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STRATEGIC ACTION PROGRAMME (SAP) TO ADDRESS POLLUTION FROM LAND-BASED ACTIVITIES

ASSESMENT OF"COOPERATIVES ACTIONS" TO FACILITATE TRANSFER OF TECHNOLOGY IN THE FRAMEWORK OF THE SAP

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1. INTRODUCTION

The Strategic Action Programme (SAP) to address Land Based Sources(LBS) of pollution is an ambitious undertaking, spanning a lengthy period of 25 years and addresses to countries with different levels of socio economic development ,technical scientific and administrative competencies, different cultural values and environmental priorities together with the complex, multidisciplinary as well as the resulting heavy financial implications make serious demands on the institutional arrangements involved.

The SAP actors, which are responsible of its implementation, are identified as international and regional donors , the Barcelona Convention system and the national actors involved such as the related ministries , administrations, local actors, NGOs, the technical and scientific institutions, chambers of industry and commerce and maritime and urban associations.

Due to the complex, multidisciplinary, long term character, the Operational Strategy for the implementation of the SAP, adopted by the Contacting Parties (CPs) to Barcelona Convention for the protection of the Mediterranean Sea in their meeting in Monaco 2001,forsees an innovative national consultative and cooperative body that could enhance and catalyse the local actors in their efforts in the implementation of the SAP. This body could have different institutional structure according to conditions prevailing in the country.
The duties of this body is to supervise, assist and back the national and local SAP actors and stakeholders in their endeavour to identify the most convenient solutions for the implementation of their SAP/National Action Plan (NAP) to reach the SAP targets in the reduction of releases of pollutants from LBS. Their national cooperative **structure or body** would build up and/or strengthen the local collaborative infrastructure and facilitate the transfer of knowledge and know-how that the implementation of the NAP would require. However, this structure should be properly maintained and functioned, and must be placed in the **correct institutional setting** and used by qualified personnel being part of national heritage.

What is achieved so far: during the last two years, MEDPOL with the assistance of Global Environment Facility (GEF) and (Fond Français pour l'Environnement Mondial (FFEM), undertook a capacity building programmes which enable the national environmental authorities to prepare the NAP and forming people to tackle precise tasks dealing with the implementation of the SAP and national experts continue to produce National Diagnostic Analysis (NDA) related to LBS activities and Baseline Budget (BB) of releases . The MEDPOL vision in this issue is that building capacity would encompass also national building structure capable of complementing the achievements and ensure the sustainability of the SAP. Such structure may be highly expensive in some Mediterranean countries, and may not be always cost-effective. Solution in this case is the establishment of national networks, that will has an additional benefit of national specialization.

In the past three decades, have emerged many ideas and concepts forming a basis to capacity building in science and technology. These ideas and concepts embodied in various forms of institutions aiming at the promotion of small and medium enterprises by offering them valuable and necessary scientific technological and know-how assistance. Most of these concepts are in place in the electronic, high technology , information technology fields, therefore few structure are in place in the environment field.

The literature shows that barriers to the effective use of science and technology to support environmental concerns include the lack of:

- A strategy or "master plans" at the country level (e.g., integrated coastal management; integrated wastes management, integrated water management, integrated river basin management);
- Holistic sectoral approaches to problem-solving;

- Adequate stakeholder involvement;
- Mobilizing adequately the potential of multidisciplinary co-operation.

Transfer of technology is an important aspect in the national enabling process that would ensure the proper implementation of the SAP. There are a variety of mechanisms by which transfer of technology could be achieved. One modality that could be successful is the development of partnerships or collaborative linkages between institutions in developed and developing countries. This can take the form of national and regional cross-institutions network(s), which can be facilitated by ICT (Information and Communication Technology) already worldwide used. This can offer all network database access, in addition to information sharing and instantaneous contact between researchers. In this regard, there is no single prescription that would apply, a network of institutes, representing “instate”, "south-south" collaboration, as well as a "north-south" flow of information. Approaches could differ with each country or region concerned.

At the end, this vision is supported with this fact: In a recent progress report published in 2002 by Europe environment information service on the progress achieved in the implementation of Nitrates Directives it was stated that the establishment of close cooperation between universities, research institutes, governments administration and farmers constituted the most effective manner for the convenient implementation of the measures that led to the reduction of the use of nitrogen in agriculture .The document made reference to five European projects:

a) Danemark: nitrates management programme
b) France : Ferti-Mieux Initiatives
c) Wallonie :Prop’eau-sable
d) Germany :bade-Wurttemberg (Schalvo)
e) Greece :Thessalie

These projects have strong support and assistance from local and national technical and scientific community, which has led to a considerable reduction of Nitrate inputs into the environment, and improve the quality of water resources.

Development of an Environmental Sciences & Technology policy at the national and regional levels

Sciences and Technology is a key to achieving industrial sustainable development throughout the Mediterranean region. There is a need to find and develop means to reduce the use of raw materials and energy, the generation of waste and promotion of the recycling concept.

In fact, under the Barcelona convention and its Protocols, industries have to be prepared for considerable reductions during the next century in resource use, pollution and human impacts on ecosystem. They would require highly skilled and specialized environmental engineers and scientists and eco-efficient products and services. On other words, what will be needed is an innovative Mediterranean environmental sciences and technology policy at the national and regional levels.

a Mediterranean environmental sciences and technology policy could be focused on: environmental education and research& development.

The major principles that could be considered to elaborate an environmental sciences & technology policy are:

1- Integration of the environmental sciences & technology policy in the national science &technology policy

2- Increasing the effectiveness of existing environmental education and research& development national institutions

3- Encouraging partnerships between national industrial sector and environmental research &development institutions

4- Developing partnerships between environmental education and research& development institutions throughout the region

5- Creating and extending specialized information networks

6- Adopting practices and regulatory approaches that encourage national environmental innovation.

7- Strengthening the relationships between industrial sector and NGO's at the national and regional levels.

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2. ASSESMENT OF COOPERTIVE ACTIONS

In the following section, brief definitions for the most common institutional forms of Science and Technology initiatives will be given. A more detailed discussion will be given in next sections.

2.1-Definitions

2.1.1- Technopoles:

Technopoles are relatively new entities in cooperation domain between industries and scientific institutions. Technopoles are situated usually in a well-defined geographical area where exchange of expertise between scientific and industrial institutions is largely facilitated given the proximity of these institutions and willingness and need to collaborate. They offer existing enterprises, an attractive and helpful environment in new and evolving areas of applied sciences, including use of research facilities. Technopoles comprise large firms R&D laboratories; universities, research institutes, high technology enterprises, as well as technology transfer services.

A variant of Technopole is the Technology parks. Technology parks are more transfer-oriented of technological know-how and industrialization than technopoles. Technological and entrepreneurial representatives in addition to service firms, financing institutions and governmental agencies may be part of Technology parks.

Technology parks could be labeled Research Parks or Science Parks when scientific R and D activities are dominating the park. These activities could be performed in cooperation with research laboratories in universities or research institutes in the same geographical area. Technology parks could be labeled also Science City when the park covers a wide geographical area.

2.1.2- Technology incubators:

Technology incubators are focusing on new start-up enterprises, whose operations are based on innovative technological ideas that could lead to a marketable new product. They offer: general services, financial, legal and business support to these future enterprises. The incubation process could be stopped after a pre-defined period of time or ends with gradual of successful steps that move the enterprise outside the incubator.

2.1.3 - Innovation centres

are also a mixed variant of technology incubators and thechopoles: The aim of these centres is essentially at the help of new high technology starting-up firms survive their operational phases- pre-launch, launch and early phases. They may help also in instilling existing small firms by offering advises for the improving their production processes. These existing or future firms can have access to R&D facilities and equipment within research institutes and university laboratories. They are also getting benefits of assistance and guidance in adhering to innovation networks.

2.1.4 - High technology industrial clusters

This term is related to groups of institutions from different sectors using relatively high amounts of each other's products based on innovative and/or production efforts. Another area of cluster activities in such clusters, are institutions cooperation in diffusing process of innovations and linkages relating to firms or sectors that form value-added production chains.

2.1.5 - Innovation networks

Innovation networks are constituted of people such as: managers, bankers, venture capitalists, professors, graduates, scientists, artists, and government officials working on, or towards, innovation-related targets in a variety of application areas. Among the types of institutional forms aforementioned, innovation networks are the most liable to adopting virtual status.

2.1.6 - Virtual research centres/networks

The continual progress and advance made in information and communications technologies enable cooperation between distant researchers, from the same or different country (even countries) by creating on-line research institutes and co-laboratories, where widely separated researchers can work with colleagues on specific projects or fields of knowledge.

In the following section we will go more in depth in the most important concepts of the ones mentioned above. For more details, you can refer to the report on *Technology Capacity building Initiatives, elaborated by The ECONOMIC AND SOCIAL COMMISSION FOR WESTERN ASIA, 2001.*

2.2 - Description of "Cooperative Actions" structure

2.2.1 Technopoles

In this section we will go through a closer view of Technopoles, their roles, structure and their respective functions.

Technopoles and related entities have emerged during the past three decades, mainly in the developed countries and new developed nations. The current assumption is that such initiatives stimulate innovation, technology transfer, and general business development. They can play a useful role in regional development. Many worldwide experts support the notion of technopoles as a useful tool of technology transfer and national as well as local development. There is a general agreement that the technopole concept, with all its shades and variants, deserves real attention by organization and countries engaged in technology-related development.

Technopole concept success is linked to agglomeration, which refers to gain increases in case of firms' ability to operate in close proximity. Agglomeration benefits are reflected in various ways, such that possibilities for group procurement, joint services, and infrastructure sharing and marketing, in addition to enhanced availability of skilled people. In many cases, a psychological factor based on the fact that a group of common goal actors brought together by the technopole scheme might also acquire special importance.

a. ***A more concise definition of a Technopole***

The United Kingdom Science Park Association (UKSPA) defines a technopole as "a property-based initiative which has formal operational links with a university or other higher educational or research institution". It is intended to "encourage the formation and growth of knowledge-based businesses and other organizations normally resident on site." Furthermore, according to UKSPA, one of its main management functions is to actively support technology transfer to, and enhance business skills in, the park's tenant firms.

So, technopoles may be intended to (1) facilitate technology transfer from existing research institutions to existing businesses, or to (2) provide aid for new technology based firms.
Differences exist between technopoles related to their essential functions in terms of technology transfer, innovation, and business management as well as the clients they are intended to serve. Differences between varieties of technopoles based on their functions lead to distinction between research parks, innovation centers, technopoles and innovation networks.

From a structural point of view, a technopole should accommodate university and research facilities.

b. Services offered by technopoles

Technopoles support their tenants by performing two main tasks. First, they provide them with technological support, including ready access to relevant and up-to-date technological knowledge, through contact with a university research center. Second, technopoles provide business connections, advice and services in addition to general assistance. The latter one could cover quite a wide range of contacts, basic building maintenance, secretarial and administrative services, advanced business and financial assisting and guiding as well as access to research laboratories. Its circumstances and the particular needs of its tenants ultimately define the individual bundle of services offered by a given park.

Prerequisites for the success of technopole initiatives

The following factors have been found intrinsic for successful technopoles:

- Desirable working and living environments;
- Proximity to a major university or research institution;
- Steady supply of skilled manpower.

The first factor is fundamental for attracting tenant firms and their employees. Proximity to a university or research center provides a technopole with access to research facilities, simplifies technology transfer operations, and allows incubation of spin-off enterprises that may very well be launched by staff from universities and research centers associated with the park, consulting, directing, continuing education. Additionally, the proximity of a technopole to a university should guarantee a continuous stream of skilled manpower as well as possibilities for continuous training and rehabilitation.

c. Technopoles as networks

A major technopole function is to facilitate the network formation involving multilateral formal as well as informal interactions among a multiple institutional forms. Networks are formed on the basis of mutual needs between businesses and researchers. This occurs when at least one entity has a need for something, a good or a service, that another party is thought to be able to deliver.

d. Technopoles as agents for technology transfer

As aforementioned, the main function of technopoles is to facilitate technology transfer from university research domains into business domain. This function is simply based on the idea that bringing researchers and business people into the same area would ultimately enhance technology transfer and development opportunities. The fact that technology transfer cannot be performed successfully by simple information transmission from researchers to business renders close and permanent contact between these two parties extremely important. The essential feedback role of business domain played during and following the act of technology transfer may not be achieved in cases where distance and institutional barriers impede active information exchange and direct interaction. Personal relationships may be a helpful factor in the success of technology transfer and development operations.

Being close to highly skilled manpower, businesses may first realize the potentialities of new technologies and prospects for their utilization. Furthermore, because of enterprise's interaction with this highly skilled manpower, exploitation ideas and further development of the original ideas may be matured.

Businesses and universities, or research centers, being, in the past, closed to each other is rather a necessary condition for successful technology transfer operations. This factor can be relaxed for the time being with the progress and advent of new ICTs. This means that proximity is no longer an imperative condition, and this gives the concept of technoploes new dimensions.

Other issues should be addressed very carefully. Mainly the transfer of technology from universities to small and medium-sized enterprises (SMEs), often suffer obstacles such:

- Academic staff and researchers lack of exposure to business requirements;
- University's intrinsic unwillingness to cooperate with business enterprise, often due to:
    - Different culture systems governing academic research and business communities;
    - Academic life conditions;
    - Perfectionism University's inclination;
    - University's hostility to compromise and lack of practicality;
    - Low interest for deadlines, profitability and confidentiality.

However, these difficulties cannot be generalized in every context and country. Universities and research institutes sponsoring system can attenuate them. But in a world of globalization, lots of social and economical systems are shifting toward more flexible forms of cooperation between academic institutes and businesses.

SMEs in developed countries seeking generally academic cooperation, implying different forms of technology transfer, for different reasons such:

- Acquiring information and ideas leading to new products and/or services that could be the focus of commercial activity; complement existing activities; or have the potential of improving their business strategies;
- Obtaining reliable information from specialists in technologies, e.g. measurement, processing and control methodologies, including their capabilities, limitations, implications of their adoption and suitable implementation methods;
- Using academic laboratories and technological facilities for the development or enhancement of new products or services;
- Getting an improved public relations profile;

- Promoting recruitment activity;
- Training employees in specialized techniques and methodologies.

e. Technopoles as innovation centers

Previous discussion shows clearly that technopoles can stimulate innovation through proactive interaction and ideas cross-fertilization between researchers and entrepreneurs.

One can expect logically that university research facilities and enterprises agglomeration should lead to more efficient use of innovation resources. Moreover, technopoles could stimulate innovation only by linking basic research to effective commercialization. This would involve R&D activities which is essential for translating an original scientific concept in to a concrete product with prospects of commercial application as well as the hole process starting from prototype developing to full-scale production and marketing.

We should recognize that businesses in their nature are more sensitive to customer needs than academic institutions. So, both sides have complementary roles in innovation process. This would in turn favor even more strongly the technopole concept

Innovation process is obviously more complicated than the linear one described here. It comprises more links and interactive feedback developed by different actors. For interested people in innovation process, there is an extensive literature dealing with this issue. We can find many authors emphasizing the importance of closer proximity of R&D and production and marketing units for successful innovation.

Finally, innovation may not be shrunken in making technology inputs offered by technical component of technopole. Rather, business role is primordial in ensuring successful implementation of such inputs.
Technopoles; institutional aspects

Main actors in technopole constitution could be categorized within two classes: participants and promoters. Among participants we can find tenant firms, research institutions and universities and technopole management. While promoters could be local and national political institutions, and figures as well as property developers. Roles of participants and promoters are not completely separated.

Tenant firms are instrumental in defining technopole nature and orientations. Especially, their diversity in terms of size, business focus, technological position and future projects are all factors that contribute to form the park's character. It may be made up of service and consultancy enterprises aimed at transmitting acquired expertise, including technological knowledge. Another type of tenant firm may be the operational arm of a medium to large company aiming at maintaining close linkes with research institutes and other firms within the park. We have to notice that there is no strict defined boders between these kinds of tenants. Tenants could be, for instance, both a start-up firm and already have services to provide outside or inside. However, strong evidence demonstrate that techopoles is essential to the survival of tenants firms comparing to non-park ones.

Research facilities located in technopoles including independent research institutes as well as university and corporate research departments. Entire research institutions are located in some country parks. Both branches of public sector research institutes as well as commercial research centers are found in technopoles in these countries.

The presence of research institutions within parks creates opportunities for its involvement in R&D contracts. Furthermore, the technopole context facilitates the building of networks of sub-contractors which enforces the ability of a research institute to bid for contracts.

The huge impact of universities on society as a whole is indubitable, and paradoxically unquantifiable. In short, the traditional functions played by universities in society, such that high-level education and training, diffusion and creation of new scientific and technological knowledge may all used fruitfully within the framework of a technopole.

Naturally, linking universities to business is a very tough task for both academia and the business domain, even in the developed countries. Although, greater success has been accomplished in educating manpower responding to production and services sectors requirements, transferring knowledge from scientific and technological research to business is a difficult process.

In principle, new knowledge created in scientific and technological research institutes is transferred to business firms who has been investing in the development and marketing of the product resulting from the new knowledge. This transfer is performed through cooperative programs involving university researchers and business firms. Another mode of transfer that technopoles may boost when new knowledge leads the researcher(s) to exploit their discovery through a spin-off company within the technopole. While the latter type is growing, the former, more traditional, is far more predominant.

Assistance by academic staff occurs on contract basis. This contract could involve university, research institute(s), research laboratory, or individual researcher. It could involve also more than one academic side. Contract design includes R&D plan and tasks to be carrying out. Tasks and R&D plan should be unambiguous.

Technopoles have often been built as associated structures to universities. Generally speaking, universities can obtain many benefits:

- Enhancement of its profile in reason of its direct contribution to tangible socioeconomic development and job creation.
- Positive and practical changes in undergraduate as well as graduate course curricula, due to interactions resulting from research done by the university for business enterprises.
- Graduates opportunities, offered by tenants, for internships in an environment combining proximity to their alma mater as well as invaluable contacts in relation to commercially oriented research.
- University's research teams acquire training on real life situations where their expertise may be brought to bear on practical problems.
- Possibility for university's staff and graduates to start their own spin-off enterprise based on new research patent or finding.

Additionally, interconnection between university people and business technical staff may be translated in local knowledge networks.

f. Technopole management

It is headed by a manager acting accordingly to its charter and in line with its strategic and executive plans adopted by its governing body. Technopole management team should work as a technology broker or intermediary in linking park tenants to sources of technology knowledge in associated academic body. Management should also be accountable directly to the owners or to a board designated by them. Park's manager has normally sufficient power to draw technopole features through establishing goals to be achieved.

We should notice that government support of technopoles is essentially originated from the belief that they constitute useful instruments for economic growth, mainly by their innovation

capacity, and by the established fact that we are living now in an era of economy based on knowledge.

g. Techopoles Success Stories

As success story of technopole we can indicate the case of:

The Sophia Antipolis technopole[1], which was launched over 30 years ago (in 1969). It is one of the first technopoles in Europe. Today it constitutes a model for economic development and has distinguished itself in several fields going from mathematics to physics, computer science and communication, biotechnology, health and earth sciences.

Located in the South of Europe on the French Riviera, linking about 1,200 firms employing nearly 21,000 engineers and technicians, as well as a university, engineering schools and research centers with 5,000 researchers and students are currently located in this park

The Thessaloniki Technology Park[2], in Creece, is the first technopole to be created in the country was the Thessaloniki Technology Park (TTP). The Foundation of Research and Technology Hellas (FORTH) established it in 1992, at the initiative of one of its research institutes, namely the Chemical Process Engineering Institute (CPERI), which became part of the park. It had for objective to form a bridge between universities and industry, facilitating the exchange of ideas and people as well as sharing facilities.

TTP promotes activities that contribute to the increased competitiveness of the Greek industry with special emphasis on **Chemical Technology, Material Technology, Food and Beverage, Textiles, and Energy and Environment**.

A **Technology Transfer Unit** serves as industry-research liaison, performs partner searches, executes assessment and exploitation of research results, and assists with research and technological development proposal preparation, submission and project management. It ensures information dissemination concerning research results, technological developments and the emergence of new technologies. It even promotes technology transfer between Greece, the EU, the USA, Eastern Europe and the Balkans.

2.2.2 Technology incubators

This is a particular case of incubators concentrating on the building of new enterprises with operations based on new technologies introduced at national or local levels. Technology incubators[3] started as a development policy tool in many developed countries in the last three decades. Many industrialized countries adopted technology incubation as a means for promoting innovative enterprises and the commercialization of university research. Several new developed countries adopted also the concept of incubator. Number of incubators has grown tremendously during the eighties and nineties. A good deal of new incubators was focused on information and communication technology and biotechnology.

Numerous objectives can be achieved through the incubation scheme, such that:

- Overall economic development.
- Economic restructuring
- Addressing specific economic development problems.
- Creating employment opportunities
- Technology commercialization
- Universities opportunities to respond to **SMEs needs**
- Opportunity to firms to access university R&D facilities.
- Graduates and researchers Assistance in building their own enterprises.

Indirect benefits of incubation schemes comprising entrepreneurial culture encouragement, service industry attraction, and property values enhancement.

Services provided by incubators

The start up of an enterprise is generally accompanied with difficult steps to be overcome. These difficulties present serious challenge to young enterprises. They could be:

- Take-off costs
- Access to equity capital;
- Need of effective specialized technical assistance and infrastructure;
- Adequate market information
- Management and business ability

Besides providing incubator with scientific and technological expertise, equipment and instrumentation, and hosting facilities, an incubator should also seek attraction of venture capital and offer other business-related services aiming at the creation of real chances of survival during development phases.

Thus, technology or business incubators are service-oriented business institutions. In particular, a technology incubator has to provide specific high value-added services. Concretely, there are few incubators capable of providing a sufficiently wide range of such services. Thus, they are forced to form networks giving access to other effective resources of public and private support. Locating incubators within larger complex facilities aimed at catalyzing innovative activities is intended to facilitate links to other sources of support services. Isolation is one sure enemy of technology incubators while networking is essential for helping tenant firms access technology and markets.

An important issue to take in account while the design of incubation scheme is the credibility gained by associating renowned technology and research institutions. However, we should notice that many practical aspects hinder establishing incubation concept in developing countries:

- Lack of specialized services required by technology incubators,
- Lack of top-level scientific institutions to impart acceptable credibility to associated technology incubators,
- Economy ineffectively knowledge oriented
- Lack of venture capital and financial advise in raising up funding

Institutional and organizational aspects

Technology incubators have been incorporated within a variety of institutional forms in developed countries, such as innovation and technology centers as well as science, technology and research parks. Thus, technology incubators are often affiliated with sources of new technological knowledge in the public or private sectors, including universities, R&D centers, firms with significant R& D capabilities, etc.

There is no unique form of technology incubator structure. This should be flexible and versatile in order to be adequately fitted with local environment. One should find there a large measure of organization and management dynamism.

Essential constituents of support provided by technology incubators are;

- Hosting space, as office, laboratories and pilot system facilities;

- Management support, including business information and planning, training and marketing;
- Scientific and technical support as well as providing data bases and technical libraries;
- Access to different financial schemes;
- Legal support for contractual, licensing and intellectual property issues;
- Networking with other incubators, technopoles, and national services

Technology incubator management

Management policies for technology incubators should take in consideration some essential issues such that:

Networking and resource policies*:* Great attention should be paid to the establishment of clear criteria concerning the incubator linkages to, and networking with, institutions and funding sources. Past lessons show that incubators resource funding should be diversified. Reliance on subsidies, what ever its origin, it is rather a negative aspect in the incubator live.

Incubator occupancy periods*:* Taking into account that technology incubators could be lucrative property-based ventures, it is strongly advised, at the incubator management level, that shorter-term high occupancy rates be balanced against longer-term technology commercialization targets.

Incubator rent*:* Since most incubators charge rent falls generally below market values, it is essential to ensure strict compliance with entry requirements.

Enterprise graduation*:* Adopted criteria for graduating businesses from technology incubators are of varying severity and complexity. Several incubators for businesses, which following 3-5 years of incubation, make claims of 80 per cent graduation rates. It is essential to adopt relatively flexible policies that are able to take into account the peculiarities of some enterprise types and the surrounding market conditions.

An in-depth analysis of technology incubator impacts will help identify good practices that are more closely in tune with particular institutional and even cultural settings.

a. Regulatory aspects: Issues related to regulations and property laws should be addressed carefully in planning the establishment of incubators. Particularly, institutional affiliations of the various players committed in setting up an incubation scheme must be reviewed closely to discern possible conflict areas. For example, in cases where universities are part of incubator facilities, differences in the public university system and the regional tax-base will need to be addressed. Although, most municipalities in France receive tax revenues directly from local firms, land and property allotted to public universities belong to the central government, opening the door for possible conflict.

In many countries, central and local government authorities support for incubator initiatives is predicated on conceived market discrepancies and gaps in institutional infrastructures that are, therefore, filled by small technology-based businesses.

b. Virtual incubators

Examples of “virtual incubators” abound in some countries such that in Italy. They generally serve two essential objectives:

- As a cost-effective way of providing incubation services to small entrepreneurs in areas or application sectors lacking critical mass;

- As a means of testing demand, possibly with a view to customizing future physical facilities more precisely to the needs of prospective clients.

c. Incubators Success Stories

Hundreds on incubators were established around the world in the past decade. The most astonishing ones in the Mediterranean region are in Israel.

Israel[4] appears to have recognized over a decade ago the importance of technology incubators in the new economy. More than 25 technology centres are actually existing. Among them we can find the Meytag-Golan Initiative Centre that incubate many projects. Among these project we can find:

-Salts separation and cleaning in electrical field
-An exothermic process for producing electrically conductive ceramics
-Pigments for corrosion preventing paints and coatings
-Ion therapy devices
-Computerized graphic catalogue
-Ion implantation process
-Slow release fertilizer
-Fluidic jet sensors
-Renewable filter for purifying domestic drinking water
-Cleaning acidic gases
-Detection of heavy metals in water
-Mineral paints and coatings
-Organic coating for fruit and vegetables

And many others.

2.2.3 High technology industry clusters[5]

High Technology Industry Cluster (HTIC), according to OECD: “Can be characterized as being economic networks of strongly interdependent firms (including specialized suppliers), knowledge producing agents (universities, research institutes, engineering companies), bridging institutions (brokers, consultants) and customers, linked to each other in a value-adding production chain. The cluster approach focuses on the linkages and interdependence between actors in the network of production when producing products and services and creating innovations.”

Type of relationships linking partners in a cluster can be classified in three main categories:

a) Buyer/Supplier Relationships: Functioning between a set of enterprises producing goods and services and of enterprises operating within earlier stages in the value-adding chain supplying intermediate goods, services and raw materials for assembly or conversion into final goods and services. Activities targeting distributors of final goods and services may also be a part of such clusters.

b) Competitor/Collaborator Relationships: In this case, enterprises that produce the same or similar goods and services at a specific level in the value chain co-exists with the hope of sharing information about product and process innovations and market opportunities. This may be especially important for small enterprises hoping to develop the ability to supply larger markets than those they normally serve. In the industrialized countries competitor/collaborator relationships are also utilized in jointly accessing and utilizing innovations within the context of pre-competitive or strategic alliances.

c) Shared-Resource Relationships: firms rely on the same sources of raw materials, technology, human resource development programs and attendant facilities and information. Naturally, the various partners to produce a diversity of goods and services for completely different markets could use many of these resources.

Given the focus on the fact that these networks incorporate dissimilar competencies in order to interact in an innovative way, it is easy to explain that the production-chain clusters are regarded as a part of what are called National Systems of Innovation.

Investors, institutions such as government agencies and universities, as well as the community and other stakeholders that affect the cluster's competitiveness, usually support HTICs.

Successes achieved by clusters targeting specific industrial activities, e.g. food industry, medical biotechnology or microelectronics, have been attributed to two main reasons:

1. Clusters have resulted in high growth in the targeted industrial segment as well as in a chain of related businesses, including suppliers, specialized and general service industries as well as basic support industries, e.g. construction, real estate development and retail businesses.

2. Additionally, much of this growth has often been achieved with limited public support. Thus, given the right setting, both physical and legislative/regulatory related industries and businesses would seek the region designated for a cluster in order to enhance its competitive status. In many instances, support needed from government does not need to exceed a business-friendly regulatory climate and tax deferment or other similar incentives, e.g. exemption of import duty on selected items of equipment or material input.

HTICs are now being adopted as a means of improving regional industrial and technology development on the basis of socioeconomic relationships involving specific manufacturing and service industry segments. The concept provides help in the formulation and fine-tuning of socioeconomic development strategies. Experiences in HTICs point to their effectiveness in improving industry agglomeration at minimal costs. In addition, HTICs are useful tools for defining medium- and long-term industrial and technology development strategies. They provide rich ground for dynamic interaction among a range of essential partners in development than is available through traditional forms.

2.2.4 Research networks and co-laboratories

Today's large research projects are based on interdisciplinary grounds necessitating collaboration of a multitude of researchers often living in different geographical areas that could extend over continents. Sustained collaboration by interdisciplinary groups of researchers, a hallmark of today's research work, is a necessity due to the immensity of accumulated knowledge in the various science and technology fields.

The classical structures of research institutes and university laboratories, on the other hand, are not always geared to interdisciplinary and collaborative work. In particular, traditional departmental boundaries and budget allocation are discipline oriented, and the incentive system, essentially based on publications, does not promote collaboration across disciplines.

Structures devised to try to solve this problem, such as university-associated research centers, have led to isolation of research staff and distancing of teaching and research activities, compounded by relentless search for financial support.

The concept of "research center without walls" or "virtual research center" allows for building multidisciplinary research teams that are geographically distributed. Such a center consists

of networks of collaborating scholars from various institutions and disciplines working together on common projects. Computer networks and particularly high speeds Internet links render this possible. One important advantage of such networks is that they empower research in developing countries and allow disadvantaged nations to collaborate in international research.

Remote access of supercomputers, libraries, scientific instruments and other tools needed by researchers becomes a reality through Internet II technology, which permits the creation of an increasingly growing knowledge base and bringing together researchers in different institutions, disciplines or professions.

The explosion of communication speed and bandwidth, which is tripling every year, opens many doors for scientific and technological collaboration and helps make research centers without walls more common. Several forms for these research centers have been implemented; some are relatively small inter- or intra-university research networks, while others are vast co-laboratories extending over continents.

Members of a network commit themselves to a scientific problem area that defines the network and to interdisciplinary collaboration. They choose a chairperson and meet four to six times a year depending on need. Critical questions facing members of the teams as well as an interdisciplinary agenda of research to address those questions are identified, leading to collaborative research. In spite of marked differences in network evolution, four explicit stages of organizational development were found to be common to all networks:

Stage 1: *Search for a common theme*: specific enough to attract members intellectually but general also to give them room for exploration in their own themes.

Stage 2: *Conceptual modeling:* Common concepts and common grounds enabling efficient communication are necessary for multidisciplinary collaborative work. This is achieved whereby a conceptual translation from the vocabulary of one discipline to the other through analogy and metaphor. By the end of this stage a conceptual model common to all participants is developed on which interdisciplinary collaboration could be built followed by joint research work.

Stage 3: *collaboration*: A high degree of mutual tolerance and readiness to collaborate emerges in this stage. This could lead to major collaborative efforts among members of the network, or at least intra-disciplinary discussions that would gradually lead to more concrete collaboration between various laboratories.

Stage 4: *Joint Projects:* Maturity, concretized by joint research projects between various members of the network, is usually reached after two to three years.

The results of this experiment in “research centers without walls” show that the network concept can work if proper environment and favorable circumstances are developed. In particular, a commitment on the part of a funding agency is necessary as well as careful selection of individuals on the basis of their expertise and enthusiasm to interdisciplinary investigation. Permanent attention to the complexities of carrying out collaborative work across institutional and disciplinary boundaries is also a necessary condition for success.

Another example of a virtual research network is the AIDS Research Institute of the University of California at San Francisco (UCSF)[6], a research network encompassing a dozen existing research centers and institutes at UCSF and about a thousand investigators working in geographically dispersed locations in San Francisco. It represents one of the largest initiatives in research on AIDS in the US.

Research centers without walls in the form of research networks enable scientists who are committed to collaborate with colleagues from other disciplines, institutions, and even cultures, to share in the conduct of research that would otherwise remain beyond their reach.

Co-Laboratories: Another form of research centers without walls is that of "co-laboratories". These are generally large virtual entities where scholars and research scientists work together, sharing funds and a work plan for the accomplishment of a particular objective. Each co-laboratory (abbreviated “co-lab”) may have a different range of goals and objectives. But co-labs may be linked together for research on serious problems that require combined efforts of international institutions in order to solve problems affecting humanity.

In a co-lab interaction of scientists in various disciplines who share instrumentation, data systems, and collaborate in teams is of essence. Such collaboration dates back a few decades ago. However, with the advent of high-speed communications co-labs are becoming increasingly dependent on computer networks, involving multimedia computer conferencing, simulation, modeling, graphics and gaming, involving in some instances the remote manipulation of instruments in outer space and deep in the ocean.

Centralized data management is of utmost importance and necessity in any co-lab as well as support system for teamwork, networking for continuous thinking and planning together, and software tools for developing methods and organizational structures of the co-lab itself. Interconnecting with other co-labs and research teams permit tackling the most difficult problems by sharing ideas, experiments and discoveries. By working together regularly and on an international scale, researchers can combine and use tools to tackle problems otherwise too complex and difficult to approach. Through co-labs work can be completed faster, more efficiently, and more comprehensively than ever before.

Co-laboratories lead to global projects involving creative interaction across disciplinary, cultural and international boundaries. Brief synopses of co-labs are given in Frame 12: the International Center for Genetic Engineering and Biotechnology and the Human Genome Project co-laboratory.

3. Overview of some capacity building structures in the Mediterranean region

TUNISIA INTERNATIONAL CENTER FOR ENVIRONMENTAL TECHNOLOGY OF TUNISIA (CITET)

CITET is a government institution operating under the Ministry of Environment and Land Use Planning.

It was established on 25 March 1996 by act of parliament n° 96-25. The CITET was set up to satisfy the needs of Tunisia and other countries in the Arab-African and Mediterranean region in terms of transferring, adapting and promoting ecologically friendly technology. The CITET aims to provide help in strengthening skills and capacities building in protecting the environment, managing natural resources and mastering environmentally friendly technologies, in accordance with options taken at national level and regional priorities. Sustainable development is at the heart of the CITET's mission.

The Center is located in Tunis, close to one of the capital's largest industrial zones as well as to a number of ministries, technical institutes and universities involved in fields relevant to the CITET's activities. These activities are focused on environmental issues and land use planning, agriculture, infrastructure and public works, telecommunications, transport, etc.

The creation of the CITET is the result of the Tunisian government's will to protect the environment and the fragile natural resources of the country as well as its deep concern to guarantee present and future generations of Tunisians their legitimate right to a healthy environment and sustainable development.

The environmental sector in Tunisia in the 1990s saw rapid expansion, with numerous projects being launched across the country in the different areas of environmental technology and sustainable development. This rapid expansion gave rise to a demand for environmental technology and a need to build a strong base of skills in Tunisia.

The creation of the CITET came to strengthen the institutional structure already existing and to assure sustainable environmental management. Linked to the Ministry of the Environment and Land Use Planning with other institutions such: the National Wastewater Management Agency (ONAS), the National Environmental Protection Agency (ANPE), the National Coastline Protection Agency (ANPL), the National Renewable Energies Agency (ANER), and the National Commission on Sustainable Development.

I- Vocations

Aiming at satisfying the needs of Tunisia and other countries in the Arab-African and Mediterranean region in terms of transferring, adapting and promoting ecologically friendly technology. The CITET aims to provide help in strengthening skills and capacities building in protecting the environment, managing natural resources and mastering environmentally friendly technologies, in accordance with options taken at national level and regional priorities. Sustainable development is at the heart of the CITET's mission.

Though CITET has a Mediterranean, African and Arab vocation, it is open to any other areas. At national, regional and international levels, CITET seeks to be:

- Place of partnership for public and private sectors, the industrial world and the universities, centres of ecotechnological innovation and environmental or economic operators, i.e. the real or potential users of ecotechnologies, in Tunisia, the region or elsewhere.
- Platform for cooperation, a place where the help projected as part of agreements and environmental protection programs aimed at the countries of the region takes shape. The

CITET has thus to facilitate the transfer of cheaper technologies, better adapted to the geographic, climatic and economic conditions prevailing in Tunisia and similar countries.

- Open centre to the international environment, creating and developing flows of information, experience and know-how. Thus the CITET will benefit from the technologies and know-how of the eastern countries, adapting them and making them available to the South. The Centre could be an example of effective North-South and North-South-South cooperation.

II- Missions

The CITET was established to strengthen capacities in environmental protection and the sustainable management of natural resources in Tunisia, Africa, and the Arab and Mediterranean countries. The Center does this by:

- Developing skills and capacity building in Tunisia and the countries of the region in the field of environmental management and ecotechnologies
- Providing technical assistance to industry and promoting cleaner and more environmentally friendly technologies.
- Facilitating the adaptation, transfer and promotion of technologies, which are economically more efficient and ecologically more rational.
- Promoting knowledge and making information available on environmental protection, the sustainable management ecotechnologies.

III- Activities

The CITET's activities are based on national and regional priorities in environmental protection: Protection of water resources, protection of marine environment and coastline, fight against industrial pollution, solid waste management, conservation of biological diversity and fight against desertification, and clean and renewable energies

The CITET's activities are focused on training, applied research and technology transfer, laboratory services, technical assistance in industrial sector, and information, documentation and publication.

The CITET is part of a number of environmental programs, and in particular those, which are part of international cooperation, where CITET seeks to, develop new international cooperation projects.

The CITET was assigned by the World Bank the responsibility for the regional coordination of the Pilot Project METAP[7] (Mediterranean Environmental Technical Assistance Program) for institutional strengthening of the environmental impact evaluation system in the southern Mediterranean countries: Albania, Algeria, Bosnia-Herzegovina, Cyprus, Croatia, Egypt, Jordan, Lebanon, Morocco, Palestinian Authority, Syria, Slovenia, Tunisia and Turkey. The main objective is to strengthen environmental management capacities in the region and promote and ensure distribution of expertise on environmental impact evaluation as an essential instrument of sustainable development.

IV- Projects underway

CITET has many environmental projects, the most important are:

- Water resources protection and waste water treatment.
- Pilot project to control the water quality of the Mejerda River watershed.
- Full automation management of the activated sludge wastewater treatment plant of Sousse-Nord.

- Decontamination of polluted sites.
- Pilot project for the decontamination of hydrocarbon polluted sites: case study area – La Marsa.
- Waste treatment.
- Treatment and recycling of liquid waste from olive oil manufacturing process.
- Recycling of organic solid waste by composting.
- Recycling of organic solid waste from wholesale market to create energy and soil nutriments.
- Desertification.
- Improving the quality of waste water treated by the Gabès waste water plant (tertiary treatment) and its re-use in agriculture
- Monitoring of Coastal pollution.
- Measuring biomarkers in marine organisms.

V- CITET Structure

As independent core, the CITET has its own management, composed of General Director assisted by management board and scientific board. The CITET has adequate administrative and managerial services. On the scientific and technical level, CITET has four Directions. Training and capacity building direction, cleaner production and assistance to industry direction, research and development direction, and laboratories direction. Five laboratories are belonging to the last direction. Laboratory of water and sewage, laboratory of solid waste, laboratory of air quality, and laboratory of natural environment and desertification.

Despite the development of technical centers to assist in capacity building, further work needs to be done to understand and appreciate the relationship between environment, economy and development, as well as to prioritize and develop effective projects to assist national stakeholders manage crosscutting challenges.

CITET has set of laboratories and departments linked to the Ministry of the Environment and Land Use Management. CITET is actually assisting other national organs and establishments dealing with environmental problems. This assistance takes the form of conducting analysis work (water and air), training staff for national and regional organizations, and applied research in some environmental topic specific for the national context. This center is acting as R&D establishment, participating in efforts of capacity building and environmental projects, at both national and international levels.

CITET is the sole environmental R&D establishment in the country, dealing with almost all types of environmental problems. It is obvious that managing all these issues effectively needs more involvement from other actors such as universities. One should take in account the fact that necessary equipments for such topics are very expensive. Thus states in developing countries cannot offer them self the luxury of building environmental area-oriented centers, so it seem that the CITET format is a suitable one, especially if it can achieve a good relation with local universities or foreign universities and transfer technology centers.

This center expresses its interest to act as a regional center to assist in implementing projects and training programs in environment, at the national, as well as, regional levels. This center seams to have necessary infrastructure to play a major role as active member in a Mediterranean research network and active player as incubator (in link with local universities). Despite his national and regional relations, it seams those relations with university laboratories have to be strengthened, mainly in research, capacity building and long term monitoring (coast and air) activities.

SPAIN CENTRE PER A L'EMPRESSA I EL MEDI AMBIENT (CEMA) CATALONIA

I-Background

Catalonia is part of Spain, having its own language and culture and an important self-government status. It is forming a 15th of Spain surface and more than 15% of Spain inhabitant, which mean more the double of average of inhabitant Spain density. It is a very industrialized region, 40% of its working force is in industrial sector. As well as it is highly urbanized and developed region. Service activities are very developed representing 69% of the Catalan GNP.

Given these data, one can conclude that some environmental problems, like air pollution and waste sources, may be crucial obstacles to the sustainable development of this region. The Agenda 21 of Catalonia related to sustainability gives a great importance to the environmental issue.

The Catalan legislations are very clear about environment protection in all its aspects. It is based on the principle of avoiding the emergence of contamination and other negative effects at their origin rather than later combating their effects.

Thus, the Catalan legislation emphasizes that all public or private projects consisting in the execution of any works of installations or other activities will be subjected to environmental impact assessment.

Any industrial project should include an environmental impact study, which has to cover a detailed analysis of the place where the work, activity or installation is foreseen and of its surroundings. This will include a description of the physical setting covering the geological, hydrological, hydro-geological, climatological, atmospherically and edaphic aspects as well as the vegetation, landscape and other factors required in defining the setting in the affected area and its surrounding:

The study should include also the assessment of the foreseeable direct and indirect effects of the project on the population, mineral wealth, soil, flora and vegetation, fauna, air, water, climatic factors and on the landscape and material assets including the historical-artistic and archaeological patrimony.

As well as detailed list and economic estimate of the measures foreseen for eliminating, reducing or counterbalancing the significant negative environmental effects; the schedule for execution, possible alternatives that exist with regard to the conditions of the project initially foreseen and justification of the suitability of the alternative chosen with regard to the minimization of the negative effects on the environment.

Additionally, the study should describe a program of environmental care in which the parameters for the continuous observance of the quality of the affected environmental vectors are determined in a detailed manner, as well as the appraisal and control systems for these parameters.

At the institutional level, the government of Catalonia created a **Ministry (Department) for the environment.** This ministry is composed of:

General Directorate of Environmental Planification having the task of:

- Dissemination of environmental information and management of tools, which guaranty its access.

- Programs and campaigns of environmental awareness.

- Support for the sectoral programming of the Department.

General Directorate of Environmental Quality with the role of:

- Pollution prevention and monitoring
- Technological research. Air quality
- Meteorology Service. Environmental qualification: eco-labels, EC Eco-management and audit scheme

General Directorate of Natural Heritage and Physical Environment, having the task of:

Planning and guidelines for protecting the natural heritage.
Developing the Plan of Sites of Natural Interest.
Assessment of environmental impact.
Integrated restorations for opencast mining.

In addition to these Directorates, the Ministry of environment has two agencies:

Waste treatment agency aiming at the:

Promotion of minimization, cleaner production and waste valorization.
Authorization and control of the cycle of management of industrial waste.
Support for municipal waste management.

Water Agency of Catalonia having the task of

Planning and co-ordination of the hydraulic politic for a sustainable water use and supply.
Management of the public hydraulic domain.
Water taxation. Sanitation.
Water and beach monitoring.

The fourth component of the Ministry of Environment is The **CEMA** (Le Centre per a l'Empresa i el Medi Ambient CEMA), is the Catalonia Ministry of environment tool aiming at encouraging Catalonia enterprises to adopt practices and technologies leading to waste reduction at sources and the pollutant emission generated by their production processes.

II- CEMA

CEMA**,** situated in the city of Barcelona (Spain), started its activities in July 1994 as initiatives centre for cleaner production, which were predicted actions within the management program of special wastes in Catalonia over the period of 1994-2000.

The CEMA's primary function is to help companies and sectors in minimization, to inform them and work closely with them.

The CEMA, conceived as a unit at the service of the industrial fabric, extended its activities in 1998 to become an incorporated company owned entirely by the Government of Catalonia and attached to the Department of the Environment.

It also supports other units of the Department of the Environment and undertakes assignments from them and other institutions in the field of pollution prevention at source.

The Center per a l'Empresa i el Medi Ambient (CEMA), was designated by the Contracting Parties to the Barcelona Convention in 1996 as Regional Activity Centre for Cleaner

Production (RAC/CP). Since then, is one of the six Regional Activity Centres (RAC) in the/within the Mediterranean Action (MAP)[8].

Each one of these centers is responsible for/is concerned with a specific thematic area. The main goal/objective of the RAC/CP is the promotion and dissemination of prevention, the reduction of pollution at source in the industrial sector, as well as the giving of technical support to the Contracting Parties and the institutional organizations. Through them, also to the businesses wishing to promote less polluting and more eco-efficient techniques and practices in their activities.

By virtue of the collaboration agreement between the governments of Spain and Catalonia, the Center was recognized as the adequate tool for the promotion and dissemination of the pollution control throughout/in all the Spanish territory. Likewise, in 1995 the Spanish government presented the candidacy of the Center as RAC/CP at the IX Meeting of the Contracting Parties of the Barcelona Convention. The Center have been designated as RAC/CP, since the proposal/offer was accepted by the Contracting Parties in the extraordinary meeting held in Montpellier (France) in 1996, hence

The main and primordial task of CEMA is to facilitate way to enterprises and sectors of minimization, providing information, and have tight collaboration. The CEMA is designed to be a service unit serving industrial tissue. It has enlarged its activities in 1998 by being transformed in anonymous society funded 100% by Catalan autonomous government and affiliated to Environment ministry.

III- Objectives

CEMA has the following main objectives:

- Promote, encourage, and advise enterprises for the adoption of practices, techniques and technology aiming at the prevention of pollution at the origin.
- Diffuse of concepts of cleaner production
- Provide response, consultancy and enterprises considerations of different sectors according to policy of environmental protection enhancement
- Promote developing of goods and services sectors related to environment.

Companies are the main targets, working with them individually and collectively. CEMA's messages and actions are companies oriented.

The CEMA is a neutral meeting place for companies and their offer of environmental goods and services. In this respect, the CEMA also collaborates with the sectors and companies that supply cleaner technologies, with the ultimate aim of offering the most feasible tested options to industrial concerns.

It has institutional links with organisms, in Catalonia, in the Spanish state and on a regional/international levels, which also aim to seek and share information on successful methodologies, technologies and experiences, and promote cleaner production, eco-efficiency and pollution reduction at source. In this regard, CEMA is open to:
Companies and industrial sectors wishing to take action that need information related to pollution prevention/reduction.

Professionals in the sector who have available technologies for pollution reduction or who act as consultants.

Institutions or centers working on cleaner production issues and individuals interested in the subject

As aforementioned, CEMA is one of six centre acting as RAC/CP within the MAP. In this regard, CEMA has the following objectives:

- Participate in the MAP and in the Mediterranean Commission about SustainableDevelopment (CMDS) activities.
- Co-ordinate the network of National Focal Points (NFP), designated by the signatories of the Barcelona Convention.
- Advice the NFP about cleaner technology.
- Facilitate and promote the cleaner technology transfer and the exchange of experts.
- Promote demonstration projects and training activities.
- Carry out studies about pollution prevention alternatives in different fields and sectors of interest for the Region.
- Inform, through the publications of news and practical cases implemented in companies within the Mediterranean Region.

CEMA is open to industrial sectors desiring the achievement of defined intervention and needing information concerning every issue related to the pollution prevention. It is also open to professional consultants able to provide pollution reduction technologies, and institutions or centres concerned by cleaner production question.

IV- Structure

The structure of CEMA is based on action-oriented tools helping in the achievement of its goals. These tools are:

MOED: The Minimization Opportunities Environmental Diagnosis tool developed by CEMA at the service of companies. It consists of experts' assessment of an industrial activity or process, to determine the real opportunities for prevention/reduction of pollution and alternative actions that are technically and economically viable.

The MOED has a defined methodology and specific objectives, which provides the company with a comprehensible document constituting a basic element of planning strategy, for implementing actions that prevent pollution.

The MOED is an identification tool of sources of pollution within a production process that will later need to be treated before it can be dumped in the environment. Treated material often contains substances and products that can be recovered, reintroduced or simply saved, through better management of the production process.

It aims specifically at analyse productive processes and waste flows, to identify the opportunities for environmental improvement linked to those processes. It gives the company the opportunity to include care of the environment in its management, and assess the possible savings brought about by this form of action with the aim of avoiding the adoption of end-of-pipe remedies, which are sometimes unnecessary, that can cause the company to be inefficient due to the added costs this type of treatment involves.

WORK GROUP: Is one of the instruments that the CEMA uses as a means to identify options for pollution prevention and minimization. The work groups are a methodology based on:

- Meetings between representatives of different companies in the same sector with the collaboration of experts and the CEMA.
- The meetings promote the sharing of knowledge and experiences and the most environmentally suitable alternatives are discussed. Specialists are invited to develop specific themes related to part of the process, a particular type of material, etc.

- These meetings generate a series of pollution prevention proposals that later, each of the companies will freely choose to apply and which at the same time can be applied to other companies in similar circumstances

A work group may be set up on the initiative of a group of companies, an association or guild, a chamber of commerce, etc. and the ideal number of participants is 6 - 12 companies, to take advantage of synergy, whilst making it more efficient for those taking part. Work groups operate for about six months.

For those industrial sectors that are considered a priority, depending on the Programs of the different units of the Department of the Environment, the CEMA may contribute to the financing of work groups depending on the budget available for such actions.

GRANTS AND TAX DEDUCTIONS: Within the Resolution of 20 February 2001, publicizing the call for applications for subsidies to carry out the implementation of waste minimization projects, CEMA can offer enterprises help to get benefit from governmental grants and subsidizes for those applied for waste minimization.
This aid is granted by the Waste Treatment Agency and is the organism responsible for the technical review of the projects for which a subsidy is requested. Actions that may be granted a subsidy are:

- Environmental diagnoses directed at minimization (beneficiaries: companies and groups of companies).
- Industrial waste minimization projects (beneficiaries: companies and groups of companies).
- Research and technological development projects applied in the fields of industrial waste minimization (beneficiaries: companies, groups of companies and non-profit-making organizations).
- Training and promotion projects aimed at industrial waste minimization (beneficiaries: companies and groups of companies).

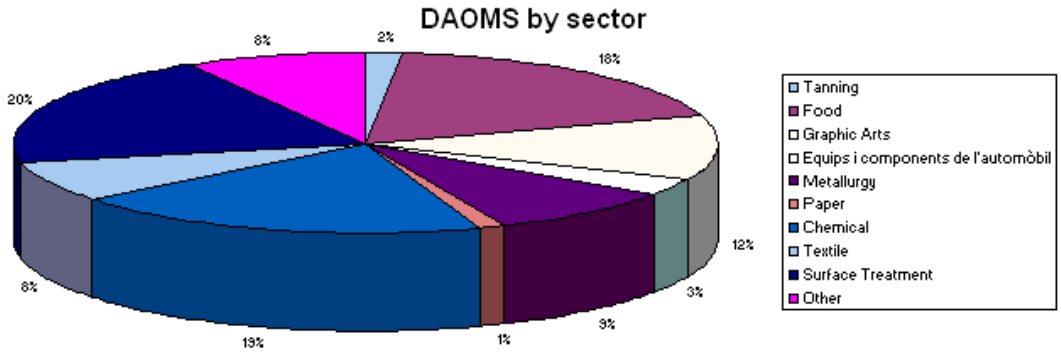
PUBLICATION AND DIFFUSION COMPAINS: CEMA has many valuable actions related to the area of capacity building. In this regard, CEMA organizes various conferences, workshops, and courses on the topic of cleaner production from practical and methodological point of view. These capacity building activities have an international character by its participation and financing. An example of this is the “International course on pollution prevention”, organized within the framework of the Mediterranean Action Plan, the Centre for the Enterprises and the Environment in quality of Regional Activity Centre for Cleaner Production (RAC/CP), organizes a course on techniques and pollution prevention alternatives the following 30 September until 4 October, aimed at representatives of the Mediterranean region.

CEMA has carried out various studies related to the subject of waste treatment and pollution minimization. It has published many valuable documents on these topics. An example of these is the compilation of papers presented within the framework of the Second International Conference on Minimization and Cleaner Production held in Barcelona in 1995. They deal mainly with practical cases, studies, methodologies, technologies, company cases and studies (sectoral, regional and national) all directed at preventing pollution at source. It is published in English with abstracts in Catalan and Spanish.

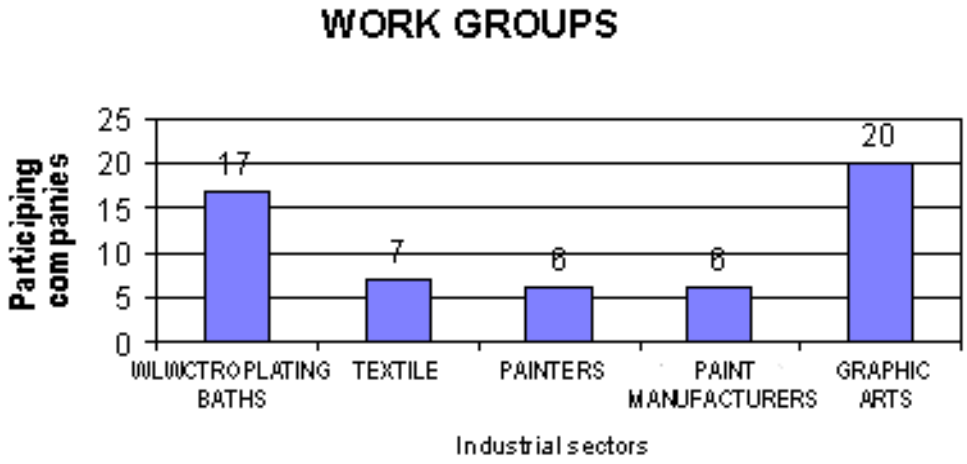
V- Activities

Enterprises are the principal clients of CEMA, this means that CEMA is working with individual enterprises as well as group of enterprises. CEMA is the focal point between enterprises and offer of goods and services related to environment. This kind of activities is

reflected by the MOED and WORK GROUP discussed in the previous section. The following graphic shows the distribution of CEMA's activities between different segments of industrial sector within MOED:



And the following graphic shows CEMA's activities repartition across WORK GROUPS:



CEMA has institutional relations with various organizations having the same objectives, at local, national and international levels. These relations take the form of joint research, information exchange dealing with methodologies, technologies and successful experiences, and developing, en general, cleaner production, and eco-efficiency or pollution reduction at the origin.

Other than CEMA's RAC/CP activities and its activities within local enterprises, CEMA has many valuable actions related to the area of capacity building. In this regard, CEMA organizes various conferences, workshops, and courses on the topic of cleaner production from practical and methodological point of view. These capacity building activities have an international character by its participation and financing. An example of this is the "International course on pollution prevention", organized within the framework of the Mediterranean Action Plan, the Center for the Enterprises and the Environment in quality of Regional Activity Center for Cleaner Production (RAC/CP), organizes a course on techniques and pollution prevention alternatives the following 30 September until 4 October, aimed at representatives of the Mediterranean region.
The Global Environmental Facility (GEF), the Mediterranean Action Plan and RAC/CP jointly finance this course, and it takes place within the framework of a project that is being carried out in the Region. Namely, the aim of the project is to provide the countries with the necessary tools and know-how in order that these are able to elaborate their National Plans

for the reduction of pollution and the application of the Land-Based Sources Protocol (LBS Protocol).

VI- Funding

The RAC/CP normal/daily activities are financed by the Spanish government, once approved by the Contracting Parties to the Barcelona Convention and the Comisión Bilateral de Seguimiento - or Bilateral Monitoring Commission (formed by representatives of the Spanish and the Catalan governments), which monitors the actions undertaken by the Centre in this field.

The RAC/CP participation in other MAP actions and in other extraordinary activities is done through a system of mixed financing, a different contribution being agreed on for each specific case.

VII- Conclusion

The CEMA is a regional activities centre aiming at helping companies that want to carry out a minimization opportunities environmental diagnosis aiming at combating pollution at the source. Its effort is quite associated to a very important industrial activity in the Catalonia.

It owns a structure, MOED and Work Groups, enabling it of offering support and expertise to regional companies in a collaborative way. The principle of this center is based on prevention rather than on remediation. This is an advanced stage of awareness permitting taking action and anticipation of future problems.

This formula should be very suitable for small and medium enterprises that have not the necessary means of struggling against pollution, also for companies lacking experience in the field of waste reduction and pollution emission reduction.

This is a formula to be generalized in many countries, mainly in the southern part of the Mediterranean countries, where expertise is inexistent within the industry in this region. CEMA could be a focal point of a network to be created in the Mediterranean region aiming at waste reduction and pollution emission reduction in the industrial sectors.

CROATIA HAZARDOUS WASTE MANAGEMENT AGENCY, AGENCIJA ZA POSEBNI OTPAD, (APO)

APO is a public consulting and engineering company, specialized in environmental protection with a focus on hazardous and radioactive waste management.
It is established at 1991 and located in Zagreb. It contains 15 employees, 5 of them are experts of specialized United Nations organizations.

I- Missions

APO's core business lies in providing consulting services and engineering activities related to environmental protection with focus on:

- Elaborating and studying specific aspects of environmental protection and waste management.
- Environmental impact studies.
- Organizing and implementing the management of all types of waste.
- Co-ordinating and implementing projects of radioactive waste management.
- Promoting environmental ideas, informing and educating the public.

II- Structure

APO is an independent company and has its own management composed of General Director assisted by auditing board. APO contains four departments:

- Corporate and public affairs department
- Waste systems and technology department
- Siting department
- Risk assessment and safety department.

III- Activities

APO Co-operates with a range of international organization/specialized firms, and local institutes and firms, either through cooperation agreements or through membership in professional associations. The objective is ensuring access to and the application of new knowledge and technologies as well as compliance with the highest global and local environmental protection standards.
APO is partner in many national and international projects like "Building Cleaner Production Capacities in Croatia" in collaboration with Government of the Czech Republic and UNIDO.
APO was authorized by the State Directorate for Nature and environmental Protection to perform:
Environment-related expert studies
Environment impact studies.
Environment monitoring
Hazardous waste management.

APO is active in the following areas -

- Biological Treatment of wastes, Biotechnology and Chemistry Consultancy
- Collection, Disposal and Transport Consultancy
- Contaminated sites Consultancy
- Education and Training Consultancy
- Fixation and Solidification Consultancy
- Hazardous, Clinical and Hospital Wastes Consultancy
- Incineration and Combustion Consultancy
- Industrial wastes Consultancy

- Landfill and Deep wells Consultancy
- Management, Administration, Economics and Marketing Consultancy
- Mining, Oil, Fuel and Forestry wastes Consultancy
- Monitoring, Instrumentation and Control Consultancy
- Public awareness and Ethics Consultancy
- Recycling, Compost utilization and Recovery Consultancy
- Risk assessment and Odor evaluation Consultancy
- Sewage and Sludge Consultancy
- Source separation Consultancy
- Waste Avoidance and Minimization Consultancy
- Workers Health and Safety Consultancy

IV- Studies and projects

In following examples of studies and project conducted by APO in different fields:

Radioactive waste and nuclear materials

APO performed may studies and feasibility studies in the domain of radioactive waste:
- Analysis in the sites of Kutina (INA-PETROKEMIJA) and the site of Plomin. These studies included irradiation analysis and contamination.
- Studies of the strategy for the disposal of radioactive waste in Croatia,
- Proposition of program to replace radioactive lightning rods and ionising smoke detectors.
- Monitoring and analysing radio nuclide migration through good chains in Trgosvska gora area.
- Translated Supplementary Protocol and Agreement on the containment of nuclear arms,
- Studies of supervision and International control of Nuclear Materials.
- Study of the organization of a prevention system against unauthorized trans-boundary traffic of nuclear material.

It proposed many project to implements concerning:
- Management of radioactively contaminated areas in Croatia.
- Handling damaged sources of radioactivity in the war-affected areas of Croatia.
- Technological solution to the disposal of low-and medium- level radioactive waste in the Republic of Croatia – tunnels and shallow sites.
- Conditioning of radium sources.

Hazardous waste
APO performed may studies and feasibility studies:

- Studies about the hazardous waste situation and management in Croatia and its treatment especially of residual pesticides and their packaging with proposal for immediate and long-term remediation measures.
- Management of the residual edible oils.
- Management of the hazardous clinical and pharmaceutical waste, its storage and conditioning of old pharmaceutical industrial waste management
- Management of inorganic slurry by building it in into the bricks, solidification of greasy slurry and sludge of heavy metals.

It prepared documentation of many project:
- Technological solution of the Centre for hazardous waste treatment and disposal at the State level.
- Preliminary design of the Centre for hazardous waste pre-treatment and storage for Bjelovar-Bilogora County.

- Preliminary design of the Centre for hazardous waste pre-treatment and storage for the Istrian County.
- Technological project of a Centre for solvents recovery.
- Technological solution of the sub-centre for hazardous waste treatment in KGK, Karlovac.
- Technological solution of the Centre for special waste pre-treatment and storage for Osijek-Baranja County with the study on environmental impact.

It conducted many project implementations:
- Organization and implementation of waste oils management of waste oils management at the State level
- Keeping the Database on electrical equipment containing.
- Mercury contamination - The assessment of risk and the clean-up procedure, HEP – Electrical and thermal power plant.
- Establishment the current situation with expired pharmaceuticals originating from donations at various location in the counties of Split and Dalmatia and Šibenik and Knin.
- Recovery and disposal of expired pharmaceuticals in Croatia – Outline proposal for collaborative involvement.
- Setting up and keeping of the land registry for the industriall waste (hazardous and non-hazardous) in Croatia.
- GIS application of the landfill's land registry.
- Long-term training for the introduction of Cleaner production into industrial manufacturing companies.

General environmental protection
- ECO-Auditing – environmental Impact Assessment of the Jertovec Thermal Power Plant.
- Environmental impact study on the use of alternative fuels, old tires and used oils in Koromačno cement plant.
- Strategy for the introduction for the Cleaner production program into the Republic of Croatia.
- Criteria for the assessment of earth quake risk for the nuclear power plant Krško site.
- GIS application of preferential locations for the disposal of low and medium levels of radioactivity waste in Croatia.
- Preliminary biological and ecological characterization of the preferential location for the disposal of low and medium levels of radioactivity waste in the area of Trgovska gora.

Informing and educating the general public
- Organization of the Regional Workshop on Safety in use, storage and disposal of radiation sources (Zagreb 1998).
- Organization of the professional meeting "Electric power supply-coal-environment (Mošćenička Draga 1998)
- Organization of the international meeting "Strategic assessment of the environment in the development of the environment in the developmental plans of industries – the most efficient environmental protection (Zagreb 1998).

In addition APO published many books and bulletins and is holding a bimonthly APO newsletter.

V- Conclusion

The new state of Croatia is facing many problems in the reorganization of the economy as well as the politic and the society. The environment problems come in second place of priority. Croatia has many pollution problems resulting from many years of war, in addition of old industries. The government conducts many efforts in order to confront the environmental problems, but the legislative basis of environmental protection is characterized by fragmentation, a lack of equilibrium in solving specific issues, and a lack of regulatory co-ordination. There is a particular lack of systematic environmental state monitoring,

achievement of protection from pollution, clear definition of rights and liabilities in environmental protection, as well as that of responsibilities, control, financing and charges. First step was the creation of independent governmental establishment the “Directorate for Environment Protection” which was active in defining programs, but missing the power of minister limited its efficiency. In 2000 new ministry was created “Ministry of Environmental Protection and Physical Planning” and we can expect improvement in environmental purpose.

We presented the activities of the public company “Hazardous Waste Management Agency” (APO) which is specialized in radioactive and hazardous waste management. We notice that most of its activities is studies, project documentation and auditing with a lack of concrete implementation. This situation is due probably to financing problems.

MOROCCO NATIONAL OBSERVATORY OF ENVIRONMENT OF MOROCCO (OBSERVATOIRE NATIONAL DE L'ENVIRONNEMENT DU MAROC (ONEM)

It was created in 1995 with the support and the financing of the UNDP and UNESCO. It depends on the Department of the Environment[9]. ONEM ensures the evaluation and the follow-up of the environmental data necessary to the decision-making. Its principal missions are:

- to collect, analyze and disseminate information relating to the environment,
- to produce statistics and indicators on the environment and the sustainable development,
- to develop networks of actors for the monitoring and the follow-up of the state of environment,
- and to contribute to the definition of the sustainable policy for country development.

ONEM controls several projects like the installation of a database on the occupation of coastal area (MED-Geobase System), and of the information systems on the regional environment[10].

NATIONAL LABORATORY OF ENVIRONMENT (LABORATOIRE NATIONAL DE L'ENVIRONNEMENT (LNE):

It was created in 1994 as a result of the project of environmental management financed by Germany. The activities of the LNE are multiple:

- analysis of the various forms of pollution and nuisance (water, air, ground),
- monitoring of the hygienic quality of beaches,
- the realization of environmental audits in various industrial sectors,
- air quality monitoring of agglomerations,
- making standards for pollutant emissions,
- the standardization of analysis methods,
- the development of data bases,
- development and implementation of computerized simulations of situations related to environmental problems and their space-time evolution, etc.

LNE has a mobile laboratory for measurements of the air quality, and undertakes monitoring campaigns of quality.

CENTRE OF INFORMATION ON SUSTAINABLE ENERGY AND ENVIRONMENT (CIEDE) (CENTRE D'INFORMATION SUR L'ENERGIE DURABLE ET L'ENVIRONNEMENT)

It was created in 2000 within the Department of the Environment as a result of the Regional Project for Capacity Building in the Maghreb supported by GEF/PNUD. CIEDE aims at the organization, the collection, the analysis and the diffusion of the information relating to uses of the energy and its rational uses. (See bellow).

THE MOROCCAN CENTER OF CLEAN PRODUCTION (LE CENTER MOROCCAIN DE PRODUCTION PROPRE (CMPP):

It was founded in 2000 in Casablanca as a result of cooperation between Morocco and Swiss. It is related to the "Department of Industry and Commerce" in the "Ministry of Industry, Commerce, and Telecommunication", and it has the status of non-profit-making association. Its aim is to strengthen Morocco's industrial sector, enhancing the competitive position of SMEs by raising environmental efficiency (efficient use of energy, water and raw materials)[11].

The Center participates in many national and international projects such as the “Cleaner Production Programme” financed by the “State Secretariat for Economic Affairs” in Swiss, which has been commissioned to manage the programme by UNIDO.

INFORMATION CENTER ON SUSTAINABLE ENERGY AND ENVIRONMENT (CIEDE) (CENTRE D’INFORMATION SUR L’ENERGIE DURABLE ET L’ENVIRONNEMENT)

CIEDE is created within the Department of the Environment, become operational from February 2000. The CIEDE benefits of a strong support of the Department of the Environment, in view to reinforce its institutional mission in domains of information and coordination, notably in domains of the Climate Changes and Sustainable Development. The CIEDE also benefits, of a support of the GEF/PNUD through the Regional Project of Capacity Building in the Maghreb - RAB/94/G31 - in the setting of the implementation of the United Nations Framework Convention on Climate Change (UNFCCC).

I- Missions

The CIEDE’s mission is focused on the organization, the collection, the analysis and the diffusion of the information relating to the use of the energy, and to the rational utilization of the natural resources (forest, wood-energy…) with view to their multiple impacts on the environment (emission of GES…)

The CIEDE transports, in a closed manner to its partners, all information on the evolution of negotiations related to the climate change and lasting development. It demystifies, through specific bulletins and web site, the applicable indicators bound to the triptych Energy-Development-Environment, and criteria of eligibility of the new mechanisms of cooperation and financing.

II- Structure

The CIEDE is composed, for its starting phase, of a young team of three permanent people and a network of collaborators within the National Committee for the Climate Change that regroups several Departments, public and private establishments .

III- Activities

Activities of information of the CIEDE cover fields of:

- ✓ Utilization of sustainable energy and their impacts on the environment,
- ✓ The rational uses of energy in the industry, the transport, the residential, the tertiary, etc. and the rational utilization of the natural resources (biomass…),
- ✓ The climate change and their multiple negative impacts on the agriculture, health, and the natural resources (waters, forests…)
- ✓ Measures of mitigation to the level of sectors that consume enormous energy: the production of electricity, the agriculture; the transport, the utilization of natural resource
- ✓ The reinforcing of the regional and international cooperation in the domain of the energy / environment
- ✓ The new mechanisms of development and financing .
- ✓ Arrangements and different agreement stakes and conventions bound to the environment

IV- Studies and projects

CIEDE participates in many projects and studies in the framework of many national and international cooperation partnerships. Examples of such cooperation:
-With the World Bank/PCF: Projects and negotiations under the club of the host countries of the Prototype Carbon Fund –PCF. Wind Park of 200Mw project, waste treatment by biomethanisation project.

- ✓ -With the Agency of the Energy Efficiency of Canada: Development of a national system of information on the energy and environment situation of Morocco.

- ✓ -With ADEME: The agency of Development, of the Restraint of the energy and the environment showed to the CIEDE its disposition of support in the information projects, in sensitisation and formation concerning domains of the energy and the environment.

- ✓ -With the German Technical Cooperation- GTZ: Study on Clean Development Mechanisms, CDM, for projects of renewable energies and energy efficiency: wind Park of 200 MW, energy Valorisation of the Solid Waste of Marrakech, hydroelectric power station of El Borj in Khénifra of 20 MW, and Biométhanisation of the worn-out waters of the big Wilaya of Agadir.

CIEDE organized many national meetings concerning the environment, for examples:

- ✓ The National Council of the Water and the Climate, 21 - 22 June 2001, Agadir.
- ✓ The National Council of the Environment, 15 - 17 July 2001, Rabat
- ✓ National Workshop on program planning "Renewable energies" for a Sustainable Economic and social Development, ENIM, 25 - 28 June 2001, Rabat.
- ✓ A Study day on " Morocco face to global Changes ", CEREC, FLSH Ben M'sik, September 27, 2001, Casablanca

CIEDE participated in many international meetings like:

- ✓ Informal governmental meeting on the climate change negotiations, 27-28 June 2001,
- ✓ COP7, October 29 - November 09, 2001, Marrakech, Morocco
- ✓ 1st Session PREPCOM of the Summit RIO+10 (CSD-10) New York, April 30 to May 02, 2001.
- ✓ 2nd Session PREPCOM of the Summit RIO+10, New York, January 28 to February 08, 2002.
- ✓ 3rd Session PREPCOM of the Summit RIO+10, from May 27 to June 07, 2002, Bali Indonesia.
- ✓ Preparatory meeting under regional of the world summit 2002 on the Sustainable Development Region North Africa, from 05 to 07 September 2001, Tunis, Tunisia.

- ✓ Regional preparatory Reunion of the world summit on 2002 - Africa Region, 15 - 18 October 2001, Nairobi, Kenya.

CIEDE published many information bulletins and technical documents:

- ✓ Executive Summary: CDM Project Assessment Process
- ✓ Creating a National Program for the Carbon Market.
- ✓ Emerging Carbon Markets and Climate Change Projects.
- ✓ Measuring & Monitoring Carbon Benefits for Forest-Based Projects: Experience From Pilot Projects.
- ✓ Land Use and Forestry Projects Technical Issues and Data Needs.

- ✓ Dr. Harlan L. Watson, Senior Climate Negotiator and Special Representative U.S. Department of State. Remarks to the Workshop on Sustainable Climate Change Projects. Rabat, Morocco, October 12, 2001
- ✓ Workshop PrepCop-7 CIEDE/DE-DOE/USA on sustainable energy projects, Morocco, Rabat 11-12 October 2001

CONCLUSIONS

The present document exhibits in its first part the aims and benefits of some collaborative structures. All these structures are aiming at the creation of platforms offering assistance to small and medium enterprises in different scientific, technical and managerial disciplines. Most of these structures were and still very active in the field of high technology. Although only few of them are dealing with environmental issues, it would provide an appropriate platform for the development of these interdisciplinary structures that are considered as an effective institutional set up for the sustainable implementation of the SAP.

Many success stories can be found in many countries worldwide. The oldest Technopole may be it is the French one (Sophia Antipolis), and the newest may be is the Greek (The Thessaloniki) .

In the second Part of this report, we tried to make a detailed description of some centers existing in the Mediterranean countries. Those of Spain and Croatia are focused in well-defined and precise task (not tasks). The Tunisian and Moroccan centers have a wider task(s), where they cannot, in our opinion, tackle all problems that their reciprocal countries facing, despite all good efforts they are deploying, therefore they are considered as important platforms for the development of new structure. The creation of national and regional technopoles is certainly valuable for the implementation of the SAP. Also the formula of technological incubator is very adequate and helpful, especially for small and medium size companies and municipalities.

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[7] METAP is a program, sponsored by the World Bank, the UNDP, the EIB, and the EU, designed to provide technical assistance for the developing countries of the Mediterranean region.

[8] THE MEDITERRANEAN ACTION PLAN
The Action plan for the protection and Development of the Mediterranean (MAP) strives to protect and improve the environment and to foster development in the region, based on the sustainability principles. 16 Mediterranean States and the EC, under the auspices of the United Nations Environment Program (UNEP), adopted it in 1975. Its legal framework comprises the Barcelona Convention adopted in 1976 and revised in 1995, and six Protocols to ensure its application, covering specific aspects of environmental protection. MAP covers aspects such as coastal zone management, pollution assessment and control, protection of ecosystems and preservation of bio-diversity
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