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Final Report

**FHBB Mission to consult the  
Central American Cleaner Production Centres**

June 10 - 25, 1999

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Muttenz, 31.6.1999

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# 1 Goal of this mission

This mission is part of a project consisting of two missions to consult the NCPC's in Central America and of several working steps conducted at FHBB. The aim of the whole project is as follows (see also Annex E of contract NO. 99/099 and contract Art. 1.01):

“The aim ... is to provide training services on CP and work planning to the NCPC's of Costa Rica, El Salvador and Guatemala.”

A first mission to El Salvador has been performed in May 1999 (see report 5/99). The duties to be performed at the second mission are given below.

## **Duties to be performed**

According to the TORs, the duties of the mission are as follows (details see contract 99/099, annex E):

### *CP-Training*

- In cooperation with STENUM prepare and organise a regional workshop at El Salvador

### *Missions*

- Travel to the NCPCs at Guatemala (mission 2), El Salvador (missions 1 and 2), Costa Rica (mission 2) in order to consult the director and the staff.
- Assist the directors to organise awareness workshops for industry representatives (El Salvador)
- Assist the directors to perform quick scans in selected enterprises in order to identify industrial partners for the first series of in plant assessments.
- Assist the directors to start the first series of in plant assessments

### *Policy advise*

- Prepare guidelines on how to introduce the concept of CP into the national and regional legislation and policies

### *Workplan*

- Elaborate a detailed work plan on a long-term basis (training needs).

## 2 Workplan for the next 12 months

### 2.1 Lessons learned from the first year of activities as Counterpart of the NCPCs.

#### 2.1.1 Training

Until now two workshops at regional level have been organised together with STENUM, Graz. Participants came from Nicaragua, El Salvador, Costa Rica, Guatemala. The concept of the training was (and is) as follows:

- Training of trainers  
Trained personnel is able to organise local workshops for national consultants and industry representatives. This has best been understood at the NCPC Costa Rica, where already some local training workshops have been organised.
- The training is very practical. For people at trainer level, it should be very easy to find general or case specific information at sources like scientific journals. So it is certainly not necessary to use the limited workshop time for theoretical and general discussions. But the *application* of the knowledge is crucial. So at every workshop one main topic is a „1:1“-case study in the field. Theory discussed is mainly related to the topic of the case study.
- Know how transfer does not only occur in a vertical direction (from „high level“-experts to local staff), but also horizontally between the participants of the workshops. One of the best sources for applicable knowledge for the NCPCs is the experience made by other NCPCs in the region and e.g. in Mexico, Vietnam. So training workshops can be a platform for exchange of experience.
- The workshops are designed as a step by step process in order to enable the trained personnel to cover more and more topics of CP. Of course this makes it absolutely necessary for the participants to follow all the courses. We got the impression, that especially in the case of Guatemala this prerequisite has not been followed.

The feedback of some of the participants shows, that this concept was not always well understood. It is well known, that this type of very practical training can lead to mainly two reactions of participants who don't understand the concept (or who are expecting something else):

- During case studies (practical work), people are asking, why they have to work (and not the expensive experts). Since they did not see the preparation steps, they think, that this is only an easy way for the experts to do their job.

- Listening to presentations by their colleagues (e.g. activity-reports of NCPC-directors), some participants sometimes react very critical since they would prefer to „exploit“ the international experts present.

Both of the reactions show a misunderstanding of the goals of training and an overestimation of frontal teaching by „high level“-experts. But modern didactical experience mainly in the field of environmental education shows clearly, that not the amount of knowledge transmitted, but the time spent on a specific task is important.

Other observations made:

- **Language problems:**  
Many participants are not able to follow a presentation made in English. It is a question to be answered whether experts at this regional level should be able to understand English, as most expertise (written and oral) in CP is not available in Spanish. So actually the profile of a regional CP-trainer should include sufficient English-knowledge, and training in Spanish or with translation should preferably be organised at a national level (by the trainers).
- **Changing composition of participants (mainly Nicaragua, Guatemala):**  
In order to build up national pools of experts, we should try to have the regional experts personally at almost each of the training courses. Changing composition of the auditory makes it very hard to generate sustainable training effects.
- **Level and background of participants very different:**  
Levels and backgrounds of the participants of the first two training courses have been very different. E.g. in the field of energy efficiency there have been at the same time people with almost no knowledge and experts with at least some experience. So it was necessary to include very basic parts into the training programme which might have been boring for many participants.
- **Role unclear:**  
For many participants their role in implementing CP in their country is still not clear. They are expecting rather a personal training success than to be trained as a trainer. So roles and goals of the whole CP-programme have to be communicated much better.

## Conclusions

Training activities have to go on at the following levels:

- Regional workshops (to train the trainers) organised by RCU, NCPCs, FHBB and other international experts. Co-ordination: RCU (organisation), FHBB (contents)
- National workshops to build up a pool of national experts (consultants, enterprise representatives. Co-ordination: NCPCs (assisted by FHBB and RCU)

Table 1 shows a proposal for topics to be covered by the next regional workshops, based on the following conclusions (Certification of successful participants organised separately: practical test (quick scan in an enterprise) and theory block). The whole training programme

(without certification) takes 24 days (like the programme of the NCPC Vietnam). The programme for the national workshops has to be elaborated in close co-operation with the NCPCs (already started in the case of Costa Rica).

- We have to define clear learning goals (successive level objectives), such as: Trained trainers know the CP-methodology including newest progress at international level (makes English-knowledge necessary), they are able to perform a quick-scan in an enterprise (makes exact knowledge of methodology and sector specific problems necessary), they are able to coach a CP-assessment team at enterprise level, they are able to train local experts.
- The trained trainers have to be selected very carefully and they have to be better introduced to their future role. FHBB and RCU have to discuss these topics with the NCPC directors and the host institutions.
- We have to reach continuity in training: participants should not miss courses. At the end of the training there should be given a certificate to every successful participant. "Successful" in this case means a) has been present at 80% of the courses and b) has passed a practical and theoretical test at the end of the course. The practical test could be a quick scan in a selected enterprise.



**Table 1: Proposal for training modules (regional workshops)\***

	<b>Workshop 1</b>	<b>Workshop 2</b>	<b>Workshop 3</b>	<b>Workshop 4</b>	<b>Workshop 5</b>
<b>when?</b>	February 1999	June 1999	November 1999	February 2000 (?)	2nd half 2000 (?)
<b>where?</b>	Costa Rica	El Salvador	Nicaragua ?	Guatemala ?	Costa Rica ?
<b>topics</b>	Test: basics of CP CP strategy and methodology Material balance CP audits in enterprise (theory and practical work) Exchange of experience (NCPC directors)	Energy balance Energy audit in an enterprise (theory and practical work) steps of a CP project in enterprises CP information sources Exchange of experience (NCPC directors)	Role of CP trainers I, didactical hints Quick scans in enterprises (theory and practical work) Evaluation of CP-options I (Costs, environmental aspects, feasibility etc.) Reports of in plant assessments Exchange of experience (NCPC directors): Presentation of ongoing in plant assessments	Evaluation of CP-options II (benchmarking) CP and EMS ISO 14'000 (assess opportunity to introduce ISO 14'000 in a selected enterprise: theory and practical work) Exchange of experience (NCPC directors): Presentation of ongoing in plant assessments	Role of CP trainers II, didactical hints LCA Lessons learned Discussion experience, opportunities, constraints Exchange of experience (NCPC directors): Presentation of case studies
	5 d	4 d	5 d	5 d	5 d

\*other workshops can be added, 1 additional day is needed for the certification

### 2.1.2 Information dissemination and awareness raising

Mainly the following types of activities took place until now:

- Workshops organised for industry representatives (Costa Rica, El Salvador)
- Presentations during meetings of chamber of industry etc. (Guatemala)
- Written information in different newspapers etc.
- Meetings and discussions with different opinion leaders
- Networking with representatives of NGOs, other institutions

Since these activities are the duties of the directors of the NCPCs, there was not much possibility for actions until now (Guatemala and El Salvador: new directors). So information

on dissemination and awareness raising should be improved during the next project period. In order to systematise the activities, a communication concept should be elaborated. This topic could also be included into the planned training activities.

### **Conclusions**

- A communication concept for the dissemination of information should be elaborated.
- Further short workshops (half day) for enterprise representatives should be organised in all countries, covering the following topics:
  - Awareness raising (benefits of CP strategy in general)
  - Knowledge of CP-Tools (Audit, LCA, EMS)
  - Environmental legislation
  - Sector specific CP opportunities, case studies
  - Financial aspects of CP
  - Improving the management system in order to introduce CP related changes in production
  - Ecodesign
  - etc.

### **2.1.3 In plant assessments**

During the missions of FHBB in all three countries and especially during the first regional workshop at Costa Rica, quick scans in different enterprises have been made. This has been a good training tool for the local experts involved, but also led to a list of enterprises interested in further co-operation in form of in plant assessments (list in Guatemala missing at this time). In Costa Rica and El Salvador, "Convenios" for this co-operation have been worked out by the NCPC-directors assisted by FHBB and RCU, and some of the enterprises already have signed the agreements. So the practical work now could start. However, there are still some uncertainties:

- Working groups have to be formed and assigned to the different enterprises (El Salvador)
- Concrete work plans have to be issued by the directors (Costa Rica and El Salvador, later also Guatemala)
- A system for quality assurance has to be installed (FHBB will send some experts to supervise at least the first series of assessments)

### **Conclusions**

- It is very important now to gain practical experience and to produce results in this field. So in any case the agreements between NCPC and enterprises have been signed already, the working groups should be operational without delay.
- Quick scans are a good tool to get into contact with the management of enterprises and to get their commitment for further co-operation in form of CP-assessments. We have to include this methodology into the training curricula.
- The NCPC directors, assisted by FHBB, have to issue the general workplan for the CP assessment teams in the enterprises according to the UNIDO procedure presented by P. Schwager at the workshop in June 99 at El Salvador (see later in this report).

### **2.1.4 Policy advise**

In this field, many discussions with opinion leaders at national (El Salvador) and regional (CCAD) level took place. Additionally, FHBB has prepared a list of possible articles regulating CP aspects to be introduced into national laws. It seems to be clear that the necessary implementation of CP via regulations, recommendations, agreements etc. is a long-term process. So in the case of El Salvador the board of directors decided to install a national working group assisted by FHBB and another international expert to elaborate concrete steps. At the moment, RCU and FHBB are elaborating a concept for policy advise at a regional level including national working groups also in the other countries and a mechanism for their networking.

#### **Conclusions**

The concept for the regional networking in this field has to be finalised. According to this concept, the national working groups will be formed and can start working. As one of the first steps, the organisation of workshops for the national working groups will be necessary (see work plan).

### **2.1.5 Technology Transfer (TT)**

Technology transfer will be an important task once CP-options have been generated and evaluated at enterprise level. At this time it will be very important to provide the NCPCs with information on technical equipment, providers of technology and special experts. A database with this type of information should be build up (and is also requested by other NCPCs like Vietnam). Since TT is a bi-directional process, we have also to look for dissemination of information on demands for equipment etc. among providers of technology.

#### **Conclusion**

- A database with CP-experts and providers of selected equipment has to be build up.

## 2.2 Planned activities (next 12 months)

According to the workplan elaborated by the NCPCs and taking into account the conclusions in the previous chapter, the following steps and activities involving FHBB are planned:

### *Training*

- 2 more training workshops at regional level (the whole series is planned to consist of 5 regional workshops, 2 have already been organised)
- assistance of the NCPCs in organising local workshops for consultants and industry representatives
- preparation of training materials the NCPCs can use for regional workshops
- assistance of universities etc. in elaborating curricula for studies containing CP-parts

### *Information dissemination and awareness raising*

- Elaborate a communication concept
- Assist the NCPCs in producing information materials
- Participate at awareness raising events like workshops etc.
- Send experts for presentations at awareness raising events like workshops etc.
- Assist NCPCs in didactical questions

### *In plant assessments*

- Assist the NCPCs to elaborate general work plans for the CP assessment teams in the enterprises
- Send experts to supervise the first series of in plant assessments
- Send experts for to help identify solution for selected problems (energy, food etc.)
- Assist NCPCs in elaborating a general procedure for quick scans in enterprises (see also training)
- Assist NCPCs in performing quick scans

### *Policy advise*

- Finalisation of the concept for the introduction of CP into policies of Central American countries (RCU and FHBB).

- Organisation of first workshops for the national working groups (national and regional level)
- Assistance of the national working groups and their technical experts

#### *Technology transfer*

- Build up a database on experts, providers and technologies in the field of CP
- Disseminate information about demands of enterprises in Central American countries among providers of CP-relevant technology and expertise.

#### *Set-up of the NCPCs*

- Meetings of boards of directors
- Assistance of directors, RCU (convenios etc.)

## **2.3 Work plan**

A mission to Central America for the organisation of workshops and for specific advice of the NCPCs is planned in November 1999, another one in March 2000. Two missions with the goal of quality assurance of the ongoing in plant assessments are planned in September and November 1999. Further missions are not yet defined and will be organised on demand of the NCPCs (specialised experts). All other work is home based. An overview of the estimated costs and a tentative time table are given in the annex.

## **3 Activities during mission 6/99**

### **3.1 Day 1 (10/06/99) Thursday**

#### **3.1.1 Meeting with ASAZGUA, 8:30**

##### *Persons interviewed:*

Mr. Byron Meneses

##### *Participants:*

Mr. Thomas Heim, Mr. Jose Angel Gutierrez, Mr. Johannes Dobinger

*Results:*

Mr. Meneses expressed that ASAZGUA is still interested in being a member of the Board of Directors of the NCPC. However, the contributions ASAZGUA will provide to the Centre have not yet been clearly defined. Mr. Dobinger made clear that the contribution expected of all members has to be measurable and has to satisfy a real need of the Centre.

*Follow up:*

Mr. Meneses said that he will provide a written list of concrete inputs that ASAZGUA will provide to the Centre. This list will be submitted to Mr. Jose Angel Gutierrez by Monday 14th June and has to be discussed during the Board Meeting on 18th of June.

### **3.1.2 Meeting at the NCPC, 10:00**

*Participants:*

Mr. Thomas Heim, Mr. Jose Angel Gutierrez, Mr. Johannes Dobinger

*Results:*

The work plan of the Centre (see Annex) for the next 6 months was discussed with Mr. Jose Angel Gutierrez. It was stressed by all participants that the NCPC Guatemala will need a special training effort in order to create a basic capacity of the Centre. This basic capacity can be built up, providing training to the "CP-Team". Therefore one of the most urgent activities to be carried out is the formation of the team by requesting the member institutions to assign technical staff to work with the Centre. Once the team is defined a special training will be organised (e.g. with the Mexican NCPC) in coordination with FHBB. Shortly afterwards the in-plant-assessments can begin. Other priorities of the work plan are: establishment of the Centre, initiate in-plant-assessments, establish an information Centre and other training activities.

*Follow up:*

Presentation of the work plan during the next regional workshop and during the next meeting of the Board of Directors for its discussion and approval.

### **3.1.3 Meeting with FEPYME, 14:30**

*Interviewed Persons:*

Ms. Lesbia de Melgar, Director

*Participants:*

Mr. Thomas Heim, Mr. Jose Angel Gutierrez, Mr. Johannes Dobinger

*Results:*

Mr. Jose Angel Gutierrez explained to Ms. Melgar that each institution interested in being a member of the Board of Directors of the NCPC should have presented already a detailed contribution to the NCPC. Ms. Melgar explained that FEPYME does not have technical staff available to be assigned to the NCPC. FEPYME mainly works with external consultants on a project-by-project basis. Mr. Dobinger explained that FEPYME could also participate on the advisory board of the NCPC instead of being a member of the Board of Directors. Ms. Melgar expressed that she thinks participation on the advisory board would be the best solution for FEPYME.

*Follow up:*

Ms. Melgar will discuss the proposal of FEPYME being a member of the advisory board (and not of the Board of Directors) with the President of FEPYME and send as soon as possible an official statement of FEPYME's intentions.

### **3.1.4 Meeting with Chamber of Industry, 16:30**

*Interviewed person:*

Ms. Aura Padilla

*Participants:*

Mr. Thomas Heim, Mr. Jose Angel Gutierrez, Mr. Johannes Dobinger

*Results:*

The proposed workplan (see point 2) was discussed with Ms. Padilla who agreed to the proposed activities. Also the results of the meetings with the different institutions were discussed. Ms. Padilla expressed her doubts about the contribution to be expected from ASAZGUA.

Also the integration of the UNEP "CP – Investments" project into the activities of the Centre was discussed. Mr. Dobinger explained that FUNDESA had expressed strong interest in playing an important role in this project because of the similarity of their core competences and the project's proposed activities. Ms. Padilla said that it should be still discussed whether the Chamber of Industry or FUNDESA should be the main counterpart (focal point) for the project.

## 3.2 Day 2 (11/06/99) Friday

### 3.2.1 La Popular S.A., Soap and Detergents Factory, 11:00

*Interviewed Persons:*

Mr. Miguel Angel Ponce, Production Manager

*Participants:*

Mr. Thomas Heim, Mr. Jose Angel Gutierrez, Mr. Johannes Dobinger

*Brief description of the enterprise:*

La Popular is a soap and detergents factory with about 400 employees. It produces approx. 8000 tonnes of detergents and 36000 tonnes of soap annually. Main inputs are: animal fats, caustic soda, sodium chloride (soap) and DDB (Sodium dodecyl benzoate), sodium sulfate, soda ash, STPP, sodium tripoly phosphate, sodium silicate, colours, perfumes, fragrances.

Products are exported to Central America and the Caribbean and the enterprise is family owned. The raw materials are mainly imported. A study is ongoing in the enterprise with regard possible wastewater treatment. The air-emission of the sulfonation step are treated by an electrostatic filter and a wet scrubber (caustic soda). One person is responsible for environmental matters in the company.

#### Process description Soap production

Processes	Options/Problems	Remarks
Animal fat bleaching	Energy (90-100 degree Celsius)	Inputs: bleaching clay
Saponification	Energy, part of the piping has been insulated already	Inputs: caustic soda, sodium chloride. Subproduct: glycerin, recovered in a separate plant
Storage	Energy	Storage in liquid form
Mixing		
Drying	Production losses reprocessed	
packaging	Production losses, Carton polyethylen	



**Process description Detergents production**

Processes	Options/Problems	Remarks
Pre-treatment of air	Noise, energy	
Sulfonation	Wastewater, energy	Inputs: sulfur, DDB, air
Neutralisation of DDB		
Mixing		STPP, soda ash, sodium silicate, sodium sulfate,
Spray drying	Energy, production losses (15%)	
Mixing II	Perfumes	
Packaging		

**Process description Glycerin production**

Processes	Options/Problems	Remarks
Acidification		
Filtration		Filtered fatty acids are reused in soap production
Caustic soda treatment		
Filtration	Filter cake	
Concentration	Energy	Concentration factor from 28% to 80%
Distillation	Energy	Concentration factor 80% to 99%
Filtration		

*Results:*

Potentials for an in-plant assessment were identified mainly in the areas of wastewater, raw materials and energy (distribution of production costs approx: 8% labor, 8 – 12% energy, 80 % raw materials and others). The production manager expressed strong interest in an in-plant-assessment. This plant could be a very good example for an exercise of material and energy balances (good training effect for NCPC).

*Follow up:*

Mr. Jose Angel Gutierrez will send to the general manager a proposal for cooperation within the next three weeks.

### **3.2.2 Meeting at the NCPC**

*Participants:*

Ms. Thomas Heim, Mr. Jose Angel Gutierrez, Mr. Johannes Dobinger

*Results:*

The workplan and the budget until end of 1999 have been prepared (workplan see annex, budget will be presented at next meeting of the board of directors).

Possible topics for the next regional workshop have been discussed (relationship between EMS and CP, generation of CP options)

### **3.3 Day 3 (12/06/99) Saturday**

#### **3.3.1 Hotel Stoffela, 08:00**

*Participants:*

Mr. Thomas Heim, Mr. Johannes Dobinger

*Results:*

Possible actions and strategies in the field of CP-policy in Central American countries have been discussed. Results see separate report.

Departure Johannes Dobinger for Costa Rica at 12:00

### **3.4 Day 4 (13/06/99) Sunday**

Departure Thomas Heim for El Salvador at 18:00

### **3.5 Day 5 (14/06/99) Monday**

#### **3.5.1 NCPC, 08:00**

*Participants:*

Mr. Ricardo Pinel, Mr. Thomas Heim

*Results:*

The presentation to be given by the director of the NCPC at the workshop of June 21 has been prepared. The informations in the workplan (see report on mission 5/99, annex) concerning the budget have been adjusted. The workplan will be presented at the next meeting of the board of directors.

The programme of the mission has been concretised and some company visits have been planned (Carsa, Cessa, Termofomados).

### **3.5.2 UCA, 11:00**

*Interviewed Person:*

Mr. Francisco Chavez

*Participants:*

Mr. Ricardo Pinel, Mr. Thomas Heim

*Results:*

The conditions for the upcoming workshop have been checked (rooms, food, equipment, etc.).

Francisco Chavez informed that he would perform a study about environmental management in enterprises on behalf of gtz (Identification of sectors where environmental management systems can be introduced. Similar studies are ongoing at Costa Rica (Cegesti) and Guatemala.) Th. Heim mentions the next regional training workshop in Guatemala on the topics UMS and CP. It will be discussed whether F. Chavez could contribute some preliminary results to this workshop.

F. Chavez will meet the new environmental minister and will suggest to her a leading role of the NCPC in the process of developing the new environmental legislation.

### **3.5.3 Termoformados Modernos, 15:00**

*Person Interviewed:*

Ing. Julio Chafoya, Jefe de mantenimiento

*Participants:*

Mr. Ricardo Pinel, Mr. Thomas Heim

*Brief description of the enterprise:*

Termoformados is a factory that produces plastic articles and paper packages for eggs and cakes. The total workforce is 125 persons. Its products are being exported to all Central American countries (paper) and additionally to Hongkong and the US (plastic). The main raw materials used are polystyrene, waste paper (3 t per day), special paper (cakes) imported from Italy. Waste paper is collected in El Salvador, the polystyrene granulate is imported mainly from Mexico, Brasil and Germany.

**Process description Paper recycling**

Processes	Options/Problems	Remarks
Storage	Possible fires	No sprinkler etc.
Pulping	Water use	Water amount 30 – 40 m3 in closed water cycle, losses mainly due to evaporation in drying step
Mixing	Waste	Storage in liquid form
Forming		Water back to step "pulping"
Drying	Energy	42'000 pieces per day with a weight of 225 g before and 60 g after drying (equals 7 t vapour per day), additional water consumption for cleaning (1 per week)
Packaging	Production losses, Carton polyethylen	

**Process description Plastic Articles**

Processes	Options/Problems	Remarks
Extrusion	Energy	Inputs: polystyrene, colours
Forming, cutting	Noise, production losses	Production losses are reprocessed
Packaging		

**Process description Paper for Bakeries**

Processes	Options/Problems	Remarks
Cutting	30% production losses	Input: special paper imported from Italy; production losses reprocessed in Paper recycling
Forming	Energy	
Packaging		

*Results:*

Termoformados has good potential for CP, especially in the energy efficiency area and concerning the production losses. Production losses are reprocessed, but the invested energy is lost. The management commitment to CP is high.

This week a second visit by Th. Bürki (energy expert) is planned. Later Ricardo Pinel will send a proposal for the participation of Termoformados in the in-plant assessment project.

### 3.5.4 Meeting with UNATI, 17:00

*Persons Interviewed:*

Mr. Ramon Viera (Director UNATI), Mr. Victor Rodriguez

*Participants:*

Mr. Ricardo Pinel, Mr. Thomas Heim

*Results:*

The general procedure during the in-plant assessments has been discussed. UNATI normally uses a manual starting with topics like general environmental management of an enterprise and aiming to introduce UMS (ISO 14'000). Th. Heim stresses the importance to follow the following steps:

- selecting the area to be analysed
- material flow analysis
- energy analysis
- generation of CP options
- evaluation of selected CP options

Later on it will still be possible to propose a UMS to the enterprise. The interrelationship between CP and UMS will be discussed during the next regional workshop. UNATI agrees with this general procedure.

*Follow-up activities:*

UNATI will give its ideas about CP and UMS in written form to the director of the NCPC as an input to the next regional workshop.

### **3.6 Day 6 (15/06/99) Tuesday**

Arrival Edith Totschnig 07:30

#### **3.6.1 NCPC; 11.00**

*Participants:*

Mr. Ricardo Pinel, Mr. Thomas Heim, Ms Edith Totschnig

*Results:*

Edith Totschnig is briefed for the company visits she will make together with Thomas Bürki. Main focus is energy.

An exact list for the materials for the workshop is prepared. Ricardo Pinel will organise the materials.

A preparatory meeting for the workshop is fixed at Saturday 19/6/99 evening at hotel El Salvador. Th. Heim, Th. Bürki and E. Totschnig will meet already at 14:00.

The presentations by Ricardo Pinel and Edith Totschnig at the workshop are discussed.

Departure Thomas Heim for Costa Rica 18:30

### **3.7 Day 7 (16/06/99) Wednesday**

The next three days there have been activities in El Salvador and Costa Rica at the same time (as described below)

#### **3.7.1 NCPC Costa Rica; 08:30**

*Participants:*

Mr. Sergio Musmani (NCPC Costa Rica), Mr. Thomas Heim, Mr. Johannes Dobinger

*Results:*

The ongoing activities in the fields of awareness raising, training and policy advice have been discussed:

- Awareness raising in industry:  
Two attempts have been made to organise national workshops for enterprise representatives. The interest was not big, however, one workshop about CP-principles

has been run with 11 paying participants (30'000 Colones for 12 lessons).

Since the direct access to enterprises did not bring the expected success, two other activities are planned: a) mailing of the existing CP brochure to a bigger number of enterprises in order to make the CP strategy more known, and b) organisation of workshops together with MICIT (ministry for science and technology) (details see annex)

- **Training**

The planned activities (training of national consultants, regional workshops) will be presented at the workshop next week. Some highlights: 6 national experts will be trained by the Mexican NCPC in September (subsidised by the Mexican Government) in EMS, CP and financing of CP measures, and there is a possibility for video transmission at CENAT (Centro Nacional de Alta Tecnologia). This opens the opportunity to make presentations for workshops in Costa Rica, where also international experts could speak e.g. at FHBB.

- **Policy advise**

A local workshop is planned in October or November with the participation of lawyers, international experts. etc. It will address mainly local and central government officials, banking institutions, consultants etc. Later some regional workshops could follow (see separate report).

*Follow-up:*

S. Musmanni will write down the concept for the planned activities in the field of awareness raising together with MICIT (see annex), and he will present the planned training activities at the regional workshop next week.

### **3.7.2 Costa Rica: Conservas y Palmitos Amador; 15:00**

*Person interviewed:*

José Alberto Moya, production manager

*Participants:*

Mr. Sergio Musmani, Mr. Thomas Heim

*Results:*

We presented the cooperation agreement for the planned in-plant assessment. A. Moya liked the approach and agreed about the procedure.

*Follow-up:*

J.A.Moya will discuss the agreement with the owner and with the general manager. It is foreseen to sign it at the beginning of July and to start working in the middle of July.

**3.7.3 Costa Rica: Bananera el Prado; 16:00**

*Persons interviewed:*

José Rafael Quiros sen., José Rafael Quiros jun.

*Participants:*

Mr. Sergio Musmani, Mr. Thomas Heim

*Results:*

We presented the cooperation agreement for the planned in-plant assessment. The owners of Bananera liked the approach and agreed about the procedure.

*Follow-up:*

It is foreseen to sign the agreement at the beginning of July and to start working in the middle of July.

**3.7.4 El Salvador: NCPC, 08:30**

*Participants:*

Ms. Edith Totschnig, Mr. Ricardo Pinel

*Results:*

Organisation of

- plant visits of Thursday and Friday, and
- the workshop of the following week (materials needed).

Arrival Thomas Bürki 11:35



### **3.8 Day 8 (17/06/99) Thursday**

#### **3.8.1 Meeting at NCPC Costa Rica, 10:15**

*Interviewed persons:*

Prof. Dr. Ernst A. Brugger, BHP; Juan Pablo Büchert, Gerente de Proyectos BHB

*Participants:*

Mr. Thomas Heim, Mr. Johannes Dobinger, Ms. Petra Schwager

*Results:*

Mr. Brugger presented the idea of a new fund facilitating CP-investments. A local bank, donated by the Swiss government (e.g.) should administrate it. The NCPC should identify „bancable“ projects, and an independent expert (BHB?) would make the final decision about financing. His estimation is that 1 – 3 Mio. USD would be enough.

The Unido representatives expressed their interest in such a financing instrument. However, at the moment the identification of "bancable" projects is the most important step. No concrete follow-up steps are planned.

#### **3.8.2 Meeting with technical working group, 12:00**

*Participants:*

Mr. Sergio Musmani (NCPC Costa Rica), Mr. Thomas Heim, Mr. Johannes Dobinger, Ms. Petra Schwager, Mr. Emil de la Rocha, Ms. Marianella Feoli, Ms. Mariecruz Vargas

*Results:*

The workplan for the first in-plant assessment has been defined. The overall scheme of a CP in-plant assessment looks as follows (derived from Prisma methodology):

- Agreement of cooperation with the enterprise
- Form the CP-Team, 1<sup>st</sup> Workshop
- Selection of areas analysed
- Material flow analysis, energy analysis
- Generation of CP-options, 2<sup>nd</sup> Workshop

- Evaluation of options generated
- Elaboration of action plan
- Report
- Implementation (can start earlier)

The planned activities in the fields of awareness raising and policy advise are discussed (see workshop next week)

*Follow-up:*

Sergio Musmani will prepare a short guiding document showing the steps of a CP in plant assessment.

### **3.8.3 Meeting of the Board of Directors, 15:00**

List of participants and minutes will be provided by director of NCPC.

### **3.8.4 Invitation at Swiss Embassy, 18:00**

Participants: see meeting of the board of directors

### **3.8.5 El Salvador: Cueros Artificiales S.A. (CARSA), 09:30**

Part of this description has already been given in the last report (5/99).

*Persons interviewed:*

Mr. Joaquín Castellanos (Production Manager)

*Participants:*

Mr. Ricardo Pinel, Mr. Thomas Bürki, Ms Edith Totschnig

*Brief description of the enterprise (see also our last report from February 1999):*

CARSA is a factory that produces leather substitutes and textiles in three separate plants that are located very close to each other. The total workforce is 125 persons. Its main products are "cuerina" for shoe manufacture, furniture and other applications and they are being exported to all Central American countries. The main raw materials used is PVC, DOC (plastifier), cadmium compounds (stabiliser), barium-zinc compounds (stabiliser), soy

oil, solvents, pigments, cotton, polyester, nylon and butan gas (energy). CARSA is 100% local capital.

Processes	Options/Problems	Remarks
PVC foils for envelopes, etc.	Part of solid waste is not recycled, many inputs are very toxic (stabilisers, plasitifier),	
PVC foils for shoe manufacture		Big part of solid waste is not reprocessed, high energy consumption without heat recovery, toxic inputs (cadmium), hazardous waste generated in cleaning processes, non-recyclable losses due to stand still of machines
Textile production		

*Course of the visit:*

On the company visit priority was laid on CADESA, where the workshops case study will be performed. There the pre-fabricated material is processed to the definitive shape.

The following steps take place:

- Mixing of the various components to the desired mixture. Form: paste
- Bringing up this paste as a thin layer onto a paper as bearing material
- Drying the PVC in a first oven. Heating energy: butane. Drying temperature: 400°F
- Cooling down to ambient temperature of the foil by passing water cooled cylinders
- Applying of the second layer (e.g. PVC-foam)
- Drying in the second oven. Process identical with first one (but no cooling down of the PVC-foil after passing the oven)
- Applying a layer of adhesive paste
- Applying of the third layer, e.g. a textile layer
- Baking in the third oven. Same process as in the two previous ovens
- Cooling down to ambient temperature of the foil by passing water cooled cylinders
- Separation of bearing paper and PVC-foil. The paper is reused (about 8 times)

In the final discussion with the manager of the production the following information was given:

- The neighbourhood is complaining about the PVC - vapors of the ovens, which is seen as their most important problem. If this cannot be solved, they will have to move the company to another place.
- The colour of the PVC foil is changed every 1-2 hours, that means that the whole process has to be stopped for one hour, and it takes additional 10 Minutes until the oven has reached the adequate temperature for the production.
- Working time is 5 days a week (8 - 10 h) and one day a week (5 – 6 h).
- Due to the local demand, there exists a high production time (February, when all schools are starting) and a low production time (e.g. at the time of our visit, June)
- Due to the reduced market volume (competition from Asia) the capacity has been remarkably reduced since about two years.
- The share of electricity costs is about 2%, the share of gas (butane) costs about 4%.
- The specific gas costs lie at 6-7 c/lb, electricity costs at an average of 0.80 c/kWh. Additionally, costs for electric power peaks have to be paid (~34 c/kW<sub>peak</sub>).
- In 1997, an analysis has been made on the efficiency of consumption of electric energy. The result was a list of recommended measures, where from only one measure was realised (compensation of the load factor (if under the limit) to avoid penalties). The rest was put back due to reduced production because the company concentrates on developing new products.
- A programme to replace old electric motors that are over dimensioned, inefficient, and badly regulated by new and appropriate ones will be started probably this year.

*Results:*

CARSA has good potential for CP, especially in the energy efficiency area.

Mr. Joaquín Castellanos (Production Manager) agreed to welcome the 30 workshop participants of the upcoming regional workshop on Energy Efficiency (21<sup>st</sup> to 23<sup>rd</sup> of June). It was explained to the management that approx. 5 working groups of 5 persons each or 2 big groups would visit the plant during the workshop in order to carry out a brief energy-efficiency and CP evaluation. The enterprise, in return, will receive a report on the findings of the working groups.

We obtained necessary and available information of the production Manager. Mr. Bürki will provide Mr. Pinel with a list of detailed information required for the preparation of the plant visits during the workshop. Mr. Pinel will then work with CARSA management to obtain the required information.

### **3.8.6 El Salvador: Thermoformados Modernos, 15.00**

*Persons interviewed:*

Mr. Joaquín Castellanos (Production Manager)

*Participants:*

Mr. Ricardo Pinel, Mr. Thomas Bürki, Ms Edith Totschnig

*Results:*

At a short company visit some energy data were collected. The recycling paper machine, which forms the egg holders, was in maintenance and not working.

The big amount of production waste was identified, even if the material is reprocessed, the already invested process energy is lost.

The owner (with family origin in Italy) imports wine, pasta and sauces from the Mediterranean area, stores the materials in cold rooms and sells them in El Salvador. It was found, that the insulation of the cold room's walls is much too thin (1 inch) and should be reinforced to lower the enormous amount of energy used.

For the administration building and the cold rooms a huge "chilling power" is installed.

### **3.8.7 El Salvador: Universidad Don Bosco, 16:30**

*Persons interviewed:*

Ms. Nelly Adela Castillo (Directora de Programas de Medio Ambiente)

*Participants:*

Mr. Ricardo Pinel, Mr. Thomas Bürki, Ms Edith Totschnig

*Results:*

The Universidad Don Bosco is part of a Central American programme, which deals with the evaluation of water-, air-, soil-quality. Interest in co-operation and exchanging information with the Salvadorian NCPC was expressed.

### **3.8.8 El Salvador: Cosude (SDC) Nicaragua, 17.30**

*Persons interviewed:*

Ms. Patrizia de Linares (Cosude Nicaragua), Ms. Carmen Alvarado (Swisscontact El Salvador)

*Participants:*

Mr. Ricardo Pinel, Mr. Thomas Bürki, Ms Edith Totschnig

*Results:*

Ms. Patrizia de Linares expressed interest in the work of the Salvadorian CPC and the Swiss involvement in the UNIDO - NCPC programme. She also informed about the Cosude Programme in Nicaragua with the main goal to fight poverty. Their support is focused on small enterprises, not only in the industrial but in various other sectors (e.g. agricultural). The participants agreed on staying in contact and exchanging information.

## **3.9 Day 9 (18/06/99) Friday**

### **3.9.1 Costa Rica: Industrias Cerdas SEA; dep. 0730**

*Persons interviewed:*

Manuel Arnoldo Cerdas C., Sub-Gerente; Ing. Danilo Castrilo, Gerente de Produccion

*Participants:*

Mr. Sergio Musmani, Mr. Thomas Heim

*Brief description of the enterprise:*

Cerdas is a factory that produces animal food for cows (Megaton 50'000 kg/m, Megasol 65'000 kg/m and free fatty acids FFA 120'000 kg/m). The owner of the enterprise is Mr. Cerdas sen. The total workforce consists of 50 persons. Its products are being exported to Central American countries (Costa Rica, El Salvador, Panama). The main raw materials used are palm oil, calcium-hydroxide and animal fat in the case of Megaton, vegetable fats and oils, sulphuric acid and calcium-hydroxide in the case of Megasol and FFA. The raw materials are purchased in Costa Rica (exception: sulphuric acid El Salvador). The wastewater is treated mechanically and biologically (efficiency?), the BOD is 300'000 mg/l before and 30'000 mg/l after treatment (still very high!)

**Process description Megasol, FFA**

Processes	Options/Problems	Remarks
Reactor 1	Energy (2h 96°C), wastewater (acidic)  Energy from waste oil from ships (40'000 kg/m)  Water could be used in closed loops (e.g. dilution of acid)	Inputs: veg. fats and oils, H <sub>2</sub> SO <sub>4</sub> (10%) Outputs: wastewater (pH 3-5, to treatment plant), FFA (are sold as animal food), emulsion water/oil (processed in next step)  All inputs (except H <sub>2</sub> SO <sub>4</sub> ) are sub-products of other productions
Reactor 2	Energy	Output: Megasol humide (>50% water)
Draining	Wastewater (high pH, high contents of oil and fat)	Options for other drying processes necessary
Drying	Energy	
Packaging	Dust	

**Process description Megaton production**

Processes	Options/Problems	Remarks
Reactor	Energy	Inputs: palm oil, animal fat, Ca(OH) <sub>2</sub> Output: Megaton humide
Drying	Wastewater, energy	
Packaging	Dust	

*Results:*

Cerdas has good potential for CP, especially in the energy efficiency area and wastewater treatment. The drying steps are not very elaborated and lead to high losses of energy and raw materials into the wastewater. Its a very good example for CP, since almost all inputs are subproducts from other productions. The management commitment to CP is high.

**3.9.2 NCPC Costa Rica; 17:00***Participants:*

Mr. Sergio Musmani, Mr. Thomas Heim

*Results:*

Preparation of workshop next week.

### **3.9.3 El Salvador: Visit at CESSA, 10:00**

*Persons interviewed:*

XY (responsible for quality assurance (Jefe del laboratorio))

*Participants:*

Mr. Ricardo Pinel, Mr. Thomas Bürki, Ms Edith Totschnig

Results:

- actual problems of the plant and
- the advance of construction of kiln 5 and
- the measures for emission reduction were discussed

On a plant visit we got an impression about the change that takes place in connection with the construction of the new kiln and the extent of the environmental problems of the plant (emissions with e.g. heavy dust load).

He informed the Salvadorian CPC on organisational and operational details

## **3.10 Day 10 (19/06/99) Saturday**

### **3.10.1 Meeting with Luis Mariano Herrera, Cessa, 9:00 - 11:00**

*Persons interviewed:*

Luis Mariano Herrera (responsible for environmental matters, for Cessas role concerning emissions to air and water, fauna and flora, noise, geology, social matters)

*Participants*

Mr. Ricardo Pinel, Mr. Thomas Bürki, Ms. Edith Totschnig

*Key data of Cessa:*

- Kilns 1 to 3: production capacity 1040 t/d, wet process, specific fuel consumption 43-44 gallons/ t of clincer.
- Kiln 4: 1200 t/d, dry process, 23 gallons/t of clincer



- Kiln 5 (operation from end of October 1999): 2200 t/d, dry process, 20.5 gallons/t of clinker. It has a precalcinator, grill cooler and a 5 stage heat recovery system.
- Kilns 4 and 5 have an electro filter for dust removal.
- Kilns 1 to 3 will be shut down by the year 2000.

The following improvements will be realised:

- reduction of specific fuel consumption from 44 to 23/20.5 gallons/ton of clinker
- all exhaust gases will be filtered by an electric filter, therefor dust emissions will be reduced to practically zero (today: 4 tons of dust per hour)
- the water consumption will be reduced from 500 to 150 cbm/day, wastewater will be treated so that it can be reused in a closed cycle.
- in the context of joint implementation Cessa and Maya have bought 1000 hectares and keep on buying 5-10 hectares/year land for reforestation.
- after the limestone has been taken out of the quarry the area is reforested and serves therefor together with the porous lower layer of stone as a water filter. As limestone is watertight the infiltration to the groundwater is improved after the limestone has been taken away as a raw material for the cement kiln.

*Results:*

A discussion on further improvement of production processes at Cessa and Maya was held. There is a potential of substitution of bunker oil by alternative fuels, thus reducing CO<sub>2</sub> emissions considerably and other emissions (NO<sub>x</sub>, SO<sub>2</sub>). In this context two basic documents on Swiss cement factories alternative fuel programme were handed over to Mr. Herrera. He thinks the basic document of FOFEL (BUWAL-thesis paper) is very helpful for him. It consists mainly of the positive list of alternative fuels, raw materials, additional materials and auxiliary materials, indicating the limits of trace elements (heavy metals, organic and anorganic compounds). The materials in the positive list can be used in the cement kiln without doing harm to the environment. The second document is the basic document of the working group of the Swiss cement factories on their substitution strategy. It contains mainly basic information on the philosophy of global emission reductions.

Another possibility of reducing the impacts on the environment lies in the transport of cement. Today only 15% of the cement is transported by railway. A change of the mix in transportation from truck to railway would improve the ecological balance considerably. Restrictions of railway transportation capacity result from a lack of wagons and the bad state of the tracks.

Mr. Herrera accepted the proposition of the Salvadorian CPC to support Cessa and Maya in the following topics:

- communicate the philosophy of alternative fuels and raw materials to government authorities
- assure that relevant authorities understand the ecological benefits of such a programme and create adequate legal conditions (laws, rules and regulations concerning the environment)
- communication of ideas, projects and improvements to the public
- organisation of the co-operation between cement and other industries. This co-operation consists in a safe and ecological valuable disposal of defined fractions of waste in the cement kilns.
- organisation of the transfer of additional know-how from Switzerland to El Salvador through international experts (especially detailed technical information on the use of alternative fuels and information on the methodology of environmental audits).

*Departure Th. Heim at 11:05 to El Salvador. The following activities all took place at El Salvador.*

### **3.10.2 Hotel Siesta, 17:00**

*Participants:*

Mr. Johannes Dobinger, Mr. Thomas Heim, Mr. Thomas Bürki, Ms Edith Totschnig

*Results:*

Preparation of workshop, exchange of information about the past three days, where the parts of the team worked in different countries.

## **3.11 Day 11 (20/06/99) Sunday**

### **3.11.1 Hotel Siesta, 09:00**

*Participants:*

Mr. Johannes Dobinger, Mr. Thomas Heim, Mr. Thomas Bürki, Ms Edith Totschnig, Mr. Jan Sage

*Results:*

Preparation of workshop: finalisation of agenda, preparation of materials, fine-tuning of the co-coached parts (Stenum/FHBB).

### **3.11.2 Icebreaking Dinner, Hotel Siesta, 19:00**

*Participants:*

All participants of the workshop (see Annex), as well as Hanspeter Egler (BAWI)

*Results:*

Welcome addresses given by Petra Schwager, Johannes Dobinger, Hanspeter Egler, Francisco Chavez and Ricardo Pinel

Short self-presentation of the participants

## **3.12 Day 12 (21/06/99) Monday**

### **3.12.1 Welcome and Introduction, at UCA, 9:00**

Johannes Dobinger: organisatorial, possibility to obtain a CP-diploma after attending 3 workshops

Petra Schwager: NCPCs programme all over the world - past and future

Francisco Chavez: Welcome to UCA - Universidad Centro Americana

Thomas Heim: Overview over the workshop programme, repetition of material flow principles

### **3.12.2 CP activities in El Salvador, Guatemala, Costa Rica, Nicaragua and Mexico, at UCA, 10:30**

Ricardo Pinel (El Salvador), Christine Röhrer (Nicaragua), José Angel Gutierrez (Guatemala), Sergio Musmanni (Costa Rica) and Guillermo Roman (Mexico) presented the already started as well as planned activities in their respective countries (see Annex)

### **3.12.3 Possibilities for common activities, possibilities of collaboration, at UCA, 12:00**

The countries tried to define opportunities for common activities and possibilities of collaboration, and filled their ideas into a table. The following already existing or planned activities have been mentioned:

## Planned activities NCPC Guatemala:

- with El Salvador: proyecto azucar
- with Costa Rica: proyecto azucar, visita a proyecto de trabajo
- with Nicaragua: proyecto azucar, proyecto UNEP
- with Mexico: taller de nivelación (1<sup>er</sup> taller), proyecto azucar
- with int. exp.: seminario / taller para consultores / empresarios

## Planned activities NCPC El Salvador:

- with Guatemala, Costa Rica, Nicaragua, Mexico: intercambio consultores nac., publicaciones casos concretos, unificar pagina web (temas, ISO 14000, produccion mas limpia), mecanismos de gestión de fondos, promocion de unificación de estandares a normar en el area central america; areas: agroindustria, plastico, papel, carton ...

## Planned activities NCPC Costa Rica:

- with El Salvador: compartir info continuo
- with Guatemala: compartir info continuo
- with Nicaragua: compartir info continuo
- with Mexico: conv. cooperación, capacitación (junio - sept., 6 personas, 3 cursos), seminario azucar (septiembre)
- with int. exp.: politicas P+L, seminario - diseminación - concientizacion (oct. - nov.)
- with others: Delft University - Ecodesign (Oct), promoción P+L; grupo trabajo P+L en alimentaria (julio); diseño info + capacitación Australia

## Planned activities NCPC Mexico:

- with Guatemala: proyecto caña azucar, politicas, otros sectores
- with El Salvador: proyecto caña azucar, politicas, otros sectores
- with Costa Rica: asesoria sector galvanoplastica, proyecto caña azucar, politicas, otros sectores
- with Nicaragua: proyecto caña azucar, politicas, otros sectores

## Planned activities NCPC Nicaragua:

- with Guatemala: oferta consultores nacionales
- with El Salvador: oferta consultores nacionales

- with Costa Rica: intercambio consultores nacionales, ISO 14000
- with Mexico: intercambio consultores nacionales, conv. capacitación, proyecto azucar, hospitales, cementaria
- con todos: publicación regional cada 4 mes

### 3.12.4 Seminar "Energy and Energy Efficiency"

#### *Objectives of the Seminar:*

Introduction of the topic energy efficiency as an important part of CP. Application of the topic in exercises. Application of the knowledge in a case study at a company (CADESA). Evaluation of the case study and presentation of the results to the company. Enabling the participants to make an energy analysis with in-plant-assessments.

#### *Instructors:*

Mr. Thomas Bürki, Mr Jan Sage

#### *Participants:*

Representatives of CP-Centers from Costa Rica, El Salvador, Guatemala, Mexico, and Nicaragua.

#### **14:00h: Energy and Energy Efficiency: Introduction to the topic. Presentation of the case study.**

Theory, introduction of energy and energy efficiency. Calculation rules. Introduction into the case study

#### **16:30h: Presentation of simple measuring devices**

A short presentation of measuring devices is given: measuring of temperatures (Laser), temperatures and light intensity with data loggers. The laboratory of UCA and its instruments were seen during a short tour.

### **3.13 Day 13 (22/6/99) Tuesday**

#### **3.13.1 CADESA, 09:00**

Start of the visit at CADESA. Information by representatives of CADESA. Tour through the production sites. Measurements at the installations. Discussion with the people from CADESA.

#### **3.13.2 Hotel Siesta, 14:00**

Work in 5 groups. The groups had to analyse and interpret the data and information they collected, elaborate an energy balance of the plant, identify and calculate losses, identify and propose improvements, elaborate measures to reduce losses i.e. to improve energy efficiency and prepare presentation of findings and results.

#### **3.13.3 Hotel Siesta, 17:00**

Presentation of tentative results. Adjustment of the basic energy values. Define the procedure of presentations to instructors and management of CADESA on Wednesday.

### **3.14 Day 14 (23/6/99) Wednesday: Universidad Centroamericana Simeon Cañas (UCA)**

#### **3.14.1 Preview of the next CP workshop in Central America, 9:00**

Thomas Heim presented some information on the planned training activities. It is planned that the next workshop will take place in November 1999, the thematic focus will be on ISO 14000 probably and on systematic generation of CP-options.

#### **3.14.2 Presentation of the results of the case studies by the 5 groups, 9:30**

The groups presented their analysis and drew up measures to improve the energy efficiency. Discussion of the proposals.

The enterprise management had a positive attitude towards the following ideas:

- Re-use of the solvents in the production process (the solvents are used to clean the barrels and are therefore mixed with reminders of PVC paste)

- Minimize the temperature difference between the outlet and the inlet of the three sequential operating ovens
- Suggestions concerning the safety of the workers
- Exhaust gas flow through one single chimney
- All kind of measurements, which will be useful to introduce Cleaner Production measures
- Measurements, which will enable them to evaluate the toxicity of their emissions and communicate them with the people living in the companies neighbourhood

The enterprise management had a negative attitude towards the following ideas:

- Changing the solvent – they already tried to do this and made bad experiences (the workers got allergies)
- Lowering the temperature in the oven – they said, this will also lower the quality of the PVC foil

The production manager Joaquín Castellanos thanked the workshop group for their ideas and expressed what the biggest worries of the company are:

- Is CARSA/CADESA/INVISA really as environmentally polluting as the people of the neighbourhood are thinking ?
- How can CARSA/CADESA/INVISA survive in the competition with the producers in Mexico, Colombia and Asia ?

Ricardo Pinel, the Director of the Salvadorian Cleaner Production Centre, assured the management of CARSA/CADESA/INVISA to support them in their attempt to find and implement Cleaner Production options.

*Departure Thomas Heim*

### **3.14.3 Discussion and review, 11:00**

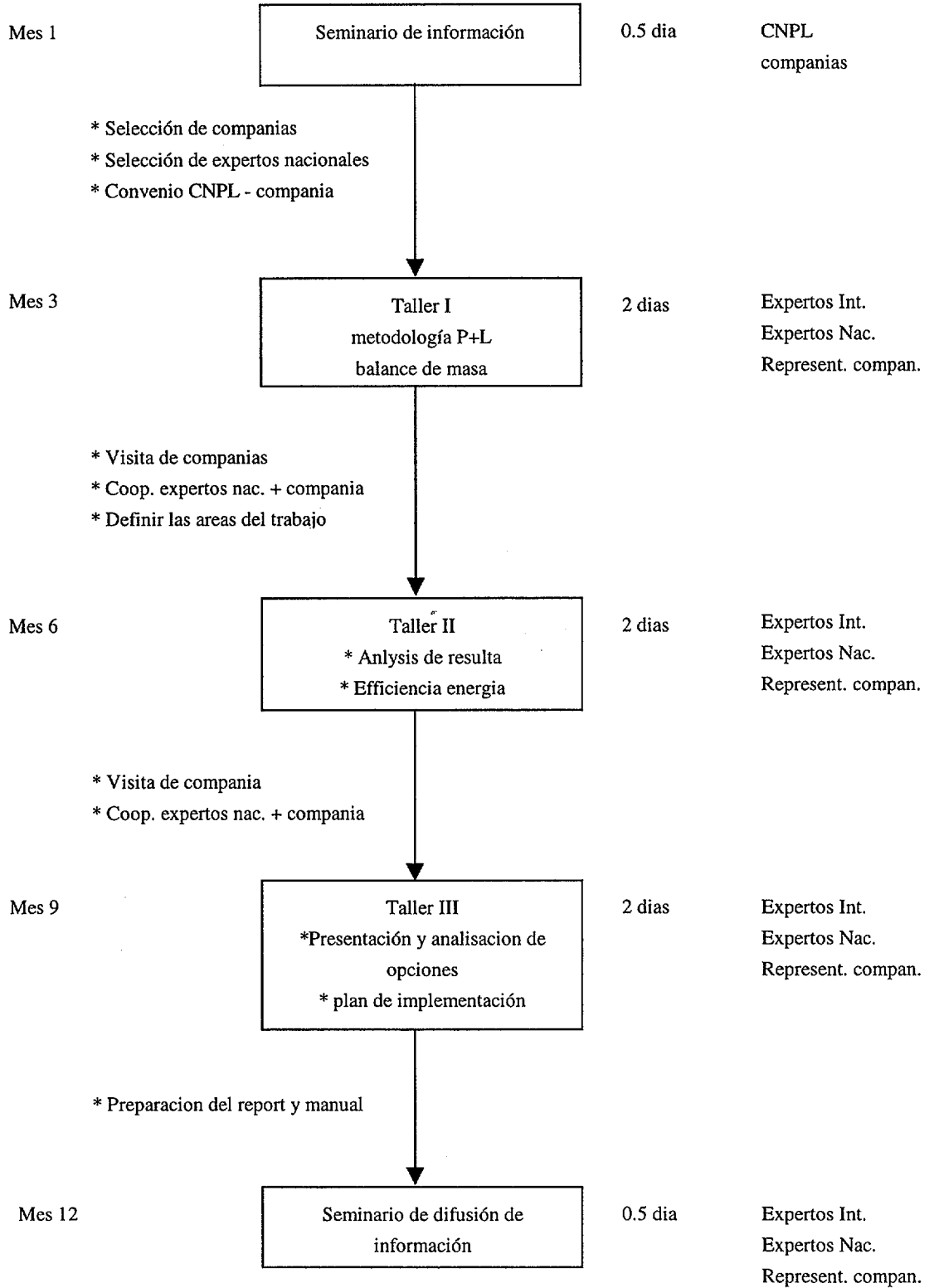
Feed back of the international experts to the participants on their methodology, proceeding, presentation and results.

**3.14.4 Cleaner Production Projects in Mexico, Guillermo Roman, at UCA, 12:20**

Guillermo Roman, the Director of the Mexican Cleaner Production Center, and his assistant Osvaldo Belmont presented various projects of Cleaner Production in Mexico (foundry, hospital, chemical sector)



**3.14.5 Cleaner production audit and training (method of UNIDO), Petra Schwager, at UCA, 12:40**



The presentation of the UNIDO method on the cleaner production audit and training provoked a discussion on:

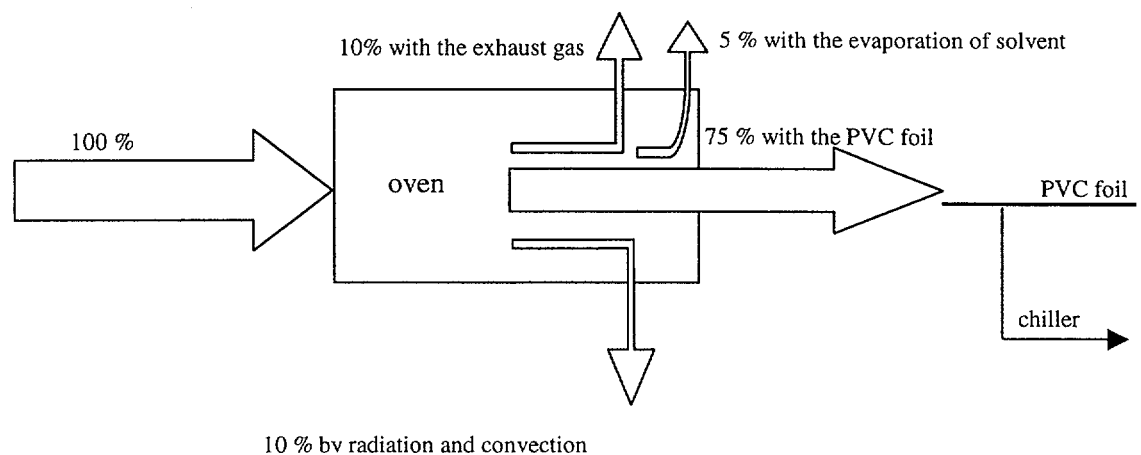
- How fast can measures be taken (short term / long term measures)?
- How should the working contract between the NCPC and the companies look like?
- How much should the companies be charged for the consulting?

The NCPC in Mexico charge fix price (2000 – 3000 USD) in each company, lately they ask for an additional amount of money (5% of the companies savings during the first 2 years after implementing the cleaner production options)

### 3.14.6 Feedback upon the group presentations, Thomas Bürki, at UCA, 14:30

Some general hints how to present Cleaner Production options to the companies management:

- If you show calculations, explain them
- If you show figures, simplify them (e.g. don't try to be exact up to three decimal places)
- Don't show too many calculations, select the most important ones
- If you suggest taking measurements, explain what you are going to need the results for
- Don't ask for too big changes (e.g. change from PVC production to PE production) in the beginning
- Show on a simplified picture how the energy flows through the process, e.g.:



- Set one to three priorities and concentrate in the first priority measure

### 3.14.7 Energy losses in Industrial Processes, Jan Sage, at UCA, 15:00

Within the part of energy analysis major emphasis was put on showing that the methodology of applying CP to material flows and energy flows is the same - making a balance, set priorities, generate and evaluate options.

Three energy measuring devices were shown and demonstrated. This equipment is simple but effective and could/should be a tool for every CP center.

- instrument to measure electric consumption and electric power demand (up to 4 kW)
- instrument to measure temperature, light intensity and relative humidity of a certain surrounding for some time (hours to days)
- laser thermometer (this was later also used in the case study to determine temperatures at various places of the furnace at Carsa)

To make the participants more familiar with several areas of energy efficiency and to train them to make easy energy calculations themselves a few exercises were carried out and discussed. They covered the following items:

- compressed air
- evaporation losses (example similar to company Palmita in San Jose/CR)
- heat losses by convection and radiation
- energy and material flow chart of a steel process (transformation from slides to a flow chart)
- heat exchanger (simple overall balances)

Within the exercises additional information was given so that the participants could apply their knowledge learning to future similar problems (example: heat losses of not insulated pipes can be easily obtained by using diagrams for various surface and surrounding temperatures, pipe diameters and air movement).

The participants were very eager to work on these exercises, so that even a big part of the Thursday morning session was used for the topic of "energy efficiency".

### **3.15 El Salvador: Day 8 (24/06/99) Thursday**

*Departure Petra Schwager, Thomas Bürki*

#### **3.15.1 Energy exercises: steel and rolling mill, Jan Sage, at UCA, 9:00**

(See Wednesday)

#### **3.15.2 CP information in the internet, Edith Totschnig, UCA, 11:00**

All workshop participants confirmed to use the internet as a source of CP information, but most of them don't search the internet systematically. They were given information on different search engines, meta search engines and how to formulate the search in order to narrow their search (e.g. use of Boolean operators). A possibility to evaluate the quality of a web page or a document found in the internet was presented. The directors of the Central American Cleaner Production Centres were handed out a disc with useful CP Internet addresses.

#### **3.15.3 Evaluation of present and future use of different sources of CP information, Jan Sage, UCA, 11:45**

In a first step the use of the internet for looking for information was briefly introduced. Special emphasis was put on the correct use of searching machines. This introduction was finalised with a wide overview of valuable homepages as CP information source.

In a second step the participants were asked to work out a prepared sheet in which they should fill in which CP information sources they use at present already very often and for which sources they see a big future potential. The results are shown below.

Information source	Use at present*	Future / Potential*
Internet / home pages	15	20
Suppliers	-	4
Data banks	2	19
UNIDO/UNEP/other NCPCs	1	15
Manuals, branch spec. information	7	16
Universities, Research centres	3	13
Seminars, Roundtables, Congresses	-	11
Counterparts	2	10
Chamber of Industry and Commerce	2	5
Government, Ministries	3	5
Other companies (same / different branch)	2	13
Employees in the company	3	16
Own experience	11	21

\* Number of part. who answered with very often

Total number of part.: 25

The following results can be obtained.

- Internet is already now for most participants a major CP information source.
- A strong input is expected from UNIDO, UNEP and other NCPCs as information sources (!). Also manuals and the contact to universities and research centres is a strong wish.
- Not many participants see the counterpart as a major information source (but: due to lack of time not all points were explained before, so that there might have been misunderstanding about what a counterpart is, anyhow an interesting result).
- National bodies like the chambers or governmental institutions are not seen to be a major information source.
- After conducting the first CP projects the participants expect to get more CP input from other companies, employees in the companies and from their own experience. That's why it is of course so important to start and continue with the CP projects.
- The international expert stated that personally his major information sources are suppliers (hardly of importance for participants), other companies and own experience.

A more detailed analysis that will also include more comments from the participants is elaborated.

### **3.15.4 Evaluation of the second Workshop on Cleaner Production in Central America, Johannes Dobinger, at UCA, 12:15**

### **3.15.5 Results of feedback session**

In the feed back discussion, moderated by Mr. Johannes Dobinger, and in the feed back questionnaires the following points were hinted at:

- Topic was of great interest to the participants
- International experts were well received. Participants should be able to make greater use of their knowledge.
- Case study and exercises were useful
- The workshop was very short. Should be compensated by sufficient pre-workshop-preparation. So, the difference between the levels of the participants could have been reduced
- Contents and materials should be presented in a more didactic way. Provide the participants with a tool kit.
- The participants should receive training materials in advance of the workshop.
- Time for practical work should be increased
- More information on analytical equipment etc. should be provided
- Interchange between NCPCs should be organised differently.

#### *Follow-up activities:*

The topic of energy efficiency should be continued. More practical examples would be appreciated (in-plant assessments). In November, a follow up and "deepening" seminar is planned.

## **4 Comments and recommendations**

see also Chap. 1

### **4.1 Specific training for the directors of NCPCs Guatemala and El Salvador**

Invitation to International workshop on Cleaner Production held at Muttensz, Switzerland (FHBB) in October 1999 is planned (see [www.fhbb.ch/umwelt](http://www.fhbb.ch/umwelt)).

### **4.2 Further continuation of the programme**

The following steps are under planning (only working steps with contribution of FHBB):

- 3<sup>rd</sup> regional workshop (FHBB and STENUM, Nov. 99)
- about 5 pilot projects in co-operation with selected companies in every of the 3 countries (NCPCs supported by FHBB)
- Preparation of a proposal for an integrated policy programme for discussion with CCAD (FHBB, RCU)
- Definition of the specialisation of NCPC Guatemala and Costa Rica (RCU, Directors, FHBB)
- Preparation of a list of selected enterprises for Guatemala (Director NCPC Guatemala, FHBB)

## Annex

### Agenda: 2<sup>nd</sup> Regional Cleaner Production Workshop: Energy Efficiency and Information Sources

Place: Universidad Centroamericana Simeon Cañas, San Salvador, El Salvador

Date: 21/6/99 – 24/6/99

Hotel: Hotel Siesta (Best Western), San Salvador

<b>Time</b>	<b>Topics</b>	<b>Activities</b>	<b>Responsible Person</b>
Sunday 20 Evening	Arrival of participants Ice-breaking dinner		Ricardo Pinel
Monday 21 Morning	Opening Introductions NCPCs State of the Project	Participants (esp. directors) report about their activities since the last workshop, open questions	Thomas Heim Jan Sage Directors Guillermo Roman
Monday 21 Afternoon	Energy in industrial Processes	Theory, Exercises	Thomas Bürki Jan Sage
Tuesday 22 whole day	Energy in industrial processes	Case Study Carsa	Thomas Bürki
Wednesday 23 Morning	Energy in industrial processes	Presentations Case Study, Discussion of results	Thomas Bürki
Wednesday 23 Afternoon	Practical hints for Energy-analysis	Theory, Exercises	Jan Sage
Wednesday Evening	Workshop-evaluation Next steps (part I)	Discussion Feedback	Jan Sage Thomas Heim
Thursday 24 Morning	CP information sources Workshop-evaluation (II)	Presentations, group work Discussion	Edith Totschnig, Jan Sage



**List of participants (Workshop 21-25/6/99)**

	<b>Nombre</b>	<b>Institución</b>	<b>País</b>	<b>entrada</b>	<b>salida</b>	<b>habitación</b>
1	Marianella Feoli	CEGESTI	Costa Rica	20-06-99	24-06-99	Sencilla
2	Georgina Jimenez	CEGESTI	Costa Rica	20-06-99	24-06-99	Sencilla
3	Irene Varela	ITCR	Costa Rica	20-06-99	24-06-99	Doble 1
4	Maricruz Vargas	ITCR	Costa Rica	20-06-99	24-06-99	Doble 1
5	Emil de la Rocha	CICR	Costa Rica	20-06-99	24-06-99	Sencilla
6	Gerardo Quirós	CICR	Costa Rica	20-06-99	24-06-99	Sencilla
7	Sergio Musmanni	CNP+L	Costa Rica	20-06-99	24-06-99	Sencilla
8	Nelly Betanco	indep.	Nicaragua	20-06-99	24-06-99	Doble 2
9	Harold Silva	indep.	Nicaragua	20-06-99	24-06-99	Doble 3
10	Freddy Boza	UNI	Nicaragua	20-06-99	24-06-99	Doble 3
11	Lesbia Rodriguez	UNI	Nicaragua	20-06-99	24-06-99	Doble 4
12	Cesar Barahona	UNI	Nicaragua	20-06-99	24-06-99	Doble 5
13	Yelena Navarro	UNI	Nicaragua	20-06-99	24-06-99	Doble 4
14	Alberto Morgan	UNI	Nicaragua	20-06-99	24-06-99	Doble 5
15	Christine Rohrer	ONUDI	Nicaragua	20-06-99	24-06-99	Doble 2
16	Ing. Ricardo Pinel	CNP+L	El Salvador	-	-	-
17	Lic. Brian Coughlin	CNP+L	El Salvador	-	-	-
18	Ing. Ramon Viera	ASI/UNATI	El Salvador	-	-	-
19	Ing. Victor Rodriguez	ASI/UNATI	El Salvador	-	-	-
20	Lic. Regina Cortez	FUSADES	El Salvador	-	-	-
21	Lic. Nelly Amaya de López	UCA	El Salvador	-	-	-
22	Julio Garcia	CIG	Guatemala	20-06-99	24-06-99	Sencilla
23	Alma Judith Ortiz	CIG	Guatemala	20-06-99	24-06-99	Sencilla
24	Jose Angel Gutierrez	CNP+L	Guatemala	20-06-99	24-06-99	Sencilla
25	Genard Mendez	Gr. De Consult.	Guatemala	20-06-99	24-06-99	Sencilla
26	Marco Antonio Santizo	Gr. De Consult.	Guatemala	20-06-99	24-06-99	Sencilla
27	Carlos Peralta	Gr. De Consult.	Guatemala	20-06-99	24-06-99	Sencilla
28	Thomas Heim	FHBB	Suiza	19-06-99	24-06-99	Sencilla
29	Thomas Bürki	FHBB	Suiza	16-06-99	24-06-99	Sencilla
30	Edith Totschnig	FHBB	Suiza	15-06-99	24-06-99	Sencilla
31	Jan Sage	STENUM	Austria	19-06-99	24-06-99	Sencilla
32	Guillermo Román	CMPL	Mexico	20-06-99	24-06-99	Sencilla
33	Hans-Peter Egler	BAWI	Suiza	20-06-99	24-06-99	Sencilla
34	Petra Schwager	UNIDO	Austria	20-06-99	24-06-99	Sencilla
35	Johannes Dobinger	ONUDI	Costa Rica	20-06-99	24-06-99	Sencilla

## **Joint cooperation activities of NCPC Costa Rica**

By Dr. Sergio Musmani, Director

Sometimes is necessary to use alternate ways to reach your objectives, sometimes using allies – this allies can be identified by them showing interest in participating or by luring them into joint projects. It's very important to address the advantages that those organisations or institutions can derive from the interaction, in terms of public relations, exposure, etc.

### **Interesting connections 1: Ministry of Science and Technology**

The Ministry of Science and Technology in Costa Rica have been actively involved from the very beginning of the creation of the NCPC, participating in the planning of the Center and facilitating some interactions with the government. With such background in mind the next step is to start building the interaction again for specific projects or activities where the Center and the Ministry can benefit. Of basic importance is to develop trust, confidence and reliability between the involved parts, so it's good to start with small and simple actions, sense the response and develop further.

The MICIT point out in a bilateral meeting between a project development officer, Mrs. Saddle Ruiz and the director of the NCPC, where a series of options for collaboration were exposed, two of the more interesting were in the areas of information dissemination and training – awareness raising. They have in their working plan 3 specific points to develop in the cleaner production field for the period between the years 1998-2000 – to develop ties to the center, to help training by courses and seminars and to bring the concept closer to the civil society.

A) On the information dissemination issue, we point out the need to prepare materials in the same line of the brochure recently prepared by the Center and the different ways of reaching more people and industries; then the idea of a poster developed from a previous drawing by ITCR. So an idea of getting more information in a practical and eye catching way was handled, taking as the basis a poster developed by IHOBÉ in Spain. The agreement was to make it together, the Center providing the design and the Ministry paying for the printing, and having their logo included in the material. People from the Center together with Tools (our corporate image creators) to design the poster and decide on details, once this was done, we requested the printing offers (2000 units). The offers were presented to MICIT and the funding approved.

### **Results:**

2000 posters available for distribution to interested parties (industries, universities, consultants, government, etc.), and use Environment Day / Month as a reason for launching the material.

The Center covered the costs of design and negatives of ¢70.000 and MICIT covered the printing costs of ¢162.000.

B) On the training issue, a project was mentioned on bringing technology (hard and soft) to rural areas with industrial expansion taking place, and the technology meeting project. Bring the sustainable industrial development theme and CP tools closer to other parts of the country, as extension or projection. For this activity they show connections with education institutions, local organisations and industrial developments zones (free zones and others).

The concept was to develop courses tailored with examples relevant for the area industries or organisations, where the organisation and other costs will be covered or run by the Ministry and local organisations. The cost of the course will cover consultant fees, materials and overhead. In that way the total cost of such a course goes down and becomes affordable for agri-industries and other local enterprises. (30.000 in San José everything included, 12.000 outside the central valley).

**Results:**

The first activity will be held at the end of June in Puntarenas, together with the University of Costa Rica Puntarenas Branch, Free Zone Park Management and INCOPECSA; at the UCR facilities.

After a review and feedback other similar activities are planned for Perez Zeledón and San Carlos.

**Interesting connections 2: Mexican Government Cooperation**

A joint project between the NCPC and ITCR was submitted to the Cooperation Office at the Mexican Embassy for consideration. The proposal included the training of personnel of both the Center and ITCR on 3 subjects: Cleaner Production, Financing Policies and Environmental Management Systems, with 6 technical people participating. The NCPC or ITCR would cover flight costs, and the cooperation will pay for the courses and stay of the people in Mexico. The CMP+L directed by Dr. Guillermo Roman will receive payment of the courses given directly from the Cooperation Office of the Foreign Relations Ministry through the host institution (IPN, Instituto Politécnico Nacional) channels.

**Results:**

The first course organised by the CMP+L is on CP, Energy Efficiency and EMS as an intensive basic course, where 3 people are participating, 2 from ITCR and 1 from the NCPC (CEGESTI), in the period of 14-18 June. This activity will involve new people at ITCR trained which latter on could participate in the program, at the same time a new person substituting Catalina Quirós will get a jump start to keep on with the internal regular training, her name is Georgina Jimenéz.

Next activity is planned for September on Financing.



- Presentacion gremiales	Dir. + Com. Tec.		X	X									
- Crear procedimientos	Dir. + RCU + FHBB		X	X									
- Imagen corporativa	Dir. + Com. Tec. + JD			X	X	X							
- Web Page (instalación)	Dir. + Com. Tec. + JD			X	X	X							
- Lanzamiento	Dir. + Com. Tec. + JD							X					
- Centro información	Dir. + Com. Tec. + RCU + FHBB	X	X	X	X	X	X	X	X	X	X	X	
Diseminación Información													
- Crear plan de mercadeo	Dir.			X									
- Artículos	Dir. + Com. Tec.		X						X			X	
Asesoramiento políticas													
- Preparación del Taller	Dir. + Com. Tec. + RCU + FHBB							X	X	X	X		
- I Taller Nacional s/políticas	Dir. + Com. Tec. + RCU + FHBB								(X)			X	

## **Workplan FHBB 1999/2000: Tentative Timetable**

see separate document

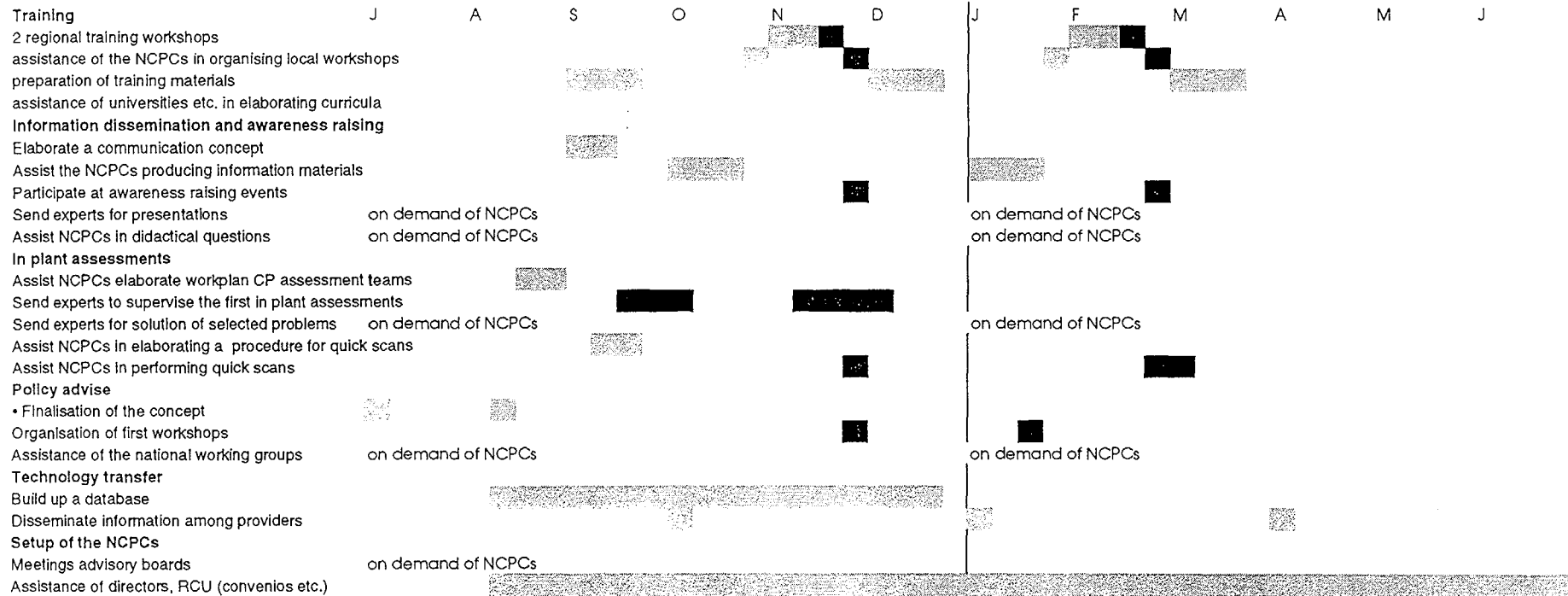
## **Workplan FHBB 1999/2000: Estimated costs**

see separate document

Costs period 7/99 to 6/00

	d 450	d 300	per diem travel •				
	field	home field	home				
<b>Training</b>						<b>45560</b>	<b>45560</b>
2 regional training workshops	14	20	10	14	4000	24260	
assistance of the NCPCs in organising local workshop	10	2	5	5	2000	9600	
preparation of training materials		10	20			10500	
assistance of universities etc. in elaborating curricula		2	1			1200	
<b>Information dissemination and awareness raising</b>						<b>33290</b>	<b>33290</b>
Elaborate a communication concept	1	6		1		3290	
Assist the NCPCs producing information materials	6	5	20	6		11790	
Participate at awareness raising events	6		3	6		4440	
Send experts for presentations	10	1	1	10	4000	10650	
Assist NCPCs in didactical questions	3	3		3		3120	
<b>In plant assessments</b>						<b>56570</b>	<b>56570</b>
Assist NCPCs to elaborate workplan for CP assessment	1					450	
Send experts to supervise the first in plant assessments		1	40	40	4000	25050	
Send experts for solution of selected problems	10	1	1		8000	13250	
Assist NCPCs in elaborating a procedure for quick scans	3	3	3	3		4020	
Assist NCPCs in performing quick scans	20			20	2000	13800	
<b>Policy advise</b>						<b>20040</b>	<b>20040</b>
• Finalisation of the concept		4				1800	
Organisation of first workshops	6	6	15	6	3000	13740	
Assistance of the national working groups		6	6			4500	
<b>Technology transfer</b>						<b>24000</b>	<b>24000</b>
Build up a database		10	40			16500	
Disseminate information among providers		10	10			7500	
<b>Setup of the NCPCs</b>						<b>6240</b>	<b>6240</b>
Meetings advisory boards	3			3		1770	
Assistance of directors, RCU (convenios etc.)	3	6		3		4470	
						0	
•	96	96	40	145	120	27000 ••	185700

Time table period 7/99 to 6/00  
 (only activities with known date)



■ work in the field  
 ▨ home based work



## **Workplan FHBB 1999/2000: Tentative Timetable**

see separate document

## **Workplan FHBB 1999/2000: Estimated costs**

see separate document

# **FHBB Mission to consult the Central American Cleaner Production Centres**

June 10 - 25, 1999

Enclosure 1: Integrated Cleaner Production Policy Programme for Central America

Basel Institute of Technology and Management  
Institute of Environmental Technology  
Grüdenstrasse 40  
CH - 4132 Muttenz  
Switzerland

Dr. Thomas Heim  
Johannes Dobinger (UNIDO)

Muttenz, 20.9.1999

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## Executive Summary

The present document is a proposal for the implementation of an "Integrated Regional Policy Programme for Cleaner Production" in Central America. The proposal is not meant to be exclusively implemented by the UNIDO/UNEP Cleaner Production Programme and CCAD. It aims at providing a framework and work plan for all existing initiatives, which currently work in the field of environmental policies in Central America. The proposal should be of particular relevance for those who cover topics like environmental management, waste management, energy efficiency, etc. regardless of the size, sector and ownership of enterprises involved.

Cleaner Production (CP) is a systematic approach to reducing the environmental impact of enterprises through a more efficient use of resources. CP produces concrete (economic) benefits for the enterprises and is therefore a private sector friendly concept. A programme that supports CP, needs actions on the micro (enterprises), meso (information, markets, etc.) and macro levels (legislation, resource prices, etc.) in order to have a real impact. At the meso- and macro levels CP policy has an important role to play: provide a facilitating framework that allows enterprises to produce in a more efficient and cleaner way.

The situation of Central America with respect to industry and environment gives reason for concern: excessive use and pollution of water, air and soil; high production losses due to inefficient raw material use, wide-spread use of obsolete toxic substances (PCBs, etc.), low levels of energy efficiency and dependence on the use of non-renewable energy sources are but a few examples. The effect of this is twofold: environmental degradation and erosion of the competitiveness of enterprises.

In light of the above it is proposed to create a CP policy with a common regional basis and necessary adaptations in each one of the participating countries. There are five operational goals of a CP policy: 1) facilitate the implementation of CP in the enterprises, 2) assure availability of information on techniques and technologies, 3) motivate and provide incentives, 4) improve support capacity (consultants, universities, ministries, etc. and 5) create an adequate legal framework.

To achieve these goals a medium to long term programme is proposed, including the following elements:

- the formation of national working groups with the support of the respective NCPC
- analysis of existing CP policy on the national level on the basis of an analytical tool provided by the Regional NCPC Programme
- a Regional Workshop with the purpose of finding a common understanding of what needs to be done in order to establish an effective CP policy

- Workshops and other activities (promotion campaigns, seminar for decision makers, etc.) on the national level to promote the implementation of recommendations formulated during the regional workshop

# 1 Introduction

## 1.1 What is Cleaner Production (CP)?

CP is a systematic approach to increase the overall efficiency of industrial production by preventing the generation of wastes and emissions at source. CP tools are: best practices in industry (good housekeeping), raw material substitution, change or adaptation of process techniques and technologies, internal recycling and modification of the characteristics of products and services. Also external recycling can be used as a CP tool. However, the closer the measure implemented is to the source of the generation of a particular waste, the „purer“ is the application of CP and the more effective is the measure.

## 1.2 What are the benefits of CP?

Application of CP-methodology allows it to reduce inputs of raw materials and energy and to save costs and reduce emissions. The main benefits of CP are:

- Increase in a firm's, a region's or a country's competitiveness
- Decline in industrial pollution
- Resource conservation

CP is therefore a vital part of any sustainable development. In many countries preventive strategies like CP have been introduced into national policies. Currently there is an ongoing debate on how far CP can contribute to the goal of environment. Experts estimate that the current productivity levels can be achieved with a fourth to a tenth! of the current inputs used.

## 1.3 How to obtain the benefits of CP on the enterprise level

On the enterprise level, mainly two means are used to achieve the objectives of CP:

- Optimisation of industrial processes
- Optimisation of products and services (eco-design)

However, apart from the measures taken at the enterprise level, a *supportive environment* has to be created, by ensuring sustained and effective introduction of CP into the industrial processes on the macro and meso levels.

## 1.4 Environmental and Economic policies and Cleaner Production

Within the environmental policies CP comes under the “grey” area, i.e. the environmental issues in connection with industry. Due to the importance of economic development, environmental policy traditionally is directed towards protection, whereas economic policy has a rather promoting role. For Cleaner Production, both sides of policy making are equally important.

To change Central American enterprises' relation to and impact on the environment, actions have to be taken on three different but strongly inter-related levels:

### **The macro level**

Objective: to improve the framework conditions for CP (the policy level)

Question: Are there advantages for a firm in the introduction of CP measures?

Intervening factors: Legislation, raw material and energy prices, personnel costs/charges, waste disposal costs, enforcement of legislation, export orientation of industry, taxes and tariffs, market preferences, standards and norms, financing opportunities and instruments

Means: discussions, written inputs, conferences

### **The meso level**

Objective: to improve firms' motivation for CP (when advantages available)

Question: Did the firms identify the advantages?

Intervening factors: available information, accounting practices, education levels, firms' familiarity with the market

Means: information (printed material, seminars, workshops), training at the manager and industry association levels, inter-firm seminars, demo-projects

### **The micro level**

Objective: to improve the knowledge and abilities of CP among firms and consultants and to proof the feasibility of CP through successful cases

Question: Are (the already motivated) firms ready to appropriately plan and introduce CP measures?

Intervening factors: education and training, technical information, financing, consulting

Means: education/training (consultants, specialists in the industry, demonstration projects), demo-projects.

Cleaner Production is an interface between the Environment and the Economy at different levels. At the micro level cost reduction goes hand in hand with environmental impact reduction. At the macro level improved competitiveness of national industry meets with a more sustainable form of industrial development. To achieve this, CP has to be included in environmental and economic policies.

## 1.5 Why a Cleaner Production Policy in Central America?

The environmental impact of industry in Central America is of significant importance, despite the comparatively low level of industrialization. Between 1% and 4% of all industrial wastes are estimated to be toxic<sup>1</sup>, the bulk of industrial establishments lacks adequate treatment systems, ground water resources are being overexploited in parts of the region, etc.

In the long run, this is not a sustainable situation. Cleaner Production represents a realistic option to the current pattern of development.

As shown in chapter 1.4., Cleaner Production is a concept, which needs consideration on the policy level in order to produce a significant impact. However, CP, being a multidisciplinary concept, cannot be simply imposed on industry by means of a new law or an ordinance to an existing law. Therefore the present proposal looks at the policy aspect of Cleaner Production as a process. This process includes the:

- creation of awareness among actors and the general public,
- creation of mechanisms for consultation between actors,
- continuous identification and elimination of barriers for Cleaner Production,
- analysis of the status of implementation of related instruments like ISO 14000, Eco –labelling, etc.
- continuous identification and creation of incentives for and motivation of enterprises to apply CP and
- construction of an adequate legislation.

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<sup>1</sup> El Estado del Medio Ambiente en Centroamérica (the state of the environment in Central America), CCAD, 1998



With only a few exceptions, the idea of Cleaner production and pollution prevention is fairly new to Central American Industry and related institutions. Few examples of successful activities in this area exist. Traditionally the environmental discussion is mainly oriented towards the issues related to conservation (national parks, protected areas, water supply, etc).

As far as industry is concerned, existing policies at the *national level* are mainly based on command and control mechanisms with a strong emphasis on Environmental Impact Assessments and the introduction of emission and imission limits. However, national and local execution capacities generally do not cope with the quality and quantity of work, required to assure the functioning of the command and control systems in place.

At the *regional level* the Central American presidents, through their Alliance for Sustainable Development<sup>2</sup>, have assumed a list of environmental responsibilities. Among these responsibilities are:

- the establishment of Environmental Impact Assessment guidelines and rules,
- promotion of energy efficiency,
- establish monitoring and control systems for the contamination of the different environmental media and
- promote the competitiveness of industry through the use of technologies compatible with the goal of sustainable development.

So far not much has been done to live up to these responsibilities. No adequate policies exist to facilitate the application of Cleaner Production by Central American Industries.

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<sup>2</sup> The Alliance for Sustainable Development was signed by the Presidents of Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and representatives of Panamá and Belice in October 1994.

## **2 The current situation in Central America**

### **2.1 Resource use of industry**

Industrial activities contribute considerably to environmental degradation in Central America. Natural resources are being used in a non-sustainable way with marked impacts on the environment. The following is a summary of industry's resource use patterns. This summary intends to provide a starting point for the formulation of a reasonable CP policy, which could result in a more sustainable and reasonable pattern of resource use.

#### **2.1.1 Water**

World-wide industry accounts for about 23% of total water consumption (the bigger part goes into agriculture - 69% and the rest into domestic uses - 8%). This general pattern is different for Central America: currently industry is responsible for only 10 to 15% of total water consumption, with agriculture accounting for some 80% of the resource use<sup>3</sup>. This situation obviously reflects the fact that Central America does not have a very high level of industrialisation. However, with steady growth rates of industry for the last few years and more industrial growth to come, a shift in this pattern is to be foreseen.

Industry mainly consumes ground water, while domestic and agricultural water consumption is mainly taken from surface sources (rain water, lakes & dams, etc). This is an important feature of regional water consumption patterns, because it shows that the availability of ground water is directly linked to the development and consumption patterns of the industrial sector. A scenario like the one in Mexico City, where water prices exploded after (ground) water shortages began, could easily lead to serious problems in terms of competitiveness of the Central American Industry.

There is a high potential for reducing the industrial water consumption through Cleaner Production (e.g. closed cycles), thereby reducing necessary investments for waste water treatment. However, until now no effective means exist to establish a realistic price for water, which, in turn, is a basic condition for the motivation of users to apply Cleaner Production principles.

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<sup>3</sup> El Estado del Medio Ambiente en Centroamérica (the state of the environment in Central America), CCAD, 1998

### 2.1.2 Energy

Industry is the second most important consumer of electrical power and hydrocarbons in the region<sup>4</sup>. This is all the more important, taking into account that non-renewable resources (e.g. bunker) are still accounting for the generation of some 40% of total electrical energy. Hydrocarbons are also the most important source of thermal energy consumed by the industrial sector.

At the same time energy efficiency of industry is comparatively low. In some enterprises the identified potential for energy savings is up to 50%. The existing pattern of energy consumption is not only a result of low resource (energy) prices. Obsolete equipment, lack of (preventive) maintenance and ignorance of best practices in the field of energy use are causing this situation.

In energy intensive industries (e.g. cement, etc) energy efficiency can be a decisive factor for competitiveness. Improvements in energy efficiency could have a double benefit if the reduced CO<sub>2</sub> emissions can be certified and sold as "Certified Tradable Offsets" under the provisions of the Kyoto Protocol.

### 2.1.3 Raw Materials

Inefficient use of raw materials contributes considerably to the generation of solid waste, water and air pollution. In Central America this is especially the case in the agro-based industries. This problem is often neglected because of the supposedly benign nature of organic wastes. It is important to notice, however, that environmental degradation of whole ecosystems is being caused through the effects like eutrophication caused by organic wastes.

Toxic and hazardous wastes generated by industries like metal finishing, leather processing, textile dying, etc. are wide spread in Central America. In these sectors the loss of raw materials through process-inefficiencies can be an important cost factor.

Central American industry has a huge potential for improvements in raw materials utilisation. Since the majority of industrial establishments has not yet made the necessary investments in end-of-pipe technology, CP comes at the right moment: a more efficient process reduces production costs AND investments in treatment facilities.

## 2.2 Competitiveness of Central American Industry

The competitiveness of Central American Industry depends on a complex system of internal and external factors, which influence the comparative advantages of firms,

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<sup>4</sup> *ibid.*

products, sectors and countries. Throughout the past decades, the environmental performance has increased its importance within these factors<sup>5</sup>. The following aspects have to be taken into account within the framework of a policy for Industry and the Environment.

- resource use efficiency (energy, water, raw material) as a cost factor,
- there is a close correlation between product quality and environmental performance
- the relevance of environmental performance for trade:
  - green consumerism and access to foreign markets,
  - international environmental standards (ISO 14000, EMAS)
  - possible non-tariff trade barriers related to the environment,
  - requirements for suppliers of multinational firms,
- the particular importance of tourism for the region with special regard to eco-tourism,
- risks associated to environmental performance (non-compliance of laws, accidents, etc.)
- other factors

With regional integration efforts gaining strength, it is increasingly important to analyse the impact of FTAs (Free Trade Agreements) on the environment of member countries. This is of particular importance if countries with different levels of environmental performance join such an agreement.<sup>6</sup>

More important, the benefits of a “green” image of Central America, based on concrete actions and reliable information provided to outsiders, must be shown to entrepreneurs. While the tourism sector is more directly depending on the environmental performance of the region, industry is still hesitating to reckon the long term strategic potential of an environmentally sound production.

First results of the Central American Cleaner Production Programme (CACPP) show that Cleaner Production can be a very useful tool to overcome this situation. Some of the more internationally exposed firms are already implementing CP in pilot projects. For a wider impact, however, a supportive policy has to be adopted by the relevant sectors (public, private, universities, etc.)

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<sup>5</sup> see also: Centroamerica en el Siglo XXI, INCAE, Harvard IID, 1999

<sup>6</sup> see also: Industria y Ambiente en Centroamérica y Mexico, ECLAC, 1999

### **3 Policies for CP in Central America**

#### **3.1 Objectives of an Integrated Policy Programme for CP**

As explained under 1.4. the overall goal of CP is the reduction of the environmental impact of industry in a way that uses the potential that exists in enterprises to use resources more efficiently.

Starting from this the following *overall goal* can be defined for the *Integrated CP Policy Programme*:

*Assure that CP is properly introduced into the institutional and regulatory framework of industrial activities.*

At the operational level CP policies aim at the following five objectives:

- motivate
- facilitate
- provide information
- create capacity
- set the necessary rules of the game

#### **3.2 CP Policy Instruments**

A wide range of policy instruments is available to promote Cleaner Production. Grouped according to the above mentioned operational policy objectives some of the instruments are listed below:

##### **3.2.1 Motivate and Provide Incentives**

- Create concrete benefits for the participation in CP programmes and adherence to Voluntary Industry Codes of Conduct for the Environment. An example for the latter instrument would be an extended grace period for the compliance with binding environmental standards. Another example could be an award for the most significant impact reduction achieved by an enterprise through CP.
- Eliminate artificially low resource prices (often indirect subsidies like publicly financed water projects lead to water prices which cause over-utilisation of the resource). This also has to include the problem of dropping ground water tables,

especially in zones where surface water utilisation is limited by chronic infrastructure deficiencies.

- Fiscal incentive schemes like tax holidays or even tax exemption for CP investments.
- others

### **3.2.2 Facilitate the implementation of CP at the enterprise level**

- Create “green” funds for CP investments at preferential rates
- Allow for a reasonable time span to comply with new regulations
- Provide technical assistance to enterprises ready to change
- others

### **3.2.3 Assure availability of Information**

- Engage in networking activities with CP institution world wide
- Give priority to CP in national science & technology policies
- others

### **3.2.4 Assure adequate capacity of support institutions**

- Create a permanent capacity at the university level
- Subsidies for training events for CP consultants
- others

### **3.2.5 Create adequate legal framework**

- Identification of niches in existing legislation for the introduction of preventive approaches through ordinances or decrees.
- Laws and regulations requiring certain environmental standards to be complied with by the enterprise, including concepts like maximum emission values and best available technologies/techniques (BAT) and best available technologies/techniques not entailing excessive costs (BATNEEC). These instruments can also

have a counterproductive effect if not applied carefully (e.g. enterprises prefer end-of-pipe solutions instead of CP if not enough time is given for a CP approach to take effect).

- others

### **3.3 Elements of the Programme**

The programme consists of two types of elements. Firstly, "Process Elements" which bring actors together and get the process going and secondly, "Specific Elements" corresponding to each one of the five objectives of CP policy. Resources for the implementation of the programme are expected to be provided by the different participating organisations, including the private sector. Resources will be provided by the UNIDO Central American Cleaner Production Programme if the activities foreseen form part of the activities comprised in the project document of this programme. Some of the activities might be carried out by external (local or international) consultants if the participating organisations do not have the necessary human resources available.

#### **3.3.1 Process elements**

Table 1 shows an overview of the process elements.

**Table 1: Process elements**

<b>Elements</b>	<b>Purpose</b>	<b>Time horizon</b>	<b>Resources needed</b>	<b>Origin of resources</b>	<b>Involved Partners</b>	<b>Remarks</b>
1. form national working groups including legal expert	Create the capacity for the implementation of the programme	September 1999	Human resources, office space for meetings, office materials	CACP, CCAD, others	CACP (Directors and RCU), CCAD, others	
2. First Regional policy workshop (3 days): how to include CP in national legislation	Discuss conclusions, seek consensus on what has to be done, formulate action plan	January/February 2000	Funds for workshop organisation, international experts, local experts	CP programme, Ministries of Science & Technology, others	CPP, CCAD, Ministries	
3. Follow up by national working groups	Implement recommendations on the national level	February to May 2000	Human resources, office space for meetings, office mat.	CACP, CCAD, others	CACP (Directors and RCU), CCAD, others	
4. National workshops or one regional workshop	Push implementation of recommended measures	June/July 2000	Funds for workshop organisation, international and local experts	CP programme, Ministries of Science & Technology, others	CPP, CCAD, Ministries	
5. Study tour of Key persons for CP in CA	Create a group of opinion leaders convinced of CP benefits	September-November 1999	Key persons, Travel funds	CCAD	CCAD, CCP, CMPL, others	Participants are key persons in elements 2, 4 and 6
6. Regional CP policy workshop for decision makers		January/February 2000	International experts, local experts	CP programme, other programmes CCAD, participants?	CCAD, CPP, Private Sector, Public Sector, NGOs, Consultants	

### 3.3.2 Specific elements

Tables 2 – 6 show incentives, possibilities to facilitate the implementation of CP at the enterprise level, how to assure availability of information and adequate capacity of support institutions and how to create an adequate legal framework.



**Table 2 How to Motivate and Provide Incentives**

<b>Element</b>	<b>Purpose</b>	<b>Time horizon</b>	<b>Resources needed</b>	<b>Origin of resources needed</b>	<b>Involved Partners</b>	<b>Remarks</b>
1. Develop a Voluntary Code of Conduct for Central American Industry	widespread CP adoption, set the rules for what qualifies as a real CP programme in a firm	2000	International and local experts	CACP, CCAD, FECAICA, others	FECAICA, FEDCAMAR AS, CCAD, CACP	Code of Conduct has to be based on CP principles
2. Promote the association of enterprises to the NCPCs (NCPC membership)	Promote the adoption of CP measures as something beneficial to the environment	September 1999 onwards	Promotional work	CACP	Chambers of Industry	NCPC membership has to be subject to approval under predefined conditions
3. Regional CP promotion campaign: workshops, TV spot on CP, advertisements, etc.	Make CP benefits known to industry, sell the idea of a "Cleaner producing Central America"	2000 (once a set of successful showcases exist)	to be determined	International donors, Ministries, others	FECAICA, CCAD, Chambers of Industry, CACP	
4. Analysis of current resource prices and ways to adjust them	Provide a basis for the discussion of a general change in resource price policies	October 1999, results to be presented at regional workshop 2000	International experts, local experts	CACP, CCAD, Public sectors	Relevant Ministries, private and public resource providers, private sector, CCAD, CACP	
Others						

**Table 3: How to facilitate the implementation of CP at the enterprise level**

<b>Element</b>	<b>Purpose</b>	<b>Time horizon</b>	<b>Resources needed</b>	<b>Origin of resources</b>	<b>Involved Partners</b>	<b>Remarks</b>
Create CP funds at the national and/or regional level	Provide willing enterprises with the financial means to implement CP	2000-2002	To be determined	Foreign aid, existing debt-for-environment funds, commercial banks	Finance Institutions, Local and International development banks, CACP	
Provide technical assistance to interested enterprises	Facilitate implementation on the enterprise level	In process, continuing	Local and international experts	CACP, others	CACP, others	
Link existing technical assistance programmes to the CACP	Increase coverage of CP assistance	2000 - 2003	Local and international experts,	CACP, others	Chambers of Industry, Technical Assistance Programmes	
Others						

**Table 4: How to assure availability of Information**

<b>Element</b>	<b>Purpose</b>	<b>Time horizon</b>	<b>Resources needed</b>	<b>Origin of resources</b>	<b>Involved Partners</b>	<b>Remarks</b>
Establish CP information Centres at the NCPCs	Assure availability of information	Ongoing process, 1999 -2000	various	CACP, others	CACP, others	Foreseen in regular workplan of NCPCs
Others						

**Table 5: How to assure adequate capacity of support institutions**

<b>Element</b>	<b>Purpose</b>	<b>Time horizon</b>	<b>Resources needed</b>	<b>Origin of resources</b>	<b>Involved Partners</b>	<b>Remarks</b>
Provide training to staff of support institutions	Assure direct internal capacity	Ongoing process 1999 - 2003	Local and international experts	CACP, others	CACP, others	
Provide training to local consultants	Assure availability of external consultants	Ongoing process, continuing	Local and international experts	CACP, others	CACP, others	
Include CP in University curricula	Produce a "critical mass" of qualified technical personnel	2000 - 2003	Collaboration of Universities, experts	CACP, others	CACP, others	
Others						

**Table 6: How to create adequate legal framework**

<b>Element</b>	<b>Purpose</b>	<b>Time horizon</b>	<b>Resources needed</b>	<b>Origin of resources</b>	<b>Involved Partners</b>	<b>Remarks</b>
Analysis of legal framework in the participating countries	Provide conclusions on the implementation of CP aspects at the national and regional level	October 1999 – March 2000	International experts, local experts	CP programme, other programmes CCAD	CCAD, CACP, Ministries	discussion of analysis and reach consensus on conclusions is integral part of the policy process
Others						

## **4 Partners of the Programme**

The present document is a proposal for the implementation of an “Integrated Regional Policy Programme for Cleaner Production” in Central America. The proposal is not meant to be exclusively implemented by the UNIDO/UNEP Cleaner Production Programme and CCAD. It aims at providing a framework and work plan for all existing initiatives, which currently work in the field of environmental policies in Central America. The proposal should be of particular relevance for those who cover topics like environmental management, waste management, energy efficiency, etc. regardless of the size, sector and ownership of enterprises involved. An effective CP policy is of benefit to all of these programmes. Countries without an NCPC (Belize, Honduras, Panama) should participate in the programme through qualified counterpart institutions.

### **4.1 Comisión Centroamericana de Ambiente y Desarrollo (CCAD)**

The “Comisión Centroamericana de Ambiente y Desarrollo – CCAD” (Central American Commission for Environment and Development) was founded in 1989 as the organ in charge of the implementation of the “Alianza Centroamericana para el Desarrollo Sostenible – ALIDES” (Central American Alliance for Sustainable Development). CCAD forms part of the Sistema de Integración Centroamericana – SICA (Central American Initiative for Regional Integration) and was set up by the participating Governments (Belize, Costa Rica, El Salvador, Guatemala, Honduras, Panama).

Among the objectives of CCAD is to work for the compliance of the environmental commitments included in ALIDES, include the environment as an important topic into the socio-economic political agendas in the region and the strengthening of capacities of the countries to comply with the regional and international commitments like Climate Change and Agenda 21.

CCAD is cooperating with several internationally sponsored environmental projects in different areas (Biodiversity, Environmental Legislation, etc.).

### **4.2 Central American Cleaner Production Programme (CACP)**

The Central American Cleaner Production Programme is formed by a network of four National Cleaner Production Centres (NCPCs) in El Salvador (established 1998), Guatemala (established 1999), Costa Rica (established 1998) and Nicaragua (establishment of NCPC not yet completed). The United Nations Industrial Development Organisation and the United Nations Environmental Programme provide technical support to the programme. The Swiss Government supports the programme financially

and through international experts in the field of CP. Each one of the NCPCs is founded by several local institutions related to the industrial sector (chambers of industry, etc.), which provide the political support and the human resources for the functioning of the NCPC.

The mission of the NCPCs is to be a Centre of Excellence in CP in their respective country. They provide the following services to industry and related sectors: a) in-plant-assessments and demonstration projects at the enterprise level, b) training for technical staff of enterprises, consultants, university staff, etc., c) dissemination of information on CP, d) technology transfer for enterprises and e) policy advice.

### **4.3 Other Partners**

In Central America a number of initiatives in the field of Cleaner Production and Eco-efficiency exist. Some of them are already working in close co-operation with CCAD (Prolegis, CCAD-GTZ, etc.) others do not yet have links to the proposed programme. All of these initiatives should be given the opportunity to contribute to the proposal through ideas or resources needed to create an effective CP policy.

Apart from the initiatives already working in the field of CP, several institutions have to be involved in the different stages of the programme in order to assure impact. Some of them are listed below:

- Ministries of Environment
- Ministries of Science and Technology
- Chambers of Industry
- Small Enterprise Associations
- Environmental NGOs
- Universities
- Consulting firms
- Others

However, a small team of main promoters of the programme should be maintained to avoid loss of efficiency in the implementation process.

## **Appendix: Literature**

CCAD, 1998, „El Estado del Medio Ambiente en Centroamérica (the state of the environment in Central America)“

INCAE, Harvard IID, 1999, „Centroamerica en el Siglo XXI“

ECLAC, 1999 „Industria y Ambiente en Centroamérica y Mexico“

# **FHBB Mission to consult the Central American Cleaner Production Centres**

June 10 - 25, 1999

Enclosure 2: Environmental Regulations concerning Cleaner Production in Europe and Central America

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Muttenz, 9. September 1999

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# 1 Background

Various factors determine whether industrial enterprises focus on Cleaner Production (CP) measures or instead prefer end-of-pipe solutions. One reason to implement CP measures is to optimize processes, thereby minimizing costs. Financial benefits arise from more efficient resource management, reduction of disposal and emissions fees, efficient energy consumption and fewer end-of-pipe-measures. To promote preventative pollution control, it is necessary to define standards for Cleaner Production in environmental legislation.

In this analysis the relevant regulations for Cleaner Production in Europe and Central America are compared. The important articles have been identified and assessed.

## **2 Cleaner Production Regulations in Europe**

### **2.1 Objective**

Survey of relevant European regulations concerning Cleaner Production, pollution prevention and waste management in industry.

### **2.2 Research Methods**

#### **2.2.1 Internet search and literature review**

A analysis of specific journals yielded information about German regulations (in particular, *Betriebliche Abfallwirtschaftskonzepte*, Uwe Stoltenberg, EP 3/95).

The Internet search yielded European Union (EU) regulations: Council Directive 96/61/EC of September 24th 1996 concerning integrated pollution prevention and control (<http://europa.eu.int/eur-lex/de/search.html>).

One Internet site contains the complete environmental laws ([http://www.umwelt-online.de/recht/uet\\_rech.htm](http://www.umwelt-online.de/recht/uet_rech.htm)). For example, articles about waste prevention in industry are available in the section "deutsche Kreislaufwirtschafts- und Abfallgesetz".

The relevant articles on EU regulations as well as German environmental legislation are provided in the section 2.3 (Results).

#### **2.2.2 Survey of European environmental departments**

To obtain information about other European legislation and to ascertain if the EU regulations have been incorporated into national law, we contacted the governmental departments of the environment in the Netherlands, Sweden, Denmark, Ireland and Austria.

The addresses of the departments and offices that responded to the survey are given in the Appendix.

## 2.3 Results

### 2.3.1 Cleaner Production Laws in the European Union: Council Directive 96/61/EC of September 24th 1996 concerning integrated pollution prevention and control

(Official Journal L 257 , 10/10/1996 pp. 0026 – 0040)

Decisive text passages:

Regarding:

1. ... preventing, reducing and as far as possible eliminating pollution by giving priority to intervention at the source and ensuring prudent management of natural resources, in compliance with the 'polluter pays' principle and the principle of pollution prevention;

...

8. The objective of an integrated approach to pollution control is to prevent emissions into air, water or soil wherever this is feasible, taking into account waste management, and, where it is not feasible, to minimize them in order to achieve a high level of protection for the environment as a whole;

...

13. In order to tackle pollution problems more effectively and efficiently, environmental aspects should be taken into consideration by the operator; those aspects should be communicated to the competent authority or authorities so that they can verify, before granting a permit, that all appropriate preventive or pollution-control measures have been established; different application procedures may give rise to different levels of environmental protection and public awareness; therefore, applications for permits under this Directive should include minimum data;

...

15. The competent authority or authorities will grant or amend a permit only when integrated environmental protection measures for air, water and land have been established;

...

26. Regular reports on the implementation and effectiveness of this Directive must be produced;

...

27. This Directive is concerned with production units whose potential for pollution, and therefore crossborder pollution, is significant; crossborder consultation is to be organized where applications relate to the licensing of new production units or substantial changes to production units which are likely to have significant negative environmental effects; the applications relating to such proposals or substantial changes will be available to the public of the Member State likely to be affected;

#### Article 1 Purpose and scope

The purpose of this Directive is to achieve integrated prevention and control of pollution arising from the activities listed in Annex I. It establishes measures designed to prevent or, where prevention is not feasible, to reduce emissions from the above mentioned activities to the air, water and land, including measures concerning waste, in order to achieve a high level of protection of the environment taken as a whole, without prejudice to Directive 85/337/EEC and other relevant Community provisions.

#### Article 3 General principles governing the basic obligations of the operator

Member States and their authorities shall take the necessary measures to ensure that production units are operated such that:

- (a) all the appropriate preventive measures are taken against pollution, in particular through application of the best available techniques;
- (b) no significant pollution is caused;
- (c) waste production is avoided in accordance with Council Directive 75/442/EEC of July 15th 1975 on waste(1); where waste is produced, it is recovered or, where that is technically and economically impossible, it is disposed of while avoiding or reducing any impact on the environment;
- (d) energy is used efficiently;
- (e) the necessary measures are taken to prevent accidents and limit their consequences;

**Article 5 Requirements for the granting of permits for existing production units**

1. Member States and their authorities shall take the necessary measures to ensure that, by means of permits in accordance with Articles 6 and 8 or, as appropriate, by reconsidering and, where necessary, by updating the conditions, that existing production units operate in accordance with the requirements of Articles 3, 7, 9, 10, 13, the first and second subsections of 14, and 15 (2) not later than eight years after the date on which this Directive is effective, without prejudice to specific Community legislation.

**Article 6 Permit applications**

1. Member States shall take the necessary measures to ensure that a permit application to the responsible authority includes a description of:

- the production unit and its activities,
- the raw and auxiliary materials, other substances and the energy used in or generated by the production unit,
- the emissions sources from the production unit,
- the site conditions of the production unit,
- the nature and quantities of foreseeable emissions from the production unit into each medium as well as identification of significant environmental effects of the emissions,
- the proposed technology and other techniques for preventing or, where this not possible, reducing emissions from the production unit,
- where necessary, measures for the prevention and recovery of waste generated by the production unit,
- further measures planned to comply with the basic obligations of the operator as provided for in Article 3,
- measures planned to monitor emissions into the environment.

An application for a permit shall also include a non-technical summary of the details referred to in the above subsections.

2. Where information supplied in accordance with the requirements provided for in Directive 85/337/EEC or a safety report prepared in accordance with Council Directive 82/501/EEC of June 24th 1982 on the major-accident hazards of certain industrial activities (2) or other information produced in response to other legislation fulfills any of the requirements of this Article, that information may be included in, or attached to, the application.

**ANNEX I CATEGORIES OF INDUSTRIAL ACTIVITIES REFERRED TO IN ARTICLE 1**

1. Production units or parts of production units used for research, development and testing of new products and processes are not covered by this Directive.
2. The threshold values given below generally refer to production capacities or outputs. Where one operator carries out several activities falling under the same subheading in the same production unit or on the same site, the capacities of such activities are combined.

**1. Energy industries**

- 1.1. Combustion production units with a rated thermal input exceeding 50 MW (1)
- 1.2. Mineral oil and gas refineries
- 1.3. Coke ovens
- 1.4. Coal gasification and liquefaction plants

**2. Production and processing of metals**

- 2.1. Metal ore (including sulfide ore) roasting or sintering production units
- 2.2. Production units for pig iron or steel (primary or secondary fusion) including continuous casting, with a capacity exceeding 2.5 tons per hour
- 2.3. Production units for the processing of ferrous metals:
  - (a) Hot-rolling mills with a capacity exceeding 20 tons of crude steel per hour
  - (b) Smitheries with hammers whose energy exceeds 50 kilojoule per hammer, where the power used exceeds 20 MW
  - (c) Application of protective fused metal coats with an input exceeding 2 tons of crude steel per hour
- 2.4. Ferrous metal foundries with a production capacity exceeding 20 tons per day

## 2.5. Production units

- (a) for non-ferrous crude metals from ore, concentrates or secondary raw materials by metallurgical, chemical or electrolytic processes
- (b) for the smelting and alloyage of non-ferrous metals, including recovered products, (refining, foundry casting, etc.) with a melting capacity exceeding 4 tons per day for lead and cadmium or 20 tons per day for all other metals

2.6. Production units for surface treatment of metals and plastic materials using an electrolytic or chemical process where the volume of the treatment vats exceeds 30 m<sup>3</sup>

**3. Mineral industry**

- 3.1. Production units for cement clinker in rotary kilns with a production capacity exceeding 500 tons per day or lime in rotary kilns with a production capacity exceeding 50 tons per day or in other furnaces with a production capacity exceeding 50 tons per day
- 3.2. Production units for asbestos and the manufacture of asbestos-based products
- 3.3. Production units for glass and glass fiber with a melting capacity exceeding 20 tons per day
- 3.4. Production units for melting mineral substances and the production of mineral fibers with a melting capacity exceeding 20 tons per day
- 3.5. Production units for ceramic products by firing; in particular, roofing tiles, bricks, refractory bricks, tiles, stoneware or porcelain, with a production capacity exceeding 75 tons per day, and/or with a kiln capacity exceeding 4 m<sup>3</sup> and with a setting density per kiln exceeding 300 kg/m<sup>3</sup>

**4. Chemical industry**

Production within the context of the categories of activities in this section refers to production on an industrial scale by chemical processing of substances or groups of substances listed in Sections 4.1 to 4.6

## 4.1. Chemical production units for basic organic chemicals, such as:

- (a) simple hydrocarbons (linear or cyclic, saturated or unsaturated, aliphatic or aromatic)
- (b) oxygen-containing hydrocarbons such as alcohols, aldehydes, ketones, carboxylic acids, esters, acetates, ethers, peroxides, epoxy resins
- (c) sulphurous hydrocarbons
- (d) nitrogenous hydrocarbons such as amines, amides, nitrous compounds, nitro compounds or nitrate compounds, nitriles, cyanates, isocyanates
- (e) phosphorus-containing hydrocarbons
- (f) halogenic hydrocarbons
- (g) organometallic compounds
- (h) basic plastic materials (polymers synthetic fibers and cellulose-based fibers)
- (i) synthetic rubbers
- (j) dyes and pigments
- (k) surface-active agents and surfactants

## 4.2. Chemical production units for basic inorganic chemicals, such as:

- (a) gases, such as ammonia, chlorine or hydrogen chloride, fluorine or hydrogen fluoride, carbon oxides, sulfur compounds, nitrogen oxides, hydrogen, sulfur dioxide, carbonyl chloride
- (b) acids, such as chromic acid, hydrofluoric acid, phosphoric acid, nitric acid, hydrochloric acid, sulfuric acid, oleum, sulphurous acids
- (c) bases, such as ammonium hydroxide, potassium hydroxide, sodium hydroxide
- (d) salts, such as ammonium chloride, potassium chlorate, potassium carbonate, sodium carbonate, perborate, silver nitrate
- (e) non-metals, metal oxides or other inorganic compounds such as calcium carbide, silicon, silicon carbide

## 4.3. Chemical production units for phosphorous-, nitrogen- or potassium-based fertilizers (simple or compound fertilizers)

## 4.4. Chemical production units for basic plant health products and of biocides

## 4.5. Production units using a chemical or biological process for the production of basic pharmaceutical products

## 4.6. Chemical production units for explosives

## 5. Waste management

Without prejudice of Article 11 of Directive 75/442/EEC or Article 3 of Council Directive 91/689/EEC of December 12th 1991 on hazardous waste (1):

- 5.1. Production units for the disposal or recovery of hazardous waste as defined in the list referred to in Article 1 (4) of Directive 91/689/EEC, as defined in Annexes II A and II B (operations R1, R5, R6, R8 and R9) to Directive 75/442/EEC and in Council Directive 75/439/EEC of June 16th 1975 on the disposal of waste oils (2), with a capacity exceeding 10 tons per day
- 5.2. Production units for the incineration of municipal waste as defined in Council Directive 89/369/EEC of June 8th 1989 on the prevention of air pollution from new municipal waste incineration plants (3) and Council Directive 89/429/EEC of June 21st 1989 on the reduction of air pollution from existing municipal waste-incineration plants (4) with a capacity exceeding 3 tons per hour
- 5.3. Production units for the disposal of non-hazardous waste as defined in Annex II A to Directive 75/442/EEC under headings D8 and D9, with a capacity exceeding 50 tons per day
- 5.4. Landfills receiving more than 10 tons per day or with a total capacity exceeding 25,000 tons, excluding landfills of inert waste

## 6. Other activities

6.1. Industrial plants for the production of:

- (a) pulp from timber or other fibrous materials
- (b) paper and board with a production capacity exceeding 20 tons per day
- 6.2. Plants for the pre-treatment (operations such as washing, bleaching, mercerization) or dyeing of fibers or textiles where the treatment capacity exceeds 10 tons per day
- 6.3. Plants for the tanning of hides and skins where the treatment capacity exceeds 12 tons of finished product per day
- 6.4. (a) Slaughterhouses with a carcass production capacity greater than 50 tons per day
- (b) Treatment and processing intended for the production of food products from:
  - animal raw materials (other than milk) with a finished product capacity greater than 75 tons per day
  - vegetable raw materials with a finished product production capacity greater than 300 tons per day (average value on a quarterly basis)
- (c) Treatment and processing of milk, the quantity of milk received being greater than 200 tons per day (average value on an annual basis)
- 6.5. Production units for the disposal or recycling of animal carcasses and animal waste with a treatment capacity exceeding 10 tons per day
- 6.6. Production units for the intensive rearing of poultry or pigs with a capacity exceeding:
  - (a) 40 000 poultry
  - (b) 2 000 production pigs (over 30 kg), or
  - (c) 750 sows
- 6.7. Production units for the surface treatment of substances, objects or products using organic solvents, in particular for dressing, printing, coating, degreasing, waterproofing, sizing, painting, cleaning or impregnating, with a consumption capacity of more than 150 kg per hour or more than 200 tons per year
- 6.8. Production units for the production of carbon (hard-burnt coal) or electrographite by means of incineration or graphitization

**ANNEX III Indicative list of the main polluting substances to be considered when relevant for fixing emission limit values****Air**

1. Sulfur dioxide and other sulfur compounds
2. Oxides of nitrogen and other nitrogen compounds
3. Carbon monoxide
4. Volatile organic compounds
5. Metals and their compounds
6. Dust
7. Asbestos (suspended particulates, fibers)
8. Chlorine and its compounds
9. Fluorine and its compounds
10. Arsenic and its compounds
11. Cyanides
12. Substances and preparations which have been proved to possess carcinogenic or mutagenic properties or properties which may affect reproduction via the air
13. Polychlorinated dibenzodioxins and polychlorinated dibenzofurans

**Water**

1. Organohalogen compounds and substances which may form such compounds in the aquatic environment
2. Organophosphorus compounds
3. Organotin compounds
4. Substances and preparations which have been proved to possess carcinogenic or mutagenic properties or properties which may affect reproduction in or via the aquatic environment
5. Persistent hydrocarbons and persistent and bioaccumulable organic toxic substances
6. Cyanides
7. Metals and their compounds
8. Arsenic and its compounds
9. Biocides and plant health products
10. Materials in suspension
11. Substances which contribute to eutrophication (in particular, nitrates and phosphates)
12. Substances which have an unfavorable influence on the oxygen balance (and can be measured using parameters such as BOD, COD, etc.).

**ANNEX IV**

General or specific considerations when determining best available techniques, as defined in Article 2 (11), bearing in mind the probable costs and benefits of a measure and the principles of precaution and prevention:

1. the use of low-waste technology;
2. the use of less hazardous substances;
3. the furthering of recovery and recycling of substances generated and used in the process and of waste, where appropriate;
4. comparable processes, facilities or methods of operation which have been tried with success on an industrial scale;
5. technological advances and changes in scientific knowledge and understanding;
6. the nature, effects and volume of the emissions concerned;
7. the commissioning dates for new or existing production units;
8. the length of time needed to introduce the best available technique;
9. the consumption and nature of raw materials (including water) used in the process and their energy efficiency;
10. the need to prevent or minimize the overall environmental impact and risks;
11. the need to prevent accidents and to minimize the environmental consequences;
12. the information published by the Commission pursuant to Article 16 (2) or by international organizations.

## 2.3.2 Cleaner Production Laws in Germany

"Closed Substance Cycle and Waste Management Act"

(from September 27th 1994, revised version from 1996)

Decisive text passages:

### §4 Principles of the closed substance cycle and waste management

(1) *Waste must in the first place be avoided, particularly by minimizing its quantity and noxiousness; in the second place it must be recovered materially or be utilized to produce energy (energy re-recovery)*

(2) Examples of measures to avoid the production of waste are a closed substance cycle within the production unit, low-waste product-design, and influencing consumer behavior towards purchasing products low in waste and harmful substances.

### § 19 Waste management programs

The management of a production unit which annually produces more than

- 2000 kg of very dangerous waste ("which must be under special surveillance") or
- 2000 tons of dangerous waste ("which must be under surveillance")

must create a *waste management program addressing the prevention, recovery and disposal of the produced waste.*

The waste management program serves as an internal planning instrument. It must be made available upon request to the relevant authority or authorities. A waste management program for the following five years must initially be created by December 31st 1999. It must be renewed every five years.

### § 20 Waste balance sheet

The management of a production unit which annually produces more than

- 2000 kg of very dangerous waste ("which needs to be under special surveillance")
- 2000 tons of dangerous waste ("which needs to be under surveillance")

must create an initial annual waste balance sheet by April 1st 1998

### § 22 Product responsibility

Products must be designed in a way that

minimizes the emergence of waste during their production and use, and

guarantees the environmentally friendly recovery and disposal of the waste after use of the product...

Products should be multiply useable, technically durable, suited to be recovered harmlessly and disposed of in an environmentally friendly manner...

Use of recoverable waste and secondary raw materials in the production...

Labeling of products containing harmful substances...

Details about the possibilities of return, reuse and recovery, regulation of deposit...

### § 29 Waste management planning

The waste management plan must be initially established by the provinces by December 31st 1999 and renewed every five years.

The waste management plan describes the aims of waste prevention and recovery.

### § 38 Responsibilities of waste management consultants

The relevant waste disposal company is committed to providing expertise and consultancy concerning prevention, recovery and disposal of waste.



**§ 39 Public information**

The provinces report on the achieved state of waste prevention and recovery, as well as the guarantee of waste disposal (comparing predicted and actual status)

**§ 53 Responsibilities of the firm's management**

The production unit's owner must demonstrate to the authorities the planned measures for compliance with regulations and orders concerning waste prevention, recovery and environmentally friendly disposal.

**§ 54 Appointment of a company waste specialist**

The appointment of a specialist responsible for waste is required in companies which produce harm-ful waste...

**§ 55 Tasks**

The waste specialist advises the manager and employees in all affairs relevant to the closed substance cycle and waste disposal. He is entitled and committed to

1. monitoring waste streams from origin or delivery to recovery or disposal
  2. supervising the regulations and orders which have been enacted in accordance with this law, and the given conditions; He does this namely by
    - regularly monitoring the plant area and the quality of the produced, recovered or disposed wastes
    - communicating identified problems and suggesting solutions for these problems
  3. informing the employees about
    - risks to public safety resulting from any waste produced, recovered or disposed in the plant
    - facilities and measures of waste prevention, taking into account the laws and regulations concerning the prevention, recovery and disposal of waste.
  4. working towards the development and introduction of
    - a. environmentally friendly and low waste processes, including waste prevention, harm-less and lawful waste recovery or environmentally friendly disposal, as well as
    - b. environmentally friendly and low waste products, including reuse, recovery or environmentally friendly waste disposal after use,
 

and collaborating on the development and introduction of the processes described under the letters a. and b., especially by examining the processes and products from a closed substance cycle and disposal view.
  5. working towards the improvement of processes in plants which recover or dispose waste
- (2) The waste specialist annually reports the implemented and planned measures to the plant manager.

**PROVINCIAL WASTE MANAGEMENT LAW IN NIEDERSACHSEN**

The factory inspector can require firms to create hazardous waste management programs.

This concerns firms producing more than 2000 kg of hazardous waste or firms producing more than 5000 Mg (tons)

The waste management program must contain information about:

- Quality, quantity and origin of the hazardous waste
- Description of the implemented and planned measures of waste prevention and recovery
- Descriptions how the consumer goods produced by the firm can be safely disposed of after their use

**PROVINCIAL WASTE MANAGEMENT LAW IN BERLIN**

Firms producing more than 500 kg of hazardous waste, as well as firms producing more than 2000 tons of waste annually, must devise a waste management program to be demonstrated upon request to the relevant authority or authorities.

This waste management program must describe:

- Quality, quantity and origin of the hazardous waste
- Implemented and planned measures of waste prevention and recovery
- Planned methods of recovery and disposal of the produced goods after their use

### 2.3.3 Cleaner Production Laws in Austria

The Austrian environmental authority provided the following information on waste prevention regulations:

"... The IPCC regulations have not yet been implemented as national law.

Other laws requiring preventative waste management in industry include the Waste Management Law (AWG), BGBl. Nr. 325/1990 and the Environmental Impact Assessment law (UVP), BGBl. Nr. 697/1993:

§ 9 The AWG includes regulations for production related pollution prevention. Also addressed is the creation of waste management programs which describe the expected waste from production and the specific measures for prevention, assessment and disposal of waste. Further information on waste management is available on the following website: [http://www.bmu.gv.at/admin\\_umwelt/admin\\_u\\_abfall/frmset\\_abfall\\_abwirkkonz\\_i.htm](http://www.bmu.gv.at/admin_umwelt/admin_u_abfall/frmset_abfall_abwirkkonz_i.htm)

The UVP law regulates the approval process for specific production units whose nature, size or location causes concern for environmental effects. Such production units must perform an Environmental Impact Assessment (EIA) of their production process. The request for approval must include an EIA conforming to section 6.1.5 of the UVP law and addressing waste prevention, separation, assessment, handling and disposal, and in particular, the location of the residual wastes.

### 2.3.4 Cleaner Production Laws in Denmark

The Danish Environmental Protection Agency (EPA) provided the following response to our survey:

The EPA is in the process of implementing the council directive 96/61 EC, but has not yet fully incorporated it into national law. The relevant regulation will enter into force on October 30th, 1999.

With respect to pollution prevention, the directive will be implemented in following law / regulation:

"Bekendtgørelse of Lov om miljøbeskyttelse nr. 625 af 15. juli 1997".

"Bekendtgørelse om godkendelse af listevirksomheder nr. 794 af 9. december 1991".

The texts can be found in the internet: <http://www.mem.dk>

With regard to waste management see also:

"Bekendtgørelse om affald nr. 229 af 30.april 1997"

"Bekendtgørelse om bortskaffelse, planlægning og registrering af affald. ..."

### 2.3.5 Cleaner Production Laws in the United Kingdom

The Environmental Agency of England and Wales provided the following response to our survey:

"The UK will implement council directive 96/61/EC on the 31st October 1999. A first draft of the Regulations will be produced in November 1998.

A similar pollution prevention regime is already in existence in the UK. This is called the Integrated Pollution Control Regulations, made under the Environmental Protection Act 1990. The regulations allow for integrated pollution control of prescribed substances from major industries. Authorized processes must use Best Available Techniques Not Entailing Excessive Cost (BATNEEC) to achieve the Best Practicable Environmental Option (BPEO). These processes are authorized and regulated by the Environment Agency in England and Wales and by the Scottish Environment Protection Agency in Scotland. The EPA 1990 also tightened air quality controls for smaller industries, regulated by local government.

In addition to Integrated Pollution Prevention Control the EPA 1990 also covered waste regulation. The principle format for guidance in relation to waste issues has been the series of Waste Management Papers (WMP), No. 1 - 28. These can be placed into four categories:

- \* Statutory guidance provided for by section 35(8) and 74(5) of the Environmental Protection Act 1990 e.g. WMP 4 "Licensing of Waste Management Facilities" and WMP26A "Landfill Completion"
- \* Non statutory guidance on waste disposal e.g. WMP26B "Landfill Design, Construction and Operational Practice" Technical Memorandum relating to specific waste types e.g. WMP 6 "PCB Wastes - a Technical Memorandum on Reclamation, Treatment and Disposal"
- \* Review of regulatory and technical options e.g. WMP 1 "A Review of Options"

The above documents are not on the Agency website, being covered by government copyright. They can be obtained from the Stationery Office at [www.national-publishing.co.uk](http://www.national-publishing.co.uk)

Water pollution laws are covered by the Water Resources Act 1991.

One interesting point to note about the UK legislation is that wherever possible it uses the approach of environmental quality standards, rather than uniform emission standards. As far as I am aware this is unique in Europe."

### 2.3.6 Cleaner Production Laws in Ireland

The Irish EPA provided the following response to our survey:

"The council directive 96/61/EC of 24 September 1996 concerning "Integrated Pollution Prevention and Control" is not formally yet transposed into National legislation.

There are existing other laws, which demand a preventive waste management of the industry The EPA Act of 1992 requires that Integrated Pollution Control Licenses must be applied for by certain industry. There is a Schedule which lists the sectors of industry that have to apply. This mirrors, al-most exactly, Annex I of IPPC directive. The use of BATNEEC (Best Available Technology Not En-tailing Excessive Cost) is used when drafting permits and a requirement to establish an EMS to drive continual improvement is also included in all permits."

### 2.3.7 Cleaner Production Laws in the Netherlands

The Netherlands Ministry of Economic Affairs provided the following response to our survey:

"The Kingdom of the Netherlands (as the Netherlands are officially called) has implemented this council directive on September 15th, 1997.

Most of the demands of this council directive were already included in the "Wet milieubeheer".

The "Wet Milieubeheer" (loose translation: Environmental Management Act) of March 1st, 1993 is a law to protect the complete environment. It's a legislative framework, which means this law contains or has the possibility to contain several other laws. The Wet Milieubeheer (or Wm for short) contains laws on waste, dangerous waste, air pollution, surface water pollution, soil pollution and groundwater pollution. The Wm states in art.1.1 sub 2a that it is part of environmental protection to oversee the correct removal of waste, the use of energy and raw materials, and the traffic from and towards a company (institution).

The Wm satisfied most of the demands which were provided in the council directive. Most of the demands were already provided in chapter 8 of the Wm (Institutions). Other parts were provided in art. 1.1 (as above), chapter 5 (quality of the environment), art. 7.35 and art. 7.27 (relationship with environmental effect report, a report in which large projects such as airports must describe the environmental effects of their construction). Other demands had been included in the "Inrichtingen- en vergunningenbesluit" (loose translation: institution and permit decree) and the "Wet verontreiniging oppervlaktewateren" (loose translation: Law to prevent the pollution of surface water: this law is a part of the Wm).

Only a few parts of the council directive had to be implemented in the Wm. This was done on September 15th, 1997.

### 3 Cleaner Production Regulations in Central America

The present analysis of the environmental regulations in Central America is based on the CD-ROM "*Demonstrativo: Gestión Ambiental Centroamericana*". This CD-ROM contains the relevant environmental laws, treaties and agreements of Central America, on an international, regional and national level.

In this study the regional and national regulations were analyzed.

#### 3.1 Environmental Regulations on a regional level

##### 3.1.1 Tratados Regionales

###### ALIANZA CENTROAMERICANA PARA EL DESARROLLO SOSTENIBLE

Principios de la Alianza para el Desarrollo Sostenible

3. El respeto y aprovechamiento de la vitalidad y diversidad de la tierra de manera sostenible

- *Velar por la utilización sostenible de los recursos naturales*, en particular el suelo, las especies silvestres y domesticadas, los bosques, las tierras cultivadas y los ecosistemas marinos y de agua dulce.

7.3 Desarrollo Económico Sostenible

...y la *utilización racional de los recursos naturales*.

Asimismo, se desarrollarán iniciativas para el aprovechamiento racional de las fuentes renovables de energía, el fomento del comercio y la inversión productiva sostenible, el estímulo al ahorro, la desburocratización de la administración pública, el apoyo a la investigación y *el desarrollo de tecnologías limpias por medio del establecimiento de centros de investigación que faciliten a nivel centroamericano el desarrollo de estándares técnicos ambientales*, la certificación de calidad ambiental de nuestros productos de exportación, que coadyuven al proceso de reconversión industrial que se está llevando a cabo en la región, así como la utilización de procesos de producción sostenible, *incorporando medidas preventivas* y no reactivas como las evaluaciones permanentes de impacto ambiental.

7.4 Manejo Sostenible de los Recursos Naturales y Mejora de la Calidad Ambiental

Ante la grave situación que atraviesan los países centroamericanos se hace indispensable la formulación de una política y un plan maestro de generación, comercialización y consumo energético, promoviendo el uso de fuentes de energía renovables y alternas, *programas de eficiencia energética* y la Interconexión eléctrica centroamericana.

###### ANEXO, OBJETIVOS ESPECÍFICOS DE LA ALIANZA PARA EL DESARROLLO SOSTENIBLE

Económicos 8. *Promover la generación y transferencia de tecnologías limpias* para mejorar la productividad y desarrollo de estándares técnicos ambientales y estimular la producción sin deterioro del ambiente.

###### COMPROMISOS DE LA ALIANZA PARA EL DESARROLLO SOSTENIBLE, COMPROMISOS EN MATERIA POLÍTICA, Paz

...la conservación del medio ambiente, *el uso racional de los recursos naturales renovables* y la modernización del Estado.

###### COMPROMISOS EN MATERIA DE MEDIO AMBIENTE Y RECURSOS NATURALES, Energía

... y los gobiernos locales en los sistemas de generación, así como *programas de eficiencia energética*.

## CAMBIO CLIMÁTICO

Capítulo III,

Artículo 21 Se deberá *promover y estimular el desarrollo y difusión de nuevas tecnologías para la conservación y uso sostenible de los recursos naturales*, y el correcto uso de los suelos y manejo de las cuentas hidrográficas, con el propósito de crear y consolidar opciones para una agricultura sostenible y una seguridad alimentaria regional que no riña con la conservación del sistema climático.

Artículo 22 Solicitar a la comunidad internacional un trato preferencial y concesional para favorecer el acceso y la transferencia de tecnología, tendiente a reducir la brecha entre los Estados desarrollados y los centroamericanos, *y que ayude a estos últimos a sustituir por "tecnologías limpias"*, prácticas obsoletas generadoras de gases de invernadero.

### 3.1.2 Programas y Proyectos

#### COMERCIO E INDUSTRIA

Proyecto : Gestión Ambiental en la Pequeña y Mediana Industria de América Central, CCAD / Cooperación República Federal Alemana

*...diseño de procesos y productos ecológicos (marca ecológica-eco-auditoría);*

#### HIDRÁULICA

Plan de Acción de Recursos Hídricos para Centroamérica, CCAD / Embajada Real de Dinamarca / DANIDA

Impulsar la investigación a nivel de las instituciones públicas y privadas, y motivar a las municipalidades para que establezcan los controles pertinentes, de manera tal *que se pueda garantizar la conservación de estos recursos en forma sostenible tanto en calidad como en cantidad.*

### 3.1.3 Seguimiento e Informes

#### AMBIENTE

Informes sobre Avances - Alianza para el Desarrollo Sostenible

*...por medio de un plan financiero con plazos más amplios en función de cada proyecto; interconexión eléctrica; ahorro y uso eficiente de energía; desarrollo de fuentes alternas; usos pacíficos de energía nuclear y normalización y protección radiológicas.*

Centroamérica en el Cumplimiento de Agenda Cumbre de la Tierra, Río de Janeiro 1992-1997

El PROYECTO AMBIENTAL REGIONAL PARA CENTROAMERICA-PROARCA (US/AID) *cuenta con un componente de prevención de contaminación* que lo maneja el Programa de legislación Ambiental. Bajo este proyecto se elaboró un estudio mediante el Análisis Comparado de Riesgo en los países centroamericanos, teniendo como resultado la priorización en las áreas de control de la contaminación de las aguas, la contaminación del suelo por los desechos sólidos y por plaguicidas, y la contaminación del aire; estableciendo una metodología de capacitación a los responsables del tema en las instituciones oficiales ambientales. Actualmente se viene dando capacitación sobre esta metodología a las municipalidades seleccionadas en las áreas geográficas priorizadas por este proyecto; Golfo de Fonseca, Golfo de Honduras, Bocas del Toro, y la Mosquitia.

\* LEGISLACION AMBIENTAL Y PREVENCIÓN DE LA CONTAMINACIÓN tiene como objetivo cumplir con los compromisos en legislación ambiental contenidos en la ALIANZA y los mandatos del Convenio Constitutivo de la CCAD, Protocolo de Guatemala que recrea el Sistema de Integración Económica Centroamericana y los demás convenios regionales sobre medio ambiente y recursos naturales. Sus componentes principales son: a) promoción de la aprobación y armonización de leyes y reglamentos ambientales; b) creación de redes en legislación ambiental y su cumplimiento y aplicación; c) dar seguimiento a la ratificación de los convenios ambientales regionales; d) promover y apoyar la emisión de reglamentos nacionales de calidad del agua, aire y suelo; Y e) elaborar la propuesta y promoción de la aprobación de un régimen mínimo regional para los EIA.

\*CCAD maneja estos dos componentes.

**LEYES**

Estado de la Legislación y Gestión Ambiental en Centroamérica

**B) LEYES GENERALES O LEYES MARCO DEL MEDIO AMBIENTE**

La forma y contenido de ambas leyes varia, por razones obvias. La ley de Belice se enfoca casi exclusivamente en el ambiente y *la prevención de la contaminación*, por lo cual contiene tres instrumentos básicos:

- a) Evaluaciones de Impacto Ambiental (EIA's),
- b) Prohibición de vertidos en el mar con énfasis en vertidos y descargas de barcos y artefactos navales, y,
- c) Regulación del uso de nutrientes que puedan afectar la biodiversidad costero - marina.

## 3.2 Environmental Regulations on a national level

### 3.2.1 Belize

No datas available on the CD-ROM about environmental regulations of Belize.

### 3.2.2 Costa Rica

CAPITULO V: Protección y mejoramiento del ambiente en asentamientos humanos

Artículo 26.

Acciones prioritarias

La autoridad competente otorgará prioridad a las acciones tendientes a la protección y el mejoramiento del ambiente humano. Para ello,

- a) Promoverá la investigación científica permanente en materia de epidemiología ambiental.
- b) *Velará por el control, la prevención y la difusión de los factores físicos, químicos, biológicos y sociales que afecten el bienestar físico, psíquico y social de la población y el equilibrio ambiental.*
- c) Propiciará el establecimiento de áreas verdes comunales y de recreación, necesarias para el disfrute sano y espiritual de los residentes en los asentamientos humanos.

CAPITULO XIV: Recursos energéticos

Artículo 57.

Aprovechamiento de recursos

El aprovechamiento de los recursos energéticos deberá realizarse en forma racional y eficiente, de tal forma que se conserve y proteja el ambiente.

CAPITULO XV: Contaminación

Artículo 59.

Contaminación del ambiente

Se entiende por contaminación toda alteración o modificación del ambiente que pueda perjudicar la salud humana, atentar contra los recursos naturales o afectar el ambiente en general de la Nación. La descarga y la emisión de contaminantes, se ajustará, obligatoriamente, a las regulaciones técnicas que se emitan. El Estado adoptará las medidas que sean necesarias *para prevenir* o corregir la contaminación ambiental.

Artículo 60.

*Prevención y control de la contaminación*

*Para prevenir* y controlar la contaminación del ambiente, el Estado, las municipalidades y las demás instituciones públicas, darán prioridad, entre otros, al establecimiento y operación de servicios adecuados en áreas fundamentales para la salud ambiental, tales como:

- a) El abastecimiento de agua para consumo humano.
- b) La disposición sanitaria de excretas, aguas servidas y aguas pluviales.
- c) La recolección y el manejo de desechos.
- d) El control de contaminación atmosférica.
- e) El control de la contaminación sónica.

## Artículo 61.

## Contingencias ambientales

La autoridad competente dictará *las medidas preventivas* y correctivas necesarias cuando sucedan contingencias por contaminación ambiental y otras que no estén contempladas en esta ley.

## Artículo 63.

*Prevención y control del deterioro de la atmósfera*

*Para evitar* y controlar el deterioro atmosférico, el Poder Ejecutivo, previa consulta con los organismos representativos del sector productivo, emitirá las normas técnicas correspondientes y exigirá la instalación y operación de *sistemas y equipos adecuados para prevenir, disminuir y controlar las emisiones que sobrepasen los límites permisibles.*

## Artículo 64.

*Prevención de la contaminación del agua*

*Para evitar la contaminación del agua*, la autoridad competente regulará y controlará que el manejo y el aprovechamiento no alteren la calidad y la cantidad de este recurso, según los límites fijados en las normas correspondientes.

## Artículo 68.

*Prevención de la contaminación del suelo*

Es obligación de las personas, físicas o jurídicas, públicas o privadas evitar la contaminación del suelo por acumulación, almacenamiento, recolección, transporte o disposición final inadecuada de desechos y sustancias tóxicas o peligrosas de cualquier naturaleza.

### 3.2.3 El Salvador

**TITULO I: DEL OBJETO DE LA LEY**

Artículo 2: La política nacional del medio ambiente, se fundamentará en los siguientes principios:

- e) En la gestión de protección del medio ambiente, prevalecerá *el principio de prevención y precaución*;
- i) En los procesos productivos o de importación de productos deberá incentivarse la eficiencia ecológica, estimulando el uso racional de los factores productivos y desincentivándose la producción innecesaria de desechos sólidos, el uso ineficiente de energía, del recurso hídrico, así como el desperdicio de materias primas o materiales que pueden reciclarse;
- j) En la gestión pública del medio ambiente deberá aplicarse el criterio de efectividad, el cual permite alcanzar los beneficios ambientales al menor costo posible y en el menor plazo, conciliando la necesidad de protección del ambiente con las de crecimiento económico;

**TITULO III: INSTRUMENTOS DE LA POLÍTICA DEL MEDIO AMBIENTE****CAPÍTULO IV: SISTEMA DE EVALUACIÓN AMBIENTAL**

Artículo 18.

Es un conjunto de acciones y procedimientos que aseguran que las actividades, obras o proyectos que tengan un impacto ambiental negativo en el ambiente o en la calidad de vida de la población, se sometan desde la fase de preinversión a los procedimientos que identifiquen y cuantifiquen dichos impactos y recomienden las medidas que los prevengan, atenúen, compensen o potencien, según sea el caso, seleccionando la alternativa que mejor garantice la protección del medio ambiente.

Artículo 20.

El Permiso Ambiental obligará al titular de la actividad, obra o proyecto, a realizar todas las acciones de prevención, atenuación o compensación, establecidos en el Programa de Manejo Ambiental, como parte del Estudio de Impacto Ambiental, el cual será aprobado como condición para el otorgamiento del Permiso Ambiental.

La validez del Permiso Ambiental de ubicación y construcción será por el tiempo que dure la construcción de la obra física; una vez terminada la misma, incluyendo las obras o instalaciones de tratamiento y atenuación de impactos ambientales, se emitirá el Permiso Ambiental de Funcionamiento por el tiempo de su vida útil y etapa de abandono, sujeto al seguimiento y fiscalización del Ministerio

## CAPITULO VI: INCENTIVOS AMBIENTALES Y DESINCENTIVOS ECONÓMICOS

Artículo 32.

El Ministerio, conjuntamente con el Ministerio de Economía y el de Hacienda, previa consulta con el Consejo Nacional de Desarrollo Sostenible, elaborará programas de incentivos y desincentivos ambientales para facilitar la reconversión de procesos y actividades contaminantes, o que hagan uso excesivo o ineficiente de los recursos naturales.

Estos programas se incluirán, además en las leyes que contengan beneficios fiscales para quienes realicen procesos, actividades, proyectos o productos ambientalmente sanos o apoyen la conservación de los recursos naturales.

## TITULO V: PREVENCIÓN Y CONTROL DE LA CONTAMINACIÓN

Artículo 42.

Toda persona natural o jurídica, el Estado y sus entes descentralizados están obligados, a evitar las acciones deteriorantes del medio ambiente, a prevenir, controlar, vigilar y denunciar ante las autoridades competentes la contaminación que pueda perjudicar la salud, la calidad de vida de la población y los ecosistemas, especialmente las actividades que provoquen contaminación de la atmósfera, el agua, el suelo y el medio costero marino.

### PROGRAMAS DE PREVENCIÓN Y CONTROL DE LA CONTAMINACIÓN

Artículo 43.

El Ministerio elaborará, en coordinación con el Ministerio de Salud Pública y Asistencia Social, los entes e instituciones del Sistema Nacional de Gestión del Medio Ambiente, programas para prevenir y controlar la contaminación y el cumplimiento de las normas de calidad. Dentro de los mismos se promoverá la introducción gradual de programas de autorregulación por parte de los titulares de actividades, obras o proyectos.

Artículo 47.

La protección de la atmósfera se regirá por los siguientes criterios básicos:

- a) Asegurar que la atmósfera no sobrepase los niveles de concentración permisibles de contaminantes, establecidos en las normas técnicas de calidad del aire, relacionadas con sustancias o combinación de estas, partículas, ruidos, olores, vibraciones, radiaciones y alteraciones lumínicas, y provenientes de fuentes artificiales, fijas o móviles;
- b) Prevenir, disminuir o eliminar gradualmente las emisiones contaminantes en la atmósfera en beneficio de la salud y el bienestar humano y del ambiente; y
- c) El Ministerio, con apoyo del Sistema Nacional de Gestión del Medio Ambiente, elaborará y coordinará la ejecución, de Planes Nacionales para el Cambio Climático y la Protección de la Capa de Ozono, que faciliten el cumplimiento de los compromisos internacionales ratificados por El Salvador.

Artículo 51.

Para prevenir la contaminación del medio costero - marino, se adoptarán las medidas siguientes:

- a) El Ministerio, de acuerdo a la presente ley y sus reglamentos prevendrá y controlará los derrames y vertimientos de desechos, resultado de actividades operacionales de buques y embarcaciones; y de cualquier sustancia contaminante;

Artículo 52.

El Ministerio promoverá, en coordinación con el Ministerio de Salud Pública y Asistencia Social, Gobiernos Municipales y otras organizaciones de la sociedad y el sector empresarial el reglamento y programas de reducción



*en la fuente, reciclaje, reutilización y adecuada disposición final de los desechos sólidos.* Para lo anterior se formulará y aprobará un programa nacional para el manejo Integral de los desechos sólidos, el cual incorporará los criterios de selección de los sitios para su disposición final.

#### CAPITULO IV: CONTINGENCIAS, EMERGENCIAS Y DESASTRES AMBIENTALES

##### Artículo 53.

El Estado y sus Instituciones tienen *el deber de adoptar medidas para prevenir, evitar y controlar desastres ambientales.*

##### Artículo 55.

El Ministerio, en coordinación con el Comité de Emergencia Nacional, elaborará el Plan Nacional de Prevención y Contingencia Ambiental, siendo éste último el que lo ejecutará. El Plan pondrá énfasis en las áreas frágiles o de alto riesgo, de acuerdo a un Mapa Nacional de Riesgo Ambiental que será elaborado por el Ministerio con el apoyo de las instituciones especializadas.

Las instituciones, públicas o privadas que realizan procesos peligrosos o manejan sustancias o desechos peligrosos, o se encuentran en zonas de alto riesgo, que ya estén definidas en el Mapa establecido en el inciso anterior, están obligadas a incorporar el Plan Nacional de Prevención y Contingencia Ambiental en planes institucionales de prevención y contingencia en sus áreas y sectores específicos de acción y desempeño.

Cuando se trate de instituciones privadas deberán de rendir fianza que garantice el establecimiento de su Plan Institucional de prevención y Contingencia incurriendo en responsabilidad administrativa quien tenga la obligación y no elabore dicho plan.

Para la obtención del correspondiente permiso ambiental las empresas interesadas deberán establecer su plan institucional de prevención y contingencia.

#### TITULO VI: RECURSOS NATURALES

##### Artículo 62.

Cuando el Ministerio otorgue licencias o permisos ambientales para el uso y aprovechamiento sostenible de un recurso natural, se tomarán en cuenta las medidas para prevenir, minimizar, corregir o compensar adecuadamente el impacto ambiental.

#### TITULO XI: MEDIDAS PREVENTIVAS Y SANCIONES ACCESORIAS

##### Artículo 83.

El Ministerio podrá adoptar en cualquier momento, mediante acuerdo motivado las medidas de carácter provisional que resulten necesarias para asegurar la eficacia de la resolución que pudiese recaer, evitar el mantenimiento de los efectos de la infracción y los previsibles daños al medio ambiente y los ecosistemas.

Las medidas preventivas deben ajustarse a la intensidad, proporcionalidad y necesidades de los objetivos que se pretenden garantizar en cada supuesto concreto.

Las medidas preventivas podrán sustituirse por fianza que garantice la restauración del real o potencial daño que se cause.

El Ministerio, condenará al infractor al momento de pronunciarse la resolución definitiva, a la reparación de los daños causados al medio ambiente y si el daño ocasionado fuere irreversible se condenará a las indemnizaciones a que hubiere lugar por la pérdida o destrucción de los recursos naturales o deterioro del medio ambiente, así como a las medidas compensatorias indispensables para restaurar los ecosistemas dañados.

#### APLICACIÓN DE MEDIDAS PREVENTIVAS

##### Artículo 84.

El Ministro podrá ordenar de oficio o a petición del Ministerio Público o de cualquier persona, sea natural o jurídica, las medidas preventivas a que se refiere el artículo anterior ante la presencia o inminencia de un daño grave al medio ambiente, o a la salud humana dando un plazo de 15 días para que el afectado comparezca a manifestar su defensa.

Estas medidas durarán mientras el responsable de la amenaza de deterioro o del deterioro, no elimine sus causas y se circunscribirán al área, proceso o producto que directamente amenace con deteriorar o deteriore el medio ambiente, que ponga en peligro o afecte la salud humana y la calidad de vida de la población.

El Ministro deberá resolver sobre la continuación o revocatoria de las medidas preventivas que haya impuesto en el término de diez días contados a partir de la expiración del plazo concedido al afectado para manifestar su defensa.

### 3.2.4 Guatemala

No datos available on the CD-ROM about environmental regulations of Guatemala.

### 3.2.5 Honduras

#### TITULO I: PRINCIPIOS Y OBJETIVOS

Artículo 3.

Los recursos naturales no renovables deben aprovecharse de modo que se prevengan su agotamiento y la generación de efectos ambientales negativos en el entorno.

Artículo 7.

El Estado adoptará cuantas medidas sean necesarias para prevenir o corregir la contaminación del ambiente. A estos efectos se entiende por contaminación toda alteración o modificación del ambiente que pueda perjudicar la salud humana, atentar contra los recursos en general de la nación.

#### TITULO II: GESTION AMBIENTAL

Artículo 11.

Proponer aquellas medidas que se consideren idóneas, para preservar los recursos naturales incluyendo medidas para evitar la importación de tecnología ambientalmente inadecuada;

#### CAPITULO III COMPETENCIAS

Artículo 28.

- 5) La expedición y administración de las normas técnicas de prevención y control las materias objeto de esta Ley;
- 8) La prevención y control de desastres, emergencias y otras contingencias ambientales que incidan negativamente en parte o en todo el territorio nacional;

#### TITULO III: PROTECCION DEL AMBIENTE Y USO RACIONAL DE LOS RECURSOS NATURALES

##### CAPITULO I: AGUAS CONTINENTALES Y MARITIMAS

Artículo 30.

Corresponde al Estado y a las municipalidades en su respectiva jurisdicción, el manejo, protección y conservación de las cuencas y depósitos naturales de agua, incluyendo la preservación de los elementos naturales que intervienen en el proceso hidrológico.

Los usuarios del agua, sea cual fuere el fin a que se destine están obligados a *utilizarla en forma racional, previniendo su derroche* y procurando cuando sea posible, su reutilización.

##### CAPITULO V: ATMOSFERA

Artículo 59.

Se declara de interés público la actividad tendiente a *evitar la contaminación del aire* por la presencia de gases perjudiciales, humo, polvo, partículas sólidas, materias radioactivas u otros vertidos que sean perjudiciales a la salud humana, a los bienes públicos o privados, a la flora y la fauna y el ecosistema en general.

##### CAPITULO VI: MINERALES E HIDROCARBUROS

Artículo 63.

Los recursos minerales de la nación, incluyendo los hidrocarburos, se declaran de utilidad pública; su aprovechamiento, exploración y explotación deben sujetarse a los regímenes especiales establecidos en el Código de Minería y en la Ley de Hidrocarburos, así como en sus reglamentos de aplicación, debiendo observarse, en todo caso, las disposiciones de la presente Ley y de las leyes sectoriales relativas a *la prevención de la contaminación del medio ambiente* o de la degradación de los recursos naturales.

**TITULO V: DISPOSICIONES ESPECIALES PARA LA PROTECCIÓN DEL MEDIO AMBIENTE****CAPITULO II: INSPECCION Y VIGILANCIA**

## Artículo 83.

Los organismos del Estado que tienen competencia en materia ambiental ejercerán acciones de inspección y vigilancia, y para ese efecto, sus funcionarios y empleados están investigados de autoridad suficiente para inspeccionar locales, establecimiento o áreas específicas o para exigir a quien corresponda, la información que permita verificar el cumplimiento de las disposiciones legales correspondientes.

Las municipalidades cumplirán acciones de inspección y vigilancia en los ámbitos de su competencia y jurisdicción. El Reglamento desarrollará esta disposición.

Se concederán reconocimientos públicos a las personas naturales y jurídicas que realicen acciones de prevención y mejoramiento ambiental en sus respectivas comunidades.

**TITULO VII: DISPOSICIONES FINALES**

## Artículo 105.

Es deber del Estado y de la población en general, *participar en la prevención*, mitigación y atención de los desastres naturales, en la solución de los problemas producidos por éstos y en la rehabilitación de las zonas afectadas.

**3.2.6 Nicaragua****TITULO I**

## ARTICULO 3.

Son objetivos particulares de la presente Ley:

- 1) La Prevención, regulación y control de cualesquiera de las causas o actividades que originen deterioro del medio ambiente y contaminación de los ecosistemas..
- 5) Garantizar el Uso y Manejo racional de las cuencas y sistemas hídricos, asegurando de esta manera la sostenibilidad de los mismos..

## ARTICULO 4.

El desarrollo económico y social del país se sujetará a los siguientes principios rectores:

- 3) El criterio de prevención prevalecerá sobre cualquier otro en la gestión pública y privada del ambiente. No podrá alegarse la falta de una certeza científica absoluta como razón para no adoptar medidas preventivas en todas las actividades que impacten el ambiente.

**TITULO II: DE LA GESTION DEL AMBIENTE**

## ARTICULO 13.

Las instancias responsables de la formulación y aplicación de la Política Ambiental, de las normas técnicas y demás instrumentos previstos en la legislación, observarán los siguientes principios:

- 6) La prevención es el medio más eficaz para evitar los desequilibrios ecológicos
- 9) La calidad de vida de la población depende del control y de la prevención de la contaminación ambiental, del adecuado aprovechamiento de los elementos naturales y del mejoramiento del entorno natural en los asentamientos humanos

## ARTICULO 40.

El Estado garantizará facilidades a aquellas Empresas que una vez agotadas las opciones y alternativas tecnológicas factibles para resolver la contaminación y la afectación a la salud y seguridad pública que provocan, deban ser reubicadas en otro sitio menos riesgoso. Las condiciones para el otorgamiento de las facilidades se definirán vía reglamento.

## ARTICULO 45.

Se exonerará de Impuestos de importación a los equipos y maquinarias conceptualizados como tecnología limpia en su uso, previa certificación del Ministerio del Ambiente y Recursos Naturales en consulta con el Ministerio de Finanzas.

## ARTICULO 52.

Todas las personas naturales o jurídicas, públicas o privadas, están obligadas a participar en la prevención y solución de los problemas originados por los desastres ambientales.

**TITULO III: DE LOS RECURSOS NATURALES**

ARTICULO 81: Constituyen obligaciones de los beneficiarios de concesión o autorización de uso de aguas:

- 3) Aprovechar las aguas con eficiencia y economía, empleando sistemas óptimos de captación y utilización.
- 5) Evitar desbordamientos en las vías públicas y otros predios, de las aguas contenidas o de las provenientes de lluvia.

## ARTICULO 83.

La autoridad competente, atendiendo el uso que se le da al agua, disponibilidad de la misma y características especiales del manto frático, podrá establecer patrones de volúmenes anuales de extracción máxima, cuyos controles y aplicación será competencia de los Gobiernos Regionales Autónomos y las Municipalidades.

## ARTICULO 104.

Para la exploración y aprovechamiento de los recursos naturales no renovables, además de respetar las medidas restrictivas de protección de los recursos minerales o del subsuelo en general, la autoridad competente deberá obligatoriamente:

3. Promover el uso eficiente de energía.

**3.2.7 Panama****TITULO II: DE LA POLÍTICA NACIONAL DEL AMBIENTE**

## Artículo 4.

Son principios y lineamientos de la política nacional del ambiente, los siguientes:

4. Estimular y promover comportamientos ambientalmente sostenibles y *el uso de tecnologías limpias*, así como apoyar la conformación de un mercado de reciclaje y reutilización de bienes como medio para reducir los niveles de acumulación de desechos y contaminantes del ambiente.
5. Dar prioridad a los mecanismos e instrumentos para la *prevención de la contaminación* y la restauración ambiental, en la gestión pública y privada del ambiente, divulgando información oportuna para promover el cambio de actitud.

**TITULO IV: DE LOS INSTRUMENTOS PARA LA GESTIÓN AMBIENTAL**

## Artículo 37.

La Autoridad Nacional del Ambiente coordinará, con las autoridades competentes, la formulación y ejecución de *planes de prevención* y descontaminación del ambiente, para las zonas muy sensitivas o que sobrepasen los límites de emisión, y vigilará el fiel cumplimiento de dichos planes.

## Artículo 39.

El Estado, a través de la Autoridad Nacional del Ambiente, establecerá los parámetros para la certificación de *procesos y productos ambientalmente limpios*, en coordinación y con la participación de la autoridad competente, para instituciones privadas o terceros, que cumplan los parámetros exigidos. En el proceso de certificación de las emisiones contaminantes, por parte de las unidades económicas, la Autoridad Nacional del Ambiente reconocerá el intercambio de créditos entre dichas unidades.

## Artículo 53.

Son deberes del Estado y de la sociedad civil, adoptar medidas *para prevenir y enfrentar los desastres ambientales*, así como informar inmediatamente respecto a su ocurrencia.

La Autoridad Nacional del Ambiente velará por la existencia de los planes de contingencia y coadyuvará en su implementación, los que se aplicarán por las autoridades competentes y la sociedad civil, en caso de desastres.

#### **TITULO VI: DE LOS RECURSOS NATURALES**

##### **Artículo 62.**

Los recursos naturales son de dominio público y de interés social, sin perjuicio de los derechos legítimamente adquiridos por los particulares. Las normas sobre recursos naturales contenidas en la presente Ley, tienen el objetivo de incorporar el concepto de *sostenibilidad y el de racionalidad en el aprovechamiento de los recursos naturales*, así como asegurar que la protección del ambiente sea un componente permanente en la política y administración de tales recursos. Corresponde a la Autoridad Nacional del Ambiente velar porque estos mandatos se cumplan, para lo cual emitirá las normas técnicas y procedimientos administrativos necesarios.

##### **Artículo 88**

El Estado promoverá y dará prioridad a los proyectos energéticos no contaminantes, *a partir del uso de tecnologías limpias y energéticamente eficientes.*

#### **TITULO VIII: DE LA RESPONSABILIDAD AMBIENTAL**

##### **Artículo 106.**

Toda persona natural o jurídica está en la obligación de prevenir el daño y controlar la contaminación ambiental.

##### **Artículo 107.**

La contaminación producida con infracción de los límites permisibles, o de las normas, procesos y mecanismos de prevención, control, seguimiento, evaluación, mitigación y restauración, establecidos en la presente Ley y demás normas legales vigentes, acarrea responsabilidad civil, administrativa o penal, según sea el caso.

##### **Artículo 108.**

El que, mediante el uso o aprovechamiento de un recurso o por el ejercicio de una actividad, produzca daño al ambiente o a la salud humana, estará obligado a reparar el daño causado, aplicar las medidas de prevención y mitigación, y asumir los costos correspondientes.

## 4 Conclusions

Although an in-depth analysis was not possible due to limitations of time, resources, and (in the case of Central American countries) available data, the following conclusions and recommendations were possible.

The environmental legislation of the European Union includes several regulations directly fostering CP-measures at an enterprise level. Additionally, authorities must monitor certain CP-activities of the enterprises, as CP is an element of permits. Therefore, a number of European countries have already gained experience in the successful introduction of CP into legislation and enforcement of the respective regulations.

In contrast to the European law "Richtlinie 96/61/EG" concerning prevention and reduction of environmental pollution, Central American legislation does not closely address pollution prevention. Nonetheless, several articles indicate an awareness of the advantages of Cleaner Production. For example, the "Alianza Centroamericana para el Desarrollo Sostenible" demand the promotion of cleaner technologies through regional Centers. In addition, the efficient use of resources is mentioned several times.

At a national level there are some differences among the Central American countries. Regarding the legislation in Guatemala and Belize, there was no information available on the CD-ROM used as a source. In all other Central American countries, preventative approaches are included in their ecopolicy. The environmental laws of Costa Rica mention pollution prevention several times, but not precisely.

In a general paragraph of environmental law in El Salvador, the principle of prevention is favored over other measures. Article 52 demands that the Ministry of Environment promote regulations and programs for the reduction of solid wastes at the source. Honduras discusses pollution prevention mostly in the context of sustainable use of resources and the prevention of disasters. Otherwise, Cleaner Production in enterprises is not mentioned. The Environmental legislation in Nicaragua regulates in Article 4 that preventative methods must be favored above all others. The efficient use of resources and energy is also mentioned. Environmental law in Panama declares the use of cleaner technologies and prevention of pollution as a principle of national policy. Article 39 regulates the certification of clean processes and products. Article 88 mentions the promotion of clean, energy efficient technologies.

As a result of this analysis we recommend the following steps in order to concretize CP-regulations in Central American Legislation:

- Analyze the Central American environmental legislation in more detail.
- Share European experience in legislating pollution prevention strategies with the decision making institutions in Central America. The latter may then select suitable elements of established regulations for introduction in their own countries.

## 5 Appendix

### Addresses of the participating European departments of the environment

#### *Denmark*

Umwelt- und Energieministerium (Miljø- og Energiministeriet)  
Højbro Plads 4 - 1200 København K - Danmark  
Tlf: 33 92 76 00; Fax: 33 32 22 27; Homepage: <http://www.mem.dk>  
e-mail: [mem@mem.dk](mailto:mem@mem.dk)

Danish Environmental Protection Agency  
29, Strandgade; DK- 1401 Copenhagen K  
Tel: + 45 32 66 01 00; Fax: +45 32 66 04 79; homepage: <http://www.mst.dk>  
e-mail: [mst@mst.dk](mailto:mst@mst.dk)

Contact person:

Dorte W. Christensen  
Ministry of Environment and Energy;  
Danish Environmental Protection Agency; Industrial Division  
Strandgade 29; DK 1401 Copenhagen K  
Phone:+ 45 32 66 01 00; Fax: +45 32 66 04 79; E-mail: [mst@mst.dk](mailto:mst@mst.dk); Internet  
[www.mst.dk](http://www.mst.dk)

#### *Ireland*

Irish Environmental Protection Agency,  
P.O.Box 3000, Johnstown Castle Estate, Co. Wexford, Ireland.  
Telephone: +353 53 60600; Facsimile: +353 53 60699  
e-mail: [info@epa.ie](mailto:info@epa.ie); e-mail: [info@linux-wex.epa.ie](mailto:info@linux-wex.epa.ie)

Contact facilitated by Shirley Murphy  
e-Mail: [s.murphy@epa.ie](mailto:s.murphy@epa.ie)

Contact person:

EPA Licensing Inspector Jim Moriarty  
e-mail: [j.moriarty@epa.ie](mailto:j.moriarty@epa.ie)

*Netherlands*

Ministry of Housing, Regional Development and the Environment (Ministerie van Volkshuisvesting, Ruimtelijke Ordening en Milieubeheer)

e-mail abgeschickt von der Homepage [http://www.minvrom.nl/fmail\\_e.htm](http://www.minvrom.nl/fmail_e.htm)

rivm (rijksinstituut voor volksgezondheid en milieu/ national institute of public health and the environment)

RIVM, PO Box 1, 3720 BA Bilthoven, The Netherlands

phone: +31 30 274 91 11, fax: +31 30 274 29 71, Web: <http://www.rivm.nl>

email: [info@rivm.nl](mailto:info@rivm.nl), [webeditors@rivm.nl](mailto:webeditors@rivm.nl)

Contact person:

Marcel Taal

InfoMil

P.O. Box 30732

2500 GS Den Haag

The Netherlands

*Austria*

Umweltbundesamt Austria (Federal Environment Agency - Austria)

Spittelauer Lände 5, A-1090 Wien, Austria

Tel.: +43 1 31304-0; Fax: +43 1 31304-5400; Homepage: <http://www.ubavie.gv.at>.

e-mail: [umweltbundesamt@ubavie.gv.at](mailto:umweltbundesamt@ubavie.gv.at)

Contact person:

Dr. Brigitte Karigl

Umweltbundesamt - Abt. Abfalltechnologien

Spittelauer Lände 5 A-1090 Wien

Tel. ++43 - (+) 1-31 304/5512 Fax ++43 - (+) 1-31 304/5400 e-Mail: [karigl@ubavie.gv.at](mailto:karigl@ubavie.gv.at)

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**Letter sent to the Departments of the environment and offices with e-mail**

Dear madame / sir.

I am working in a project on Cleaner Production and I would like to know if

1. your country (or provinces) has (have) implemented the council directive 96/61/EC of 24 September 1996 concerning "Integrated Pollution Prevention and Control" yet - or
2. are there existing other laws, which demand a preventive waste management of the industry?

Could you please e-mail the name of these laws and the decisive text-passages and tell me (if available) where I can find these texts in the Internet.

Thank you very much for your help

sincerely

*(to Austria the letter was sent in german with e-mail)*

Sehr geehrte Damen /Herren

Ich arbeite in einem Projekt zu "Saubere Technologien" und würde gerne wissen, ob

1. in ihrem Staat (oder in den Ländern) die EU-Richtlinie 96/61/EC vom 24 September 1996 über die Integrierte Vermeidung und Verminderung der Umweltverschmutzung bereits im Gesetz verankert wurde oder
2. es andere Gesetze gibt, in denen ein präventives Abfall-Management der Industrie gefordert wird?

Könnten sie mir bitte die Titel dieser Gesetze mit den entscheidenden Textpassagen e-mailen und (falls möglich) mitteilen, wo ich die Informationen zu diesen Gesetzen im Internet finden kann.

mit bestem Dank für Ihre Hilfe