sector are definitely an asset for the work in the NCPC, particularly in conducting in-plant assessments and providing information on technologies. Only a few larger NCPCs (such as China) can afford to employ sectoral specialists. However, in most cases of in-plant assessments the NCPC staff act as managers, supervisors or organizers of activities conducted actually by consultants. It is primarily the awareness raising, training, dissemination of generic CP information and policy dialogue activities in which the staff are directly involved. Their strong feature is, therefore, good knowledge of the methodology while specialized sectoral expertise is possessed by some of them only. Given the modality of conducting in-plant assessments primarily by consultants, the professional composition of the staff seems to be adequate.

3.2.2 *Methodological tools*

40 The core of the methodology relates to the in-plant assessment consisting of identification and analysis of material and energy flows, with the purpose of identification of CP measures such as waste and risk reduction at the source, recycling and/or production of useful by-products, and their prioritization. Waste reduction at the source can be achieved by a change of technology/equipment, change of inputs, change of product or better housekeeping. As a principal methodological tool the *Audit and Reduction Manual for Industrial Emissions and Wastes*⁴ was prepared and published by UNEP/UNIDO at the very beginning of the Programme.

41 Currently 6 out of 8 NCPCs under review have their own manuals. Some of them are based on the UNEP/UNIDO manual (China), some of them are based on the Norwegian model (Czech Republic), some were designed independently (Brazil, India). Because of having their own manuals, the original UNEP/UNIDO manual is nowadays hardly used by the *Aold@NCPCs*.

42 It is recognized by most NCPCs that the counterpart (twinning) organizations from the donor countries played an important role in transferring and adaptation of the methodology of CP.

43 While adaptation of the methodology to local conditions is commendable, some elements could be standardized so that communication with the HQs and among NCPCs is facilitated (examples: categories of CP options, structure of the in-plant assessment report, methodology of analyzing economic benefits, etc.). This process has already started and is on-going. It should also be considered to support or upgrade the methodology and its application by sector or process specific benchmarking (compilation of selected technical, environmental and economic data either on best available cleaner technologies and/or on cleaner technologies applied by the companies as a result of the CP assessment).

3.2.3 *CP assessors trained by the Programme*

44 As explained above, the national capacity to promote and provide CP services is not confined to the NCPC alone but it also includes the mass of expertise and knowledge in the companies and institutions created through awareness raising, training and participation at in-plant assessments. A critical role in implementation of the CP concept is played by those participants at the above activities who become qualified enough to work as CP assessors and, thus, as active agents of the CP programmes. To achieve this capability the candidates have to attend the training course and take active part in a plant assessment.

45 The number of people trained as CP assessors by the 8 NCPCs reviewed under this evaluation (Brazil, Mexico, India, China, Zimbabwe, Czech Republic, Slovakia, Hungary) is indicated in the Activity Report (Table NCPC 1) as 1,079 (as of July 1998). The same number compiled through interviews of the NCPC Directors in March 1999 amounted to 765 (without 5-6 thousand participants at training courses of 6 days duration in China). This discrepancy can be partly explained by the fact that the Activity Report may include also those CP assessors who were trained by CP programmes organized by various donors prior to the NCPC establishment. What is, however, more important is the discrepancy between people trained as assessors (765) and the number of assessors who are qualified and experienced enough to actually conduct in-plant assessments (estimated at approximately 200). Some of these people are in industrial companies, some work in institutions and consulting companies, and some work as free-lance consultants. (The breakdown depends very much on the country -

⁴Technical Report Series No 7; UNEP, UNIDO 1991

typically NCPCs hosted by a university or national productivity centre train more staff from those host institutions.) These qualified CP assessors usually work only part-time as CP assessors, either for an in-plant assessment project of the NCPC or in the context of other consulting services. In the latter case, however, the methodology is not necessarily used in its totality.

46 While it is recognized that CP assessment will most often be used as a complement to other environmental activities, it seems that there is still a potential to make more extensive use of the developed capacity to conduct in-plant assessments. In other words, the demand for in-plant assessment services is below the capacity which is already available. Actually, the services of CP assessors working as free lance consultants are used primarily under CP projects organized by the NCPCs or other donor-funded programmes which from the point of view of the target companies contain a certain element of subsidy. A spontaneous, commercially driven unfolding of the CP advisory services beyond the NCPCs=control has been rather limited or at least there is little evidence of it. This experience seems to confirm that those who offer CP assessments as fee-paying service will probably not be able to offer them full-time but rather as a complement to other (mostly legislation-driven) services or to fix specific process related problems as they come up.

47 There are some allusions that some staff who were trained as CP assessors do at least partly apply the methodology when providing related advisory services to industry, such as counseling on EMS. It is also observed that training in CP methodology helps consultants in advising on EMS and its implementation. This fact would not only support the NCPC strategy to integrate CP with EMS. It would also suggest that making CP an integral part of other advisory services to industry could be one of the effective avenues for a self-sustaining dissemination of the CP concept. In practical terms it should imply increased attention of the NCPCs to consulting companies and free-lance consultants when selecting target groups for awareness raising and training activities as well as networking with them for the purpose of delivering complementary services.

3.2.4 *Laboratory, monitoring and measuring equipment*

48 Unlike the Pollution Prevention Centres (PPC) established by the World Environment Center (WEC) in the Central and Eastern Europe⁵ the UNIDO/UNEP Programme, as a rule, has not to date provided the NCPCs with any laboratory, monitoring or measuring equipment. (There are a few exceptions.) NCPCs working with large companies (China) make use of the measuring equipment of those companies. Some NCPCs use laboratory and measuring equipment owned by the host institutions (such as India, Brazil, Hungary). In some cases the monitoring and testing is subcontracted to a specialized agency.

49 NCPCs which are independent do not have an easy access to such equipment. Very often they apply very simple methods and consider that satisfactory. There are cases, however, that some of the standing and more prominent CP assessors buy their own equipment to be able to measure some flows and parameters.

50 Apparently there is no need to equip the NCPCs with expensive and sophisticated equipment. The experience of PPCs shows that often the utilization of such equipment was very low. Furthermore, operating such equipment required recruitment of specialists which again were idle for most of the time. Some PPCs finally leased the equipment to a large company.

⁵Cleaner Production Centres in Central and Eastern Europe and the New Independent States, OECD, CCNM/ENV/EAP(99)25, 1999

51 Yet it is worth considering equipping NCPCs which do not have an easy access to the laboratory and measuring equipment of the host institutions with a set of simple portable equipment to measure some basic flows and parameters, such as surface temperature, temperature of media and gases/air, air humidity, velocity of gases and liquid streams in pipelines and tubes, revolutions, concentrations of some pollutants, power inputs. The equipment need to be simple enough so that it could be operated without a specialist or long-term training. According to a highly experienced CP assessor working with the Czech NCPC such equipment can be procured at approximately USD 5,000 per Centre and could be operated easily by any chemical engineer.

3.3 Technology changes (CP options) resulting from in-plant assessments

52 In the context of this evaluation the NCPCs were asked to provide information on in-plant assessments conducted by them in 1998. As this turned out to be difficult for some NCPCs and as the purpose was not evaluation of the performance but rather structural analysis of their activities, it was agreed that they could provide information for any year (1997 or 1998) for which they have data available.

53 Eight NCPCs (China, Mexico, Brazil, Czech Republic, Slovakia, Hungary, Zimbabwe, India) which provided information on this question conducted in-plant assessments, most usually in 7-9 enterprises per year. (There are deviations in both directions: three enterprises in Zimbabwe and 16 in Brazil.) In some enterprises several separate in-plant assessments (by different teams) could be undertaken, usually for different production lines. For example, 7 in-plant assessments (Aprojects@) for 7 different facilities were completed in a large company in the Czech Republic (see the Box). From 71 enterprises reported by the NCPCs under this evaluation 35 were SMEs, 25 were large enterprises and 11 were non-industrial establishments. Some NCPCs work exclusively in SMEs (India), some work mainly in the large companies (China, Brazil), the others have a mixed clientele.

54 Information from six NCPCs (China, Mexico, Brazil, Czech Republic, Slovakia, Hungary) was complete enough to allow for some structural analysis (see Table NCPC 2). For this purpose the break down of the CP options in 8 categories was taken from the project DESIRE (India)⁶. From a methodological point of view the NCPCs did not find it difficult to classify the options in accordance with the 8 categories except for two situations which caused some discussion: construction of a roof over a storage area and replacement of water pipelines in a water distribution company were included under housekeeping while they should be included under Achange of equipment@ (category 5).

⁶ From Waste to Profits: The Indian Experience; final report of DESIRE, UNIDO, 1998

**Table NCPC 2: Structural Analysis of the CP Options (Six NCPCs; Annual Performance)
1997 or 1998**

<i>CP Options (Technology Changes)</i>	<i>Identified CP Options</i>		<i>Implemented CP Options</i>		<i>Transfer of Technology from Abroad*</i>	
	<i>Number (2)</i>	<i>% (3)</i>	<i>Number (4)</i>	<i>% (5) = $\frac{(4)}{(2)}$</i>	<i>Number (6)</i>	<i>% (7) = $\frac{(6)}{(4)}$</i>
<i>Good housekeeping</i>	218	50%	166	76%		
<i>Input material change</i>	15	3%	12	80%		
<i>Better process control</i>	67	15%	35	52%	1	3%
<i>On-site recovery & reuse of waste (recycling)</i>	40	9%	20	50%	1	5%
<i>Equipment/hardware modifications/replacement</i>	58	13%	32	55%	5	16%
<i>Change of process technology</i>	35	8%	13	37%	1	8%
<i>Production of useful by-products</i>	3	1%	3	100%		
<i>Product modification</i>	3	1%	2	67%		
<i>TOTAL:</i>	439	100%	283	64%	8	3%

* Acquisition of equipment or licence

3.3.1 *Identification of technology changes*

55 When conceiving technology in broad terms (including organizational framework), then the 8 categories of CP options can be interpreted as categories of technological change. The table reveals that in the years in question half of the identified CP options were improvements in housekeeping. This is quite reasonable particularly in the initial phases of introducing CP: simple measures are easier to identify and more convincing in demonstrating economic benefits (favourable cost/benefit ratio due to limited or no investment costs). Measures to upgrade process control represented 15% and changes/replacement of equipment 13% of all identified technological changes. It is not surprising that production of useful by-products and product modifications were very rare because these technological changes are rather complex and require good knowledge of the market.

56 In most cases the technological changes are identified through joint effort of consultants and the company staff. In order to increase ownership of the CP measures by the company staff some NCPCs even request consultants to coach the team deliberately in such a way that the technological changes are identified by the company staff.

57 However, the role of a consultant changes depending on the type of enterprise and technology. As a rule, in the case of large companies and/or companies with mature technologies the consultant discharges primarily a methodological function, as the company staff are usually well aware of the advances in technology development and know who is who in the technology market. In the case of SMEs and/or companies using new or emerging technologies the consultant is expected to contribute more significantly to identification of technological changes by bringing in specific sectoral information and know how. Sectoral expertise is, however, considered an asset in all cases.

58 In most cases the consultants are local CP assessors trained by the NCPC and working on contract basis with the NCPC. The CP assessors with practical experience from industry are better than those coming from the academic environment since these usually have a communication problem at the shop floor level. Only in a very few cases did the NCPCs use staff from the counterpart institutions as consultants in in-plant assessments. They were used more in the initial phase for introduction of methodology (awareness raising for companies= top management; training; demonstration projects) but their sectoral technical expertise is viewed by most NCPCs as limited. As mentioned above, the NCPC staff themselves usually act as supervisors.

59 Review of the identified technology changes indicates that some of them represent rationalization measures which could be identified without applying the CP methodology at the level of material and energy flows and balances (substitution of coal by gas, roofing of the storage area, etc.). However, full application of the CP methodology should ensure that technological changes are identified in a systematic way and not haphazardly and that priorities for implementation can be set.

3.3.2 *Implementation of technology changes*

60 According to the information provided by the six NCPCs, on average 64% of the identified CP options had been implemented by the time the NCPC assessors left the enterprise or were under implementation by that period which is in line with the implementation rate recorded by other programmes (DESIRE in India). This figure may not be accurate anyway because the NCPCs usually do not provide support to the enterprises in implementing the CP options (with the exception of some advice on financing) so that the NCPCs do not have updated information about their implementation. (Good information is available from enterprises in which the NCPCs continue to work on other projects.) Thus it is possible that the total number of implemented technological

changes may be higher (assuming that implementation of some measures was decided after the NCPC assessors had left the enterprise).

61 When statistically insignificant categories of technological changes (2 - Input material change, 7- Production of useful by-products, 8-Product modification) are eliminated, the highest implementation rate is achieved in the case of good housekeeping and the lowest in the change of process technology. The most obvious factor for this difference is the need for investment and the time required to introduce the change. In principle, the good housekeeping options and input material change are non-investment options. The other options usually require investment. (For example, in Mexico 43% of the CP measures require investment.) However, the scope of investment varies. Only rarely does the investment exceed USD 100,000. In many cases the investment is less than USD 5,000 (in the Czech Republic approximately 50% of investment options). Only a few cases of investment in the range of USD 300,000 - 400,000 are reported by NCPCs working primarily with large industry (Brazil, China). Inadequate and, therefore, unconvincing feasibility studies also contribute to postponement or abandoning of identified CP measures.

62 In most cases implementation of the technology changes requiring investment is financed from the companies' own funds. Government-subsidized financing schemes with soft terms are used to limited extent only (for example, in the Czech Republic the State Environment Fund approved 5 CP projects in 1998 in total value of USD 2 million), and only in a few cases did the enterprises obtain bank credits (particularly in China). It is, therefore, understandable that non-investment options and investment options with low initial investment and short pay back period are implemented first, with the other options left for implementation at a later date, if at all. The time factor (large investment takes longer to implement) exerts in the same direction. The only exception from the rule is when the implementation of an investment CP measure is enforced by environmental legislation (see the Box A Scope of Success) which shows the importance of legislative framework for the implementation of CP measures.

63 The dearth of capital for implementation of investment projects in general and CP projects in particular has a feedback effect on the approach of the CP teams conducting an in-plant assessment. Knowing about the financing constraints they tend to focus primarily on non-investment and low-investment options. Improving access of the companies to financing is, therefore, a factor of having a larger share of more complex and more investment-intensive technological changes among the recommended technological options. However, in the initial phases of introducing CP measures it is reasonable to expect that the non-investment and low investment options will maintain a significant share among the recommended options particularly if the CP assessment is viewed also as a learning process for the company staff.

3.4 Transfer of technology from abroad

64 Transfer of technology from abroad is viewed as one of the key mechanisms to support industrial development in the developing countries and countries in transition. Promotion of environmentally sustainable development is associated with transfer of environmentally sound technologies (EST) from abroad.

Box: Scope of success

MORA MORAVIA is a large (2900 employees) ISO 9000 certified company in the metalworking sector, with environmental objectives fully integrated in its development strategy. Implementation of the environmental objectives is supported by dedicated top management and by organizational measures (such as placing the function of environmental manager in the department of strategic planning). Currently the company is getting ready for introducing EMS.

Within such a favorable framework an extensive CP programme was started in 8 out of 9 production lines and - within one year - successfully completed in 7 of them. After initial training (28 company staff from production lines, duration 3 and a half days, company expenditures USD 4,000 for trainers and manuals) the teams (3-4 at each production line) were supported in their work by the company environmental manager and a local NCPC consultant.

Results of the analysis: Approximately 50 CP options were identified, 25 of them were selected for the first tranche to be offered to the management. Out of these 16 were non-investment and 9 investment options, total investment amounting to USD 742,000 (with the largest investment option amounting to USD 285,000, and USD 82,500 per investment option on average). Total annual savings of operating costs were calculated at USD 320,000.

Implementation: 15 options have been implemented so far, 11 non-investment and 4 investment options with total investment of USD 174,000, financed from the company's own resources. Total annual savings are calculated at USD 44,500 which after 5 years (with 10% social rate of discount) results in NPV USD 5,300. Pay back is 3.9 years, Discounted (10%) Pay Back is approx. 5.3 years.

The four investment options have very different pay back periods, the shortest one less than one year, the largest investment (substitution of coal by gas) having a payback beyond any reasonable life time of the project. This large investment with highly negative NPV influences substantially the aggregate economic benefits as described above. At the same time it demonstrates that individual options may be adopted and implemented not because of the economic benefits but due to environmental objectives such as compliance with environmental standards.

The annual environmental benefits are as follows:

<i>reduction in electricity consumption</i>		<i>10686 kWh</i>
<i>reduced air pollution - solid particles</i>	<i>4799</i>	<i>t</i>
<i>- organic substances</i>		<i>3579 t</i>
<i>- SO₂</i>		<i>6772 t</i>
<i>reduction of hazard waste</i>		<i>25,2 t</i>
<i>reduction of other solid waste</i>	<i>89,7</i>	<i>t</i>
<i>reduced discharge of waste water</i>		<i>603,4 m³</i>
<i>reduction of material inputs</i>		<i>770 t</i>
<i>reduced consumption of water</i>	<i>1994</i>	<i>m³</i>

Additional 4 options will be implemented within a few months. Furthermore, an application to the State Environment Fund for a loan to finance two other investment options is under consideration. Two remaining options will not be implemented because of long pay-back period (7 years) in one case and newly adopted plans to change the related process technology, making the other option irrelevant.

It is intended to proceed with the review of the remaining package of options which were not selected for the first tranche. Among them, however, the investment options prevail (approx.60%), making the implementation dependent even more on availability of funds.

65 As described in Chapter 34 of Agenda 21⁷, ESTs protect the environment, are less polluting, use resources in a more sustainable manner, recycle more of their wastes and products, and handle residual wastes in a more acceptable manner than the technologies for which they are substitutes. It is, thus, apparent that CP and EST are not identical as EST includes handling of residual wastes (end-of-pipe technologies) and does not include some production changes which are covered by CP, such as product modification. However, to a great extent the contents are very similar. The more so that EST is not just ~~A~~individual technologies, but total systems which include know-how, procedures, goods and services, and equipment as well as organizational and managerial procedures@

66 Transfer of technology involves a broad set of processes (selection, acquisition, adaptation) carried out primarily by the private sector but influenced by the Government and communities. Most of the transfers of technology (and all transfers of proprietary technology) are implemented through trade, licensing, direct investment or joint ventures. For practical reasons this section takes as a proxy for the process of acquisition of technology the purchase of equipment or licence from abroad by the enterprises implementing the CP options.

67 Five Centres had information on this issue (see Table NCPC 2). Out of 283 CP options implemented (or under implementation) only 8 options included a transfer of technology as defined above (3% on average). Most of them (5) were CP options in the category of ~~A~~equipment/hardware modifications/replacement@. In fact all of them represent purchase of equipment, no purchase of a license was reported. In most cases the technology (equipment) was selected by the companies themselves. In a few cases some advice on the choice of technology was given by sectoral experts recruited by the project but in most cases the NCPCs refrain from giving such advice since they do not want to be associated with a certain producer or to be charged with responsibility for such a decision.

68 In view of the structure of CP options described above the reasons for such a limited transfer of technology from abroad are easy to identify: technological changes which are mostly implemented are non-investment or low investment CP measures. Such changes call for technology transfer from abroad (as defined above) in a very limited extent only (purchase of some pieces of equipment, etc.).

69 Transfer of technology as defined above is of course rather narrow. There has been some transfer of know how from abroad in the form of information and/or expertise provided by the counterpart institutions or foreign experts, when used. (Use of foreign consultants on technology was, however, rather limited.) Furthermore, the CP methodology itself, before its application by the NCPC, had to be transferred from abroad first and, as mentioned elsewhere, the counterpart (twinning) organizations played significant role in this transfer.

70 There was also transfer of technology among economic agents within the countries themselves (acquisition and adaptation of technology from a local university in Slovakia, purchase of EST from its local producers in China, Brazil, Mexico, etc.). Apparently local transfer of technology was more significant than transfer of technology from abroad (particularly in the case of countries with R&D capacity and capacity to manufacture capital goods). This is, however, outside the focus of this section.

71 In the case of large companies the technology changes are usually accompanied by more significant transfer of technology. Some technical cooperation programmes funded by bilateral donors target such large companies.

72 There is, however, a potential for the NCPC to induce more intense transfer of technology through CP projects. Particularly in the medium-size companies there is a potential for technology changes which would bring radical improvement of process technology accompanied by both economic and environmental benefits. As

⁷ A/CONF.151/4 (22 April 1992)

mentioned above, this would require funds which would be available on soft terms and for investment projects below the minimum threshold usually set by commercial banks. For the NCPCs to meet the challenge in professional terms this may require funds to subcontract sectoral expert(s) with profound knowledge of the best available technologies in the specific field. This applies particularly to emerging technologies. As regards mature technologies, many companies themselves know who is who in the technology market.

73. A shift towards technology changes with larger portion of technology transfer would also result from integration of CP into EMS. In the framework of EMS continuous improvement focused on CP necessarily results in proceeding from the easy technology changes at the beginning to the more complex changes which usually require some transfer of technology.

3.5 Information services

74. Information services have been confined to dissemination of the CP concept, supported by publicity and dissemination of case studies undertaken by the NCPCs. There has been extensive information dissemination of the CP concept and of success stories through seminars and mass media. Thus the information services have supported primarily the awareness raising function of the NCPCs. In most cases they were supply driven in the sense that their planning and implementation were initiated by the NCPC itself. The number of spontaneous inquiries from the end-users (companies, institutions and public in general) has been rather limited. The NCPCs do not keep record of such inquiries but some NCPCs estimate that the number of such inquiries does not exceed 10 per month.

75. The inquiries usually deal with generic aspects of cleaner production, they may require information about some NCPCs activities, etc. Inquiries about environmentally sound technologies, including end-of-pipe treatment technologies, are not frequent and inquiries about specific cleaner production options are actually very rare. They are usually related to the in-plant assessments conducted by the NCPCs.

76. Low demand for this type of information reflects itself in very limited development of capabilities at the NCPC to provide such services. Databases at the NCPC, where they are developed and operational, serve rather NCPC management than external users. Some databases taken over (such as ICPIIC from UNEP) were installed and in some cases (Hungary) even translated but their use is negligible. The capability to perform a referral service is also not well developed, hardly any NCPC has a list of useful websites to refer to when looking for information. Internet is used usually for the NCPCs own information needs and again, these needs only occasionally deal with specific technologies. Also the twinning organizations and UNEP's expert groups have hardly been used as sources of information on technology. Most of the twinning organizations are considered as competent in providing methodological advice but not in terms of specific (sectoral) expertise.

77. Some NCPCs have a staff member trained and experienced in searching on Internet and this person then carries out the search for other NCPC staff. However, some NCPCs still report technical problems in connectivity (low capacity, long waiting time, etc.).

78. Low demand for information on technologies by external clients is to a great extent understandable. Large companies have their own mechanisms, professionals and established channels to keep abreast of the state-of-the-art technologies. SMEs, on the other hand, are in most cases not aware of what information they may need and, therefore, they do not ask for it. The second dimension of the problem is that information as available in the databases on Internet and elsewhere is often of little practical use for SMEs if not accompanied by advice/expertise. Technical information is a powerful tool in the hands of the expert who knows how to interpret it and apply it in a certain context whereas information on technology accessed through a library, internet, or a patent office in the hands of laymen is of limited value. If SMEs do need some information on technology, they usually contact somebody they know in the business and whom they trust, or a dealer or manufacturer/supplier of

equipment.

79. It seems that the frequently emphasized importance of information for technology change including transfer of technology needs some qualification. Simple dissemination of information on technology among SMEs would not help much. What is more effective is dissemination of information in the context of business advisory services. In view of this the NCPCs need not set too ambitious goals as regards dissemination of stand-alone information on technology. Rather they should aim at developing a capability to provide expert advice (supported by updated technical information). Such expertise, however, requires continuous exposure to the specific technology area, visiting trade fairs, following up professional literature etc. As it is hardly possible to staff the NCPC with such experts covering all sectors it is necessary either to focus on a specific sector of industry or - what seems to be more practical - to establish a network with other sectoral institutions, consulting companies or free lance consultants to whom such services can be subcontracted or referred to. This is yet another reason why these groups should be targeted in training and awareness raising activities.

3.6 Financial advisory services

80. So far only a few NCPCs have tried to address the problem of access to financing for implementation of the investment options. Some of them (such as the Czech Centre) were instrumental in promoting and establishing such financing facilities or in cooperating with them in evaluating applications for soft loans (Tunisia). As access to financing is one of the key factors of CP implementation, this field is going to become more and more important for the NCPCs and a number of them plans to enter into this field. It will require their close cooperation with the banking system and the government authorities; participation of bankers at the CP training courses or in the final stages of in-plant assessments can support such cooperation. As financing of CP options has some specific features, this is apparently one of the fields in which the UNIDO and UNEP headquarters can play a significant role in providing methodological advice to the NCPCs, in organizing an intensive and continuous exchange of experience among them and in mobilizing bilateral and multilateral investment funds to support NCPCs activities at the industry level. Special role can be played by the UNEP/TIE CP financing project, in which five NCPCs will participate. Their experience as well as the instruments to be designed by the project could be used by all NCPCs in providing financial advisory services.

3.7 Competitors

81. Competition in the current fields of the NCPC core activities is not very significant. There are other multilateral (World Bank) and bilateral (Norway, the Netherlands, Denmark, USA, etc.) programmes in cleaner production and their considerable advantage is that the programmes are backed by funds to support implementation at the enterprise of the investment option. However, as they are usually targeted at large industry and - in countries like Brazil - operate in geographical regions in which the NCPC activities are not very intense, they are not felt too much as competitors in the market niche of the NCPCs. Furthermore, some NCPCs managed to be contracted for implementation of these programmes (or some parts of these programmes) which strengthens the NCPCs reputation and financial standing.

82. True competitors are the consulting companies in the field of end-of-pipe treatment. This is the competition of different concepts. The second category represent consulting companies which are established in the market for advisory services which the NCPCs also want to enter (particularly EMS). While the first category (end-of-pipe treatment) requires conceptual competition with the possibility of cooperation at operational level (see Networking below), the second category requires cooperation. It can not be the purpose of the Programme to subsidize activities which compete with services carried out by the private sector.

3.8 Sustainability

83. As explained above, in the long term the ultimate goal of the Programme is a widespread application of the CP approach in industry. NCPCs are one of the tools. Once the ultimate goal is achieved, there will be no need for the NCPCs. However, this is a perspective reaching far beyond the lifetime of the Programme support to individual NCPCs (3-5 years). Hence, in the medium-term (3-10 years) the sustainability of the NCPCs is a real issue.

84. In practical terms the issue of sustainability boils down to financial sustainability (cost recovery). Once the UNIDO financial support is over, there are in principle three potential sources of NCPC financing: contribution in cash or kind by the host organization (if there is any), income from services to local clients (industry, the Government), income from implementation of CP projects funded by other donors. Except for Government support through the host organization, if in public sector, direct Government subsidy to the Centres seems to be only a theoretical possibility at present.

85. Even though the relevant data on financing is not standardized so that it is difficult to get a clear picture about the current level of cost recovery by the above components, it is clear that without external support (by foreign donors) the NCPCs could hardly survive. Those NCPCs which are likely to sustain after completion of the UNIDO financial support (China, India, Brazil, Mexico, Slovakia, the Czech Centre, Zimbabwe, Tanzania etc.) either enjoy support of the host institution or have managed to access other external funding sources (usually other CP programmes). Some of them earn some income on services sold to the Government when supporting them in the design and implementation of their environmental programmes.

86. There is a general trend to commercialize the services of service institutions and this trend is frequently applied to the NCPCs as well. It is, however, hardly possible for the NCPCs to sustain on income generated from CP advisory services to industry alone. Furthermore, the policy of maximizing income from the direct advisory services to industry would run counter to the purpose of the Programme. The primary purpose of the NCPC is not to provide CP advisory services to industry but rather to play a pivotal role in implanting the CP concept in existing advisory services carried out by other organizations and consulting companies. Such an approach contributes best to the dissemination of the concept, complies well with the staff qualifications and professional capabilities and, at the same time, minimizes distortion in the market of consulting services.

87. To play such a pivotal role the NCPCs must sustain their capability to act as centre of excellence in this field by deepening their direct experience from in-plant assessments under different conditions and by extending networking with potential partners in CP applications. For playing such a non-commercial (public service) role the NCPCs hosted by a well established organization (either Government or NGO) may be in an advantageous position compared to the status of being an independent entity which tends to focus on commercial activities. This, however, applies only on condition that the host organization identifies itself with the mission of the NCPC and does not consider it as potential source of income for the host organization, as some experience suggests. On the other hand, too close identification of the NCPC with a government institution may jeopardize its credibility in the eyes of industry people.

88. As there is no standard solution for the status of NCPCs after project completion it also depends on the

management and staff of the NCPCs themselves to what degree they manage to develop contacts with different stakeholders and establish themselves in the market for CP programmes and advisory services. Importance of this issue has been fully recognized in the NCPC Programme as evident from emphasis laid on and methodological support provided to preparation of Business Plans in each NCPC.

3.9 Networking and cooperation

89. Networking and cooperation with other organizations and agencies is important both for the discharge of NCPC training and advisory services to industry and for broad dissemination of the CP concept. As regards the first purpose, NCPCs cooperate primarily with a group of CP assessors and trainers who were originally trained by the NCPC or by a preceding CP programme, work now as free-lance consultants or as staff of other organizations and stand by to work for the NCPCs on contract basis. Drawing on expertise from other professional (sectoral) sources of know-how has not been practiced intensely. Some NCPCs seek information and expertise from R&D organizations but such cooperation seems rather limited. It is felt that in spite of the pressure on client orientation the R&D organizations are still rather distant from industry and that even in countries like India they do not have much to offer to the SMEs. This was the prevailing attitude of the NCPC Directors but this perception may not reflect fully the changing world. At least in some countries the NCPCs established linkages with some R&D organizations, use their information or expertise and act as a bridge between the R&D researchers and industry engineers.

90. Networking and cooperation for the purpose of disseminating the CP concept is even more important as it contributes to the development objective of the NCPC Programme. Some NCPCs (such as Brazil, Slovakia, Hungary, the Czech Centre) cooperate with educational organizations in integrating the CP concept in their curricula and involving their students in identification and elaboration of CP themes. Most of the NCPCs cooperate with central, regional and local government authorities and administrations in order to raise their CP awareness and help them design and adopt a conducive policy framework. As mentioned above, cooperation with banks and other sources of investment funding has been established by some NCPCs. Cooperation with the host institutions has been satisfactory in most cases; they represent a pool of expertise and facilities of which the NCPCs avail themselves. NCPCs do train staff from consulting companies, R&D organizations, productivity centres and other organizations providing advisory (extension) services to industry but well established and continuous networking and cooperation is limited to a few of them and sometimes even viewed as undesirable support to competitors. This may reflect a lack of understanding or clarification of the mission of the NCPC since any effective transfer of the CP methodology or know how to such organizations should be among the most important performance criteria. (This applies also to consulting companies operating in the field of end-of-pipe treatment as long as they are interested and willing to integrate the CP approach in their activities.) From this point of view the effort of the NCPC in Tunisia to transfer the CP concept and methodology through training to eight sectoral technology centres deserves to be highlighted as commendable strategy of CP dissemination.

91. In order to support the dissemination function some NCPCs (such as India, China, Hungary, the Czech Centre) established regional affiliates or branch offices or network with selected regional organizations. The latter modality is very extensive in China but the network members (research institutions, local protection environmental bureaus etc.) have little contact with industry so that the dissemination of the information tends to stop at the network members, with little awareness raising in the industry itself.

92. In search for additional income the NCPCs are active and quite successful in tapping CP or other environmental programmes funded by other multilateral or bilateral agencies, such as the Hazardous Material Management (Basel Convention). This integrates them further in the web of the green community. There is, however, a probability or a risk that through diversification of their activities some of them will tend to develop themselves into commercial consulting companies for which the CP mandate may lose attractiveness if other topics promise better commercial opportunities.

3.10 Management by UNIDO HQs

93. The large number of NCPCs, the different levels of their capacity building, the diversity of country profiles in which they operate, and cooperation with UNEP and a number of twinning organizations, all make management of the Programme a complex task.

94. Internal policy and strategy papers indicate good level of self-reflection and suggest that the Programme management has a good understanding of the factors and constraints of disseminating the CP concept through the NCPC mechanism. Such policy issues are, however, subject of discussion or review only on some occasions such as annual meetings of NCPCs. The annual meetings are a very useful platform for discussion of strategic issues and sharing experience. This, however, needs to be extended beyond the meetings. The current information technology makes it possible. In fact the technical tool (the list server) was already created some time ago. It has been used by UNEP for discussing some specific issues and it should be used also by UNIDO as a platform for broad discussion of selected substantive and methodological issues. The platform could accommodate some of the issues or proposals normally discussed at the annual meetings. After discussing the proposals they could be finalized and promulgated as NCPC standard. Gradually the platform could become an effective tool in strengthening the family concept of the NCPC. However, as the experience of UNEP as well as of a similar platform of BINAS indicate, it requires somebody acting as a moderator, a person bringing in or organizing a submission of proposals by others and seeing to it that the discussion has a certain time frame, that conclusions are formulated, etc. Apparently such a person needs to be linked to the Programme management.

95. The annual meetings themselves could be further upgraded by inviting other multilateral and bilateral agencies supporting CP programmes and representatives of industry (such as the World Business Council for Sustainable Development) to discuss (during one or two days) some specific issues of general interest. If organized in conjunction with a trade fair specialized on engineering industry the meeting could also benefit from interaction with industrialists who are at the forefront of technology advance.

96. As mentioned in the paragraph 42, the process of standardization of some methodological tools is ongoing. It is carried out through application of performance indicators and development of database of technical reports. None of these two mechanisms of standardization are fully operational yet and some effort may still be required to harmonize them. Irrespective of the need to harmonize different tools and mechanisms, the purpose and design of the database of technical reports is still an issue which needs to be consolidated. The decision to limit access to the database to the UNIDO and the NCPC programme-related staff reduces the publicity impact of the NCPC work, does not allow for linkages with UNEP websites and leaves UNIDO with the only website on CP production (Energy and Environment Subsite) which, however, is rather limited in terms of number of cases and currently being expanded by case studies on energy conservation only. Even if the decision is not changed (according to the latest information in all probability it will be reversed), the database needs to be fine tuned taking into consideration the views of NCPCs since they are expected to be the primary users as well as suppliers of the information (comments on the technical report format were solicited from all NCPCs). In any alternative it should be also born in mind that any database of technical reports with a search function could turn into a recognized source of information only if the database becomes large enough to make a search function meaningful.

97. On the operational level the Programme is distinct by allocating part of the programme budget to the NCPCs as their discretionary budget (which is a rather rare arrangement in UNIDO programmes). This gives the NCPCs autonomy in using a considerable share of the UNIDO project funds (between 25-30% on average but reaching up to 40% in case of some NCPCs) which has been very appreciated by the NCPCs. It also simplifies or reduces for UNIDO the decision making and approval processes. On the other hand it requires control over the use of the discretionary budget. In the past, when such control was performed by UNIDO HQs, it was encumbered by late submission of invoices by some NCPCs (in some cases even by 2-3 years). Submission of incomplete invoices (such as missing signatures) or double invoicing made the administration of the control very complex and laborious. To some extent it was caused by undue tolerance of sloppy reporting by some NCPCs in

the initial stages of the Programme implementation. Recently the operational control of the use of the discretionary budget was delegated to the UNDP offices.

98. Utilization of the discretionary budget for different purposes differs depending on the structure of their activities (training workshops, in-plant assessments, publications, etc.). To get a better insight into the use of the discretionary budget it would be appropriate for the Programme management to have a structural overview of expenditures by categories of purpose. (Breakdown of the expenditures charged to the discretionary budget by budget lines is reported to have been well done by all NCPCs so that such an overview should be technically possible.)

99. A specific aspect of the Programme management is utilization of UNIDO professional expertise in support of the NCPCs activities. Acquaintance of the NCPC Directors with UNIDO professionals is not adequate. In addition to the UNIDO NCPC team and supporting administrative staff they know well those UNIDO staff who managed a technical cooperation project in the country concerned and some other staff who support the NCPCs in some functions (such as information). However, no special effort has been made to acquaint them with selected UNIDO professionals in a systematic way. In particular UNIDO professionals with technology background could serve as focal points of sectoral expertise and information for the NCPCs. (Admittedly their numbers are diminishing but irrespective of that whatever expertise is available it should be put at the disposal of the NCPCs.)

100. The NCPCs should be also briefed on the UNIDO service modules so that they know UNIDO potential to provide complementary services and, when appropriate, get acquainted with UNIDO professionals backstopping those modules with which the Programme may cooperate. Such cooperation may yield synergy effects. Most tangible synergy effects can be expected from integration with the UNIDO service module "Continuous Improvement and Quality Management", particularly with the services aiming at enhanced management capabilities, industrial restructuring and upgrading, and improved production performance and product quality. Synergy effects can be achieved also through integration with other service modules, such as "Environmental Policy Framework", "Pollution Control and Waste Management", "Energy Efficiency" and some others, as the local conditions may require. However, in order to achieve actual synergy effects it is necessary to ensure that interventions under different UNIDO services are directed towards the same target groups.

4. CONCLUSIONS AND LESSONS LEARNED

Relevance

101. Cleaner production (CP) is a cost-effective approach towards sustainable development. The UNIDO/UNEP NCPC Programme confirms that the methodology on which the CP is built is an effective tool for identification and prioritization of technology changes which yield both environmental and economic benefits. This applies particularly to existing production or service facilities. (The environmental dimension of new investment projects is addressed by other tools, such as Environmental Impact Assessment and Life Cycle Analysis.) In some cases the proposals for technological changes generated under the Programme were based on generic rationalization principles without application of the CP methodology. This indicates affinity of the underlying principles of the CP methodology as applied by the NCPCs to generic rationalization approaches used in production management.

102. However, the Programme has also confirmed that dissemination and application of the CP concept among SMEs on the basis of its own economic merits does not occur easily, so there is a need to support the dissemination of the concept through promotional (awareness raising, training) activities and policy measures. Developing local capacity to promote CP takes time since a hand-on experience and a certain minimum of success stories need to be available. Furthermore, local ownership of the CP dissemination programmes (demonstrated by financial commitments) is difficult to achieve so that the role of external (donor) funding remains essential. To a great extent the constraints of local funding and availability of donor funding reflect the differences in actual policy priorities between the developed and developing countries and their capability to support environmental policy objectives by appropriate budget allocations.

Impact

103. The Programme has contributed to the dissemination and application of the CP concept in the countries supported by the Programme. Its effectiveness can be observed mainly in awareness raising, training of CP assessors, introduction of the CP concept in curricula of educational institutions and, in some countries, integration of CP in the environmental policy framework. Actual impact in terms of environmental and economic benefits at the industry level has been rather modest compared to the potential which exists in the whole industrial sector and this impact has been achieved primarily through in-plant assessments conducted or organized by NCPCs themselves. There is only limited evidence of an impact at industry level which could be ascribed to the activities of NCPC-trained CP assessors carried out beyond the control of NCPCs or through any other spin-off activities.

Transfer of technology

104. Given the constraints explained in the report (such as limited access to financing) and some intrinsic features of management decisions (the easiest to implement are the non-investment changes in housekeeping), the technological changes induced by the Programme are primarily in the lower order of complexity and investment so that most of the implemented changes are not spectacular. This is compounded by the fact that majority of the companies supported by the Programme are SMEs.

105. For the same reasons these changes call for limited transfer of technology by industry. The Programme has transferred the CP methodology to the countries supported by the Programme and it also entails transfer of some technical know how to industry and to the NCPCs through external consultants participating in in-plant assessments. The Programme has also facilitated transfer of technology in terms of acquisition of equipment or a licence although this has been limited, primarily because of constraints of capital. This has affected transfer of

technology from abroad in particular. It appears that more frequent transfer of technology has occurred among stakeholders within the countries. Unlike some bilateral programmes backed up by investment funds for purchase of equipment from the donor country, this Programme has not and can hardly become a platform for a significant transfer of technology from abroad unless the capital constraint is alleviated.

106. These two facts (simple technology changes, limited transfer of technology from abroad) are not necessarily a weakness of the Programme provided they reflect the initial phase in building up local capacity to promote a new concept the diffusion of which, at a certain stage, would unfold on its own and include more complex changes. This, however, cannot be observed as a typical process. Some companies continued in the implementation of the already identified options and/or managed to identify a few additional CP options but in many companies in which CP was demonstrated the application of CP has not become a continuous process. Furthermore, in spite of awareness raising activities the effective demand for CP advisory services by industry in general and by SMEs in particular is still low so that the capacity to provide CP advisory services (in-plant assessments) as created by the Programme is underutilized.

Management dimension

107. While the core methodology of the cleaner production is technical, its application in the company environment is a function of its management. Therefore, the success at company level depends not only on the technical and communication capability of the CP assessors but also on the level of management in the company. The NCPCs have two options how to address this problem:

- S** Providing support in conducting in-plant assessments on selective basis only to companies with good management (as reflected in company performance indicators, established systems of quality management, integration of environmental objectives in the company strategy, etc.); companies certified or preparing for ISO 9000 or EMS would be the best candidates.
- S** Complementing the CP advisory services by other management advisory services (quality management, production management, etc.).

The latter option is more difficult and represents a complex task which could stretch the NCPC services too broadly; alternatively, cooperation with other consulting services may help. To strengthen their capabilities, if required, UNIDO support through other service modules should be considered (see below).

Main lessons learned

108. The above findings suggest that:

- S** the diffusion of the CP concept can hardly unfold on commercial principles, particularly among the SMEs, so that some element of promotion/subsidy is needed;
- S** promotion of the concept under the Programme needs to focus on factors creating demand (awareness raising, policy framework, access to finance);
- S** access to finance is the critical factor of implementing more complex technology changes (usually through transfer of technology) and achieving significant economic and environmental impact;
- S** to become a continuous process in the company, CP needs to be integrated in EMS;

S consequently, the main target group for CP should be companies introducing or planning to introduce ISO 9000, EMS or ISO 14000, that is the more advanced segment of the SMEs, including SMEs with participation of foreign capital; for the purpose of visibility and creating a body of references large companies could be among the clients as well.

CP can achieve significant improvement also in highly polluting enterprises which do not belong to this category; however, a certain level of management and financial stability should be a prerequisite for any intervention. Complementing CP advisory services or integrating them with other management advisory services could overcome this problem.

109. The preceding conclusions imply that the NCPC Programme has better chances to achieve significant impact in countries which have a larger segment of well performing industry with consolidated management systems than in countries in which large segments of industry face rudimentary problems of survival and are in need of restructuring and consolidating management functions first. It is particularly in such countries that the CP programmes should cooperate closely or be integrated with other management consulting services in providing advisory services to industry.

Upgrading methodology

110. On the supply side (delivery of advisory services) the NCPCs need to continue upgrading the professional level of their advisory services to industry by strengthening their sectoral expertise (or, more probably their access to sectoral expertise) and elaborating further the CP methodology and its application. Further elaboration of the methodology could include elaboration of sector- or process specific methodologies with compilation of selected parameters for benchmarking purposes. This should be harmonized with the contents of the database of technical reports. Enhanced application of the methodology should also include active mastering of selected measuring instruments and techniques. In addition to this rather technical upgrading of the methodology itself it is also necessary to continue elaborating principles of its application in the context of company management (integration with EMS but also industrial management in general) and in relation to other tools aiming at sustainable development (such as LCA). No doubt such activities will require cooperation with other stakeholders, including universities and counterpart (twinning) organizations.

Public service versus commercial activities

111. The activities of the NCPCs should continue to be a mixture of income generating advisory services and subsidized public service (focal point) functions which, in addition to awareness raising, policy dialogue etc., should include the above mentioned elaboration of the methodology and approaches of its application as well as compilation of and mastering of access to information resources. The shares of these two categories of activities (commercial consulting and public service) can not be standardized as they depend on specific conditions of each country but the focal point function should dominate. As a rule, the more advanced and competitive the management consulting services in the country are, the easier it should be to transfer gradually the commercial application of the CP advisory services to them, while retaining and upgrading the public service (focal point) functions. Consulting companies in the field of quality management (ISO, TQM, EMS etc.) and waste treatment (end-of-pipe technologies) are the most suitable candidates to integrate CP in their services but there may be other service providers who can integrate CP in their advisory services (R&D institutions, universities, etc.).

In view of the above the NCPCs should not be evaluated exclusively or primarily by impact at the company level which results from in-plant assessments organized by the NCPCs themselves but rather by impact at the industry level resulting from:

- 1) CP services of other organizations/consultants to which the CP concept was transferred by the NCPCs, and/ or
- 2) conducive policy framework to the formulation of which the NCPCs contributed.

Headquarters support

112. Support to the NCPCs by UNIDO and UNEP can be strengthened both in conceptual terms (upgrading the methodology and modalities of its application) and in discharge of some services. In the former case this could be done by a more intense dialogue over selected conceptual issues, not limited to annual meetings of the NCPCs and not limited to the NCPC staff alone but involving selected experienced CP consultants with innovative ideas as well as UNIDO professionals working on other CP projects or on similar concepts (such as energy conservation, benchmarking for LCA) or complementary services (such as quality management, industrial restructuring and upgrading, investment promotion, etc.) Support to the NCPCs in their discharge of some services has already been practiced in the past (through training, publications, etc.) but there is still scope for improvement, for example in upgrading the capacity of the NCPCs to make use of the relevant information on Internet, in designing a standard management information system for the NCPCs to support monitoring and reporting on activities, in establishing closer professional links with selected UNIDO specialists, etc. Particularly the participatory approach to elaboration of selected conceptual issues and/or tools such as the NCPC database could contribute to converting the large number of NCPCs into a true NCPC family, with the potential to offer benefits or be of interest also to those NCPCs for which the UNIDO financial support was completed and to attract attention or cooperation of the NCPCs outside of the UNIDO/UNEP Programme.

Integrated programmes

113. It follows from the above that effectiveness and impact of the NCPC Programme (which is part of the UNIDO service module **Cleaner Production**) could be enhanced if supported by (through integration with) some other UNIDO service modules. As apparent from the report, the most tangible synergy effects can be expected from integration with the UNIDO service module **Continuous Improvement and Quality Management**. Synergy effects can be achieved also through integration with other service modules, such as **Environmental Policy Framework**, **Pollution Control and Waste Management**, **Energy Efficiency** and some others, as the local conditions may require. However, in order to achieve actual synergy effects it is necessary to ensure that interventions under different UNIDO services are directed towards the same target groups.

114. The NCPC Programme should also consider possibilities of cooperation with the Montreal Protocol Programme. It is conceivable that NCPCs could be supportive in designing and implementation of some types of the Montreal Protocol projects (for example projects envisaging integrated commodity management in grain storage). On the other hand MP projects could become for NCPCs points of entry to the companies.

NPC-Related Projects: Budget/ Expenditures as of 30 April 1999

Annex 1

	Project No.	T i t l e	Original Budget (\$)	Revised Budget (\$)	Expenditures (\$)
1	US/GLO/91/103	Preparation of a Waste Audit Manual, 2 Expert Group Meetings June 1991 and October 1991, Paris, France	39,500	41,467	41,467
2	TF/GLO/93/010	Support for Cleaner Production Activities in the Environment Coordination Unit	22,973	22,973	20,676
3	EP/GLO/94/001	Project for National Cleaner Production Centres in One Developing Country: Phase 1A	88,496	84,561	84,561
4	XP/GLO/96/065, XP/GLO/95/065	Support to the establishment of National Cleaner Production Centres (NCPCs) in developing countries and economies in transition	507,500	200,000	198,657
5	EP/GLO/95/002	Support to national cleaner production centres	730,000	828,667	824,643
6	US/GLO/97/070	Strengthening of UNIDO/UNEP Network of National Cleaner Production Centres	268,500	268,500	128,617
7	US/INT/92/044	Project for national cleaner production centres in developing countries: phase I	1,539,000	1,539,000	1,469,779
8	US/CEH/94/071	The Czech Cleaner Production Centre	415,000	603,000	578,674
9	US/SLO/94/072	The Slovak Cleaner Production Centre	417,500	517,500	421,677
10	US/HUN/96/093	Hungarian Cleaner Production Centre	444,000	444,000	230,754
11	XP/BRA/96/046	Project to support the establishment of a national cleaner production centre	100,000	100,000	100,280
12	SF/BRA/95/003	Establishment of a national cleaner production centre	150,000	150,000	140,515
		SUB - TOTAL :	4,722,469	4,799,668	4,240,300
13	XP/CAM/96/042	Preparatory assistance to establish a regional network for cleaner industrial production in Central America (Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama)	51,500	51,500	50,336
14	US/CAM/97/500	Regional programme for the establishment of national cleaner production centres in Central America (umbrella project)	495,575	495,575	455,819
15	US/CAM/97/505	Regional programme for the establishment of national cleaner production centres in Central America - Nicaragua	520,000	520,000	202,729
16	US/COS/97/501	Establishment and operation of a national cleaner production centre	958,000	958,000	75,778
17	US/ELS/97/502	Establishment and operation of a national cleaner production centre	958,000	958,000	71,173
18	US/GUA/97/503	Establishment and operation of a national cleaner production centre	958,000	958,000	35,357
19	US/VIE/96/063	Viet Nam National Cleaner Production Centre	1,140,800	1,140,800	273,845
20	US/TUN/97/060	Support to the Tunisian Cleaner Production Centre	70,000	66,428	54,466
21	TF/CRO/97/001	Capacity-building in cleaner production	53,444	123,405	109,920
22	TF/VIE/97/001	Reduction of industrial pollution: Ho Chi Minh City: Phase II	190,890	240,545	187,766
23	XP/RAS/98/032, XP/RAS/97/032	Preparatory Assistance for the Establishment of UNIDO/UNDP National CPCs in Indonesia & Philippines & Provincial Cleaner Production Centres in China	52,000	17,000	16,295
24	US/MOR/98/072	Business plan for a national cleaner production centre: preparatory assistance	51,000	51,000	13,321
		TOTAL :	10,221,678	10,379,921	5,787,105

Current and Planned [+3 years] Services/ Activities of NCPCs

Type of Services / Activities	IND	CPR	ZIM	MEX	BRA	CEH	SLO	HUN	TUN	NIC	ELS	COS	CRO
Training													
1 day	Ž	Ž O	Ž O	Ž O	Ž O	Ž O	Ž O	Ž O	Ž O	Ž O	Ž O	Ž	Ž O
2-5 days	Ž	Ž O	Ž O	Ž O	Ž O	Ž O	Ž O	Ž O	Ž O	Ž O	Ž O	Ž O	Ž O
More than 5 days	Ž O			Ž O	Ž O	Ž O	Ž O	Ž O		Ž O	Ø		Ž O
In-plant Assessment	Ž	Ž O	Ž O	Ž O	Ž O	Ž O	Ž O	Ž O	Ž O	Ž O	Ø	Ž O	Ž O
Information										Ž			
CP in general	Ž	Ž O	Ž O	Ž O	Ž O	Ž O	Ž O	Ž O	Ž O	Ž O	Ž O	Ž O	Ž O
technology	Ž O	Ø	Ø	Ž O	Ž O	Ž O	Ž O	Ž O	Ø	Ø	Ø	Ž O	Ž O
Policy Dialogue	Ž O	Ž O	Ž O	Ž O	Ž O	Ž O	Ž O	Ž O	Ø	Ø	Ø	Ø	Ž O
Education Curricula													
Education institutions	Ø		Ž O	Ø	Ž O	Ž O	Ž O	Ž O		Ø	Ø	Ø	Ø
Own (Centre's programme)			Ø	Ž	Ž O	Ž O	Ž O	Ž		Ž	Ø	Ø	Ø
EMS ISO 14001													
training		Ž O	Ø	Ø	Ž O	Ž O	Ž ?	Ž O	Ø	Ø	Ø		Ø
implementation of projects		Ž O	Ø	Ø	Ž O	Ž O	Ž ?		Ø	Ø	Ø		Ø
certification/auditing		Ž O	Ø		Ø					Ø	Ø		
information dissemination		Ž O			Ž O	Ž O	Ž O	Ž O		Ø	Ø	Ø	Ø
LCA													
training		Ø	Ø		Ž O	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
implementation of projects		Ø	Ø		Ø	Ø	Ø			Ø	Ø		
information dissemination		Ø			Ø	Ø	Ø	Ø		Ø	Ø	Ø	Ø
Ecodesign		Ø	Ø		Ž O	Ø	Ø		Ø	Ø	Ž O	Ø	
Env. Benchmarking/Performance Indicators	Ž O	Ž O	Ž O		Ø	Ž O	Ø	Ž O		Ø		Ø	Ø
Hazardous Material Management		Ø	Ø	Ø	Ø	Ø					Ø	Ø	Ø
Pre-End-of-Pipe	Ž O	Ž O				Ž O	Ø						

Ž Current

O Planned/continuing

Ø Planned/ new ?

not

yet

under

consideration

Current and Planned [+3 years] Services/ Activities of NCPCs

Type of Services / Activities	IND	CPR	ZIM	MEX	BRA	CEH	SLO	HUN	TUN	NIC	ELS	COS	CRO
Energy Efficiency													
training	Ž O	Ø	Ž O	Ž O	Ž O					Ø	Ø		Ø
implementation of projects	Ž O	Ø	Ø	Ž O	Ž O					Ø	Ø		
assessment/auditing	Ž O	Ø	Ø	Ž O	Ž O	Ø	?			Ø	Ø	Ø	Ø
information dissemination	Ž O	Ø		Ø	Ø		Ø		Ø	Ø	Ø		Ø
Environmental Reporting		Ø	Ø		Ø	Ž O	Ø	Ž O					Ø
IPPC Directive	Ž O	Ø	Ø			Ž O	Ø	Ž O					Ø
Environmental Accounting/Total Cost Assessment													
training		Ø	Ž O		Ž O	Ž O	Ž O	Ž O		Ø	Ø	Ø	
implementation of projects		Ø	Ž O		Ž O	Ž O	Ž O	Ø		Ø	Ø		
Advice on CP Financing	Ø	Ø	Ø	Ž O	Ø	Ž O	Ž O		Ž O		Ø	Ø	
Safety and Health at Work						?							
training		Ø	Ø	Ø	Ž O			Ø					Ø
implementation of projects		Ø	Ø		Ø								Ø
information dissemination		Ø	Ø		Ø		Ž O	Ø					Ø
Emergency Preparedness & Response						?							
training			Ø		Ø		Ž O						Ø
implementation of projects			Ø		Ø		Ž O						Ø
certification/auditing			Ø										
information dissemination			Ø		Ø		Ž O	Ž O					Ø
Supply Chain	Ø	Ø	Ø	Ø	Ž O	Ø	?	Ž O	Ø		Ø		
Technology Transfer	Ž O	Ø	Ø	Ž O	Ž O	Ž O	Ø			Ø	Ø	Ž O	
Social Aspects/Trade Unions		Ø	Ž O	Ø		Ø		Ž O					

Ž Current

O Planned/ continuing

Ø Planned/ new ? not yet under consideration