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INTERNATIONAL CENTRE FOR SCIENCE AND HIGH TECHNOLOGY

In co-operation with the

Foundation for African Development through International Development (FADIB)

FINAL REPORT

Workshop on

Environmental Pollution and the Applicability of Remediation Technologies in African Countries

Zodiac Hotels, Enugu, Nigeria
16-19 July, 2001

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

PLEASE BE AWARE THAT
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BACKGROUND

As a result of domestic and industrial activity, the environment has become contaminated with pollutants, in varying degrees, the world over. Sometimes these pollutants have adverse effects on human health and economic activity. Awareness of the dangers of pollution and of the methods of decontaminating polluted environments is therefore of the matters to be addressed by countries around the globe, in both industrialised and developing countries.

In recent years several remediation technologies have been developed for the decontamination of polluted sites and many of them have been proved to be very promising to clean up contaminated water and soils.

Bio-remediation is a very effective and widely applied clean-up technology. In this technology, naturally occurring micro-organisms, or mutants of naturally occurring organisms or genetically organisms are used to degrade hazardous, toxic or merely offensive pollutants. In situ bio-remediation is applied to clean-up sites contaminated by a wide range of compounds, such as pesticides, industrial chemicals, crude petroleum, gasoline and many components of crude oil. It has also the important capability of being used to degrade compounds that were once believed to be recalcitrant, such as chlorinated solvents, PCBs, chlorofluorocarbons and other stable compounds. It can therefore be stated that most organic compounds, both natural and synthesized, can be degraded by micro-organisms, either through direct use or through co-metabolic processes.

Another environmentally friendly remediation technology, which is only recently emerging, is phyto-remediation. Particular species of plants can be used to clean up contaminated sites through direct destruction of organic pollutants, indirect degradation by the support of microbial communities or by taking up inorganic contaminants from soil or water and concentrating them in the plant tissues or roots. This method, although still in the experimental stage, is likely to become a promising environmental clean-up approach in selected applications.

In conclusion, bio-remediation technologies, in combination with physical, chemical and

thermal methods, are an important way of approaching the problems of decontamination of polluted sites; research and development efforts are extending their applicability and it is expected that there will be an increase use of these technologies for the restoration of contaminated soils and waters, leading, especially in developing countries, to a very promising industrial market development in this field.

The International Centre for Science and High Technology (ICS), within the area of Pure and Applied Chemistry, with the aim of addressing the pollution problems in developing and in transition countries and improving their capacity building in environmental issues is presently carrying out a subprogramme on Remediation. To this end, a workshop on "Environmental Pollution and the Applicability of Remediation Techniques in Soil and Water in African Countries", has been held from 16 –19 July, 2001 at Zodiac Hotels, Enugu, Nigeria.

JUSTIFICATION

The continent has scattered in it various industries including crude petroleum production, petroleum refining, chemical industries such as paint manufacturing, pharmaceutical industries, food industries of various sorts, including food processing and breweries. All these industries release materials to the environment which in some cases could create health hazards. In other cases such in oil spills common in countries such as Nigeria, Angola and Cameroon, spills can render soil unsuitable for agriculture or water unsuitable for drinking.

In these cases of damage to the environment by materials from industrial activity, remediation technologies can repair the damage and restore the soil or body of water to its original state.

These remediation technologies are unfortunately not well known in Africa. In view of this, there is need to create an awareness of these technologies through the education of persons in industry, the academia, government and the public at large. Owing to the current situation in Africa, there is an urgent need to create an indigenous cadre of experts in remediation technology on the continent. These trained professionals will have responsibility of spreading

knowledge of the field to other professionals and also of educating the public.

These are the concerns which have informed the decision of the ICS in promoting the application of remediation technologies in developing countries and contributing to the creation of the said cadre of local experts in remediation technologies on the continent of Africa.

The Workshop on "Environmental Pollution and the Applicability of Remediation Technologies to Soil and Water in Africa" tried to address environmental problems on the continent and provide an updated review of modern remediation and their possible applications in Africa. The Workshop also tried to focus on the proper local policy for pollution prevention and control, and, in general, for an environmental friendly industrial development.

Hopefully the workshop will be useful for the industrial sectors, who were represented, as it represents an opportunity for them to become acquainted with up-to date remediation techniques and control of pollution. Government authorities were represented and it is hoped they learnt new methods for the implementation of projects for the remediation of polluted soils and waters.

The workshop was hosted by the Foundation for African Development through International Development (FADIB), a non-profit, non-governmental organisation founded in 1992 to work for the development of the African through the exploitation of biotechnology and other sciences. It carries out its mandate through training young African scientists in workshops, organising conferences, doing research, and carrying out general public education. Its membership is open to any one any where in the world interested in promoting African development through the exploitation of biotechnology, including genetic engineering and other sciences. FADIB has members in more than twenty-four African countries and ten non-African countries, including the USA, UK, France, Belgium, Australia, Israel, Germany, etc. It belongs to the International Union of Microbiological Societies (IUMS), the World Association of Industrial and Technological Associations (WAITRO), and the Third World Network of Scientific Organisations publishing It has organised about twelve workshops and conferences and published numerous proceedings. FADIB had in 1994 under the sponsorship of the United Nations Environmental Programme (UNEP) organised a workshop similar to the one to be sponsored by the ICS in July 2001.

The local organiser of the workshop was Prof Nduka Okafor, who founded FADIB and is its President.

OBJECTIVES

The objectives of the workshop were to:

1 to provide the participants from the region with updated knowledge on modern technologies for the abatement of contaminants, waste management and the remediation of polluted sites, with particular reference to the African continent; and thus

2 to develop local expertise which will adapt these technologies to suit local conditions;

3 to stimulate international research and technology transfer and enhance international co-operation through possible joint or follow-up projects and feasibility studies between the ICS and suitably qualified African R&D centres identified as a result of the workshop.

OUTPUTS

The expected outputs of the workshop were:

1 Scientists who attend the workshop will be updated on recent developments on the technologies of pollution abatement and remediation;

2 Attendees at the workshop will be exposed to modern and up-to-date pollution assessment and remediation technologies as well as on the strategies for selecting the appropriate methodologies for working in the specific regulatory framework of each country of the region;

3 The workshop will afford an opportunity for the identification of industries/institutions capable of collaborating in order to establish an international network for the diffusion of knowledge and awareness in remediation, and for carrying projects in remediation.

PROGRAMME AND TOPICS

Participants

A total of 38 persons attended the workshop: 5 international lectures, five local lecturers from the country, 13 participants from various parts of Africa, and 15 participants from the country. The countries present were Benin Republic, Ghana, Kenya, Senegal Sudan, and Nigeria. Participants came from the academia, government, and industry. The list of participants and resource persons is attached as Annex 1

Programme

The workshop programme is attached as Annex 2 and was structured thus:

Environmental Pollution: General Aspects

- Pollutants' sources, hazard and fate in the environment.

Regulatory Aspects

- Norms and regulations for safety setting, decontamination and environmental recovery of contaminated sites.
- Regulatory Framework for soil or waste resources protection.

Site Characterization: Investigation Tools And Strategies

- Site characterization and investigation techniques/methodologies.

Risk Analysis

- Risk analysis criteria and methods.
- Environmental risk analysis: Applications and Case Studies.

Remediation Techniques

- Established biological, physico-chemical, thermal remediation technologies: applicability, advantages, limitations.
- Innovative remediation technologies.

Country And Institutional Reports

- Recognition and definition of local environmental problems in African countries: the situation of dismantled industrial areas, agricultural land contamination and water resources contamination in the interested Countries of the Region.
- Remediation regulatory framework.
- Remediation interventions: ongoing and in-preparation projects

Follow-Up Activities

- Identification of possible common initiatives/projects and relevant financial resources

WORKING GROUPS

The meeting split into the following three working groups:

1 **Education and Training**

2 **Assessment of the Applicability of Novel Technology**

3 **Inventories of Contaminated Sites and Networking**

Each group contained some of the resource persons. At the end of the group deliberations, the entire workshop discussed the materials which the groups presented and adopted them as the recommendations of the workshop.

CONCLUSIONS

The conclusions emerging from the workshop are as follows:

1 There is a general need to carry out environmental education of the general public, at all levels and to involve the media in the process of this education.
2 There is need for better enforcement of what environmental regulations exist
3 Apart from physical environmental pollution, noise pollution seems a matter of concerní in many of the African countries present at the workshop
4 Proper waste management appears to be an area of concern in the African countries at the workshop.
5 The use of obsolete pesticides and the proper use of current ones was a point of major agreement.
6 Phytoremediation appears to be a cost-effective method of remediation which can adopted , where warranted, in African countries.

RECOMMENDATIONS

The recommendations of the workshop are in the form of proposed action, that is, in the form of four proposals for which funding will be cnvassed:

1 A Proposal on Education and Training in Proper Water and Soil Management

This proposal aims at educating the general public at the local government level, and involving government officials, universities, NGOs, and the media. The focus of the campaign will be on the proper use of water and soil with emphasis and the impact on health of their mismanagement.

The details of the proposal are attached as Annex 3.

2 A Proposal to study the Use of Phytoremediation as an Environmental Remediation Tool in various Ecological Zones of Africa.

The aims of the proposed study are to:

1 study phytoremediation with a view to determining the plants which can best remediate heavy metals such as lead and/or organic compounds such as obsolete pesticides

2 determine to what extent the plants and methods adopted in one zone are applicable to others

3 create a network of scientists in the six countries participating in the workshop with a view to determining the most appropriate plants for carrying out phytoremediation in the various ecological zones of the six countries, Benin, Ghana, Senegal, Nigeria (Tropical Forest zone), Kenya (Mountain zone) and Sudan (grassland zone), and

4 serve as means of training young African scientists in the field of phytoremediation ad other remediation procedures.

The details are attached as Annex 4.

3 The formation of an Africa-wide Environmental Non-Governmental Organization.

The NGO adopted the name African Environmental Pollution Prevention Organization (AEPPO). It has members drawn from all six African countries represented at the meeting: Benin Republic, Ghana, Kenya, Senegal Sudan, and Nigeria.

Its aims and objectives are as follows:

1 Creating awareness and consciousness of environmental issues at all levels of the population in African countries

2 Fostering education and training of young African scientists in environmental pollution

3 Carrying out projects on the proper remediation of polluted environments in Africa

More details on the NGO are attached as Annex 5. A proposal made by the organiztion is attached as Annex 5 A.

4 A Proposal on Education and Networking Concerning the Proper Use of Agro-Chemicals

The objectives of this proposal are to:

1 educate users of agrochemicals on their proper use
2 identify storage sites and work out effective waste management technologies for particular polluted sites
3 awaken the consiousness of the general populace on agrochemicals and environmental issues in general
4 encourage the training of high level manpower in environmental matters

The details of the proposal are as Annex 6.

Acknowledgements

FADIB would like to thank the ICS and UNIDO for affording it the chance to collaborate with them in organizing this important workshop.

Thanks go to the international resource persons who in spite of their busy schedules found time to come to Nigeria to participate in the workshop. The participants at various opportunities have expressed their delight not only about how knowlegeable the resource persons were, but how so easily approachable and friendly they were.

The participants, especially those from outside Nigeria, and their Nigerian counterparts also deserve thanks.

On the part of FADIB Dr Christopher Ibenegbu worked round the clock to see that every thing went well, and he was ably assisted by Dr Chidi Okeke. They deserve our thanks.

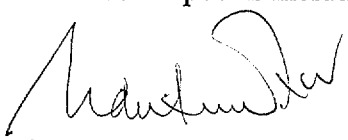
I would like to thank Prof. Stanislav Miel tus Area Coordinador of the ICS, whose warm cooperation very early in the discussion of the project made the workshop possible at all. Finally our thanks go to the indefatigable Dr Andrea Lodolo, ICS Coordiantor, who seemed always to come up with the right answers when things did not always initially work out the way they should.

Attachments

1 Workshop Programme

2 List of persons attending the workshop

3 Five Proposals including one from the new NGO attached as Annexes 3, 4, 5, 5 A and 6.



Prof Nduka Okafor,

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ANNEX 1

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A nonprofit non-governmental Organization

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July 18, 2001

FADIB/ICS-UNIDO WORKSHOP
on
Environmental Pollution and the Applicability of Remediation Technologies in African Countries

Zodiac Hotels, Enugu, Nigeria, 16 – 19 July, 2001

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ANNEX 2

FADIB/ICS-UNIDO Workshop
on

Environmental Pollution and the Applicability of Remediation Technologies in African Countries

Zodiac Hotels, Enugu, Nigeria, 16 – 19 July, 2001

PROGRAMME

Sunday, 15 July 2001

Arrival of Participants

Monday, 16 July 2001

8:00 - 9:00 Registration

Opening session

(Chairperson: Deputy Vice Chancellor, University of Nigeria, Enugu, Campus, Enugu)

9:00-9:30 Welcome: Introductions and group photograph

9.30 -10:00 ICS-UNIDO Mandate, Strategy and Activities.
ICS-UNIDO Initiatives within the Remediation Sub-programme.
Presentation of the workshop.
(Dr. Andrea Lodolo, ICS-UNIDO, Italy)

10:00 -10:30 *Coffee Break*

Session One

Environmental Pollution Assessment: Methodologies, Tools and Strategies

(Chairperson: Dr. Amar Chaudri, U.K.)

10:30 -11:00 The Environment and the Concept of Pollution, with particular reference to Africa
(Prof. Nduka Okafor, President, FADIB)

11:00 -11:30 Site Characterisation
(Prof. Bill Stigliani, USA)

11:30 -12:00 Methods for Assessing Contaminants in Soil and Water.
(Dr. Daniel Akwae Okae-Anti, Ghana)

12:00 -12:30 Risk analysis and decision support tools.
(Prof. Bill Stigliani, USA)

12:30 -13:00 Risk Analysis: Human Health and Environmental Assessment Criteria.
(Dr Joshua Danso Owusu-Sekyere, Ghana)

13:00 -14:30 *Lunch*

Session Two

Remediation Technologies and their Applications I

(Chairman: Dr. John Vijgen, Denmark)

14:30 -15:30	Physico-Chemical Remediation Technologies *(Prof. Bill Stigliani, USA)*
15:30 -16:00	Blue Nile Water Pollution by Different Industrial Effluents *Ibtisam I. Mekki, *Hassan B. El Amin and **Hamid A. Dirar *(Dr Ibtisam Mekki)*
16:00 -16:30	*Coffee Break*
16:30 -17:00	Remediation Technologies for Soil and Groundwater Cleanup *(Prof. Ed Brown, USA)*

Tuesday, 17 July, 2001

Session Three

Remediation Technologies and their Applications II

(Chairman: Prof Ed Brown, USA)

09:00 -10:00	Biological Remediation Technologies *(Dr. Amar Chaudri, U.K.)*
10:00 -11:00	Phytoremediation: an Emerging Technology for H.M. Contaminated Sites and its Applicability in the African Region *(Dr. Amar Chaudri, U.K.)*
11:00 -11:30	*Coffee Break*
11:30 -12:30	Pesticides Contamination: an International Problem *(Dr. John Vijgen, Denmark)*
12:30 -13:30	Techniques for Pesticides Decontamination and Destruction (incl. video pres.) *(Dr. John Vijgen, Denmark)*
13:30 -14:30	*Lunch*
14:30 -15:00	Protecting Water and Soil Resources on Farms: a Novel Method for the Disposal of Pesticides *(Dr. Virginia Kimani, Kenya)*
15:00 -15:30	Treatment of Brewery Wastes *(Dr. Mrs Edna Chukwura, Nigeria)*
15:30 -18:00	Excursion to Science Equipment Manufacturing Institute

Wednesday, 18 July, 2001.

Session Four

Remediation Technologies and their Applications III

(Chairperson: Dr. Virginia Kimani, Kenya)

09:00 -10:00	Remediation of Oil Spill Sites (Including the Case and Lesson of Exxon Valdez) *(Prof. Ed Brown, USA)*
10:00 -11:00	TDG-EA' s Approaches and Technology Development To Reduce Causes Effects Of Agricultural Pollution *(Dr Anthony Njurai, Kenya)*
11:00 -11:30	*Coffee Break*
11:30 -12:00	Pollution and Remediation Technologies Related to Solid Minerals *(Prof. Ed Brown, USA)*

Session Five

Policies & Initiatives for Environmental Protection and Recovery

(Chairman: Dr Bill Stigliani, USA)

12:00 -13:00	International Networks on Contaminated Land *(Dr. Urs Ziegler, Switzerland)*
13:30 -14:30	Lunch
14:30 -15:00	How to Establish a Register of Contaminated Sites *(Dr. Urs Ziegler, Switzerland)*
15:00 -15:30	Policy Regarding Soil and Water Pollution in Nigeria *(Staff of Ministry of Environment, Abuja, Nigeria)*
15:30 -16:00	*Coffee Break*

Session Six

Country & Institutional Reports

(Chairman: Dr Joshua D Owusu-Sekyere, Ghana)

16:00 -17:00 Country/Organization Reports: *(15 min. each))*
Main topics to be dealt with:

- Topical Environmental Pollution Problems in the Country
- Environmental Regulatory Framework and Technological Background
- On-going and Planned Remediation Initiatives.

Benin

Ghana

Kenya

Nigeria

Country report I : General perspectives
Country report II: The Oil Industry and the Niger Delta Area of Nigeria

Senegal

Sudan

Thursday, 19, July, 2001.

Session Seven

Follow-up Activities & Common Initiatives

(Chairman: Dr Andrea Lodolo, Italy)

09:00 -10:30 Panel: Identification of Common African Problems and Possible Solutions/ Working Groups: Identification of possible common initiatives/projects.

10:30 -11:00 Coffee Break

11:00 -11:30 Plenary presentation and discussion of project proposals/follow-up initiatives/ Working Groups: Identification of possible common initiatives/projects

11:30 -13:00 Recommendations and Conclusions of the Workshop

Friday, 20 July, 2001

Departure

Annex 3

A Proposal on Education and Training in Proper Environmental Management, including Water and Soil Management

Introduction

This proposal aims at educating the general public at the local government level, and involving government officials, universities, NGOs, and the media. The focus of the campaign will be on the proper use of water and soil with emphasis on the impact on health of their mismanagement.

Objectives

The objectives of the proposal are

a) create an awareness of the value of proper environmental management in general and of wastes, soil, and water in particular
b) to enhance the hygiene and quality of life of urban and rural dwellers in the six countries targeted in the proposal, namely Benin, Ghana, Kenya, Senegal, Sudan and Nigeria through the activity mentioned in a) above.
c) To help to find solutions to some of the prevalent environmental problems in the six countries

Contents

Waste management

-Rural
-Urban
* Organize collection
* Organize disposal
* Hygienic aspects
* Prevention

Water and soil management

-Rural
-Urban
* Sources of water and soil contamination
* Access to clean water
* Hygienic aspects
* Prevention/Spillage water

Tools

* Proper teaching material
* Train how to use teaching material

* Networking - access to new developments in this field
* Demonstration e.g. monitoring laboratory equipment
* Training on the job
* Initiate /formation of Environmental Cleaning Clubs (ECCs)

Procedure and Time-frame

-*Short term*:

1 organize a workshop for trainers from the six countries in a chosen country, about two trainers per country within first six months of the receipt of a grant;

2 next step country based workshop with 20-30 teachers form all regions depending on size of country

-*Long term*: Evaluation of short term actions and reporting back/yearly state of the art

Expected outputs (seed placing)

1. Participants have basic awareness on environmental management and can spread the message
2. Formation of Environmental Cleaning Clubs (ECCs)
3. Basis for future implementation of waste and water management plants
4. Adoption of better waste/water management behaviour

Budget

-1 year: 6 country course

Travels and accommodation US Dollar:	10.000
Development course material	10.000
Total year 1	20.000

-2nd year budget per country: 20 -30 teachers per country

-Accommodation plus travel 25.000 US Dollar per country

Partners

6 countries
National agencies/local agencies
IGOs/NGOs
Industry

Available support

Government agencies
Philanthropies

Annex 4

A Proposal to Start a Network of Scientists to study the Use of Phytoremediation as an Environmental Remediation Tool in various Ecological Zones of Africa.

Introduction:

Phytoremediation, the use of plants to remediate polluted soils is a relatively new and cost-effective means of cleaning up polluted soils. It has not been used much in Africa as can be seen. However Africa seems a fertile continent to exploit this remediation technology because unlike Europe and North America the warm climate permits the year-round growth of plants. Studies show that heavy metals such as lead are found in ordinary environments in Africa. Where the pollution is heavy phytoremediation could be a useful tool. For example agricultural fields heavily polluted with obsolete pesticides could be good candidates for remediation with plants. Yet as far is known, no studies have been done in Africa to see which plants could be suitable in the various ecological zones of Africa

Objective of the study

The aims of the study are to:

1 study phytoremediation with a view to determining the plants which can best remediate heavy metals such as lead or organic compounds such as obsolete pesticides

2 determine to what extent the plants and methods adopted in one zone are applicable to others

3 create a network of scientists in the six countries participating in the workshop with a view to determining the most appropriate plants for carrying out phytoremediation in the various ecological zones of the six countries, Benin, Ghana, Senegal, Nigeria (Tropical Forest zone), Kenya (Mountain zone) and Sudan (grassland zone), and

4 serve as means of training young African Scientists in the entire field of phytoremediation

Procedure:

1 carry out laboratory studies of selected common rapidly growing plants in each zone preferably regarded as weeds to see

2 to which extent they absorb heavy metals and obsolete pesticides by

- analysis of the soil before and after plant growth
- analysis of various plant part or accumulation of the target materials
-

Time-Scale: two years; first years, preliminary experiments; second year, confirmed

Budget: $12,000, per year for two years at the rate of $2000 per year per country or some ratio which takes account of the size of the country; total for project, **$24,000**

Possible partners: UNEP, FAO, UNIDO

Annex 5

FORMATION OF AN AFRICAN NON-GOVERNMENTAL ORGANISATION: AFRICAN ENVIRONMENTAL POLLUTION PREVENTION ORGANISATION (AEPPO)

The meeting started immediately after the FADIB workshop on Environmental Pollution and remediation Technology in Africa, Wednesday 18th July 2001.

It was convened by Rev. F. E. Oronsage, with number of scientists from different African Countries present. A name was proposed for the organisation and we agreed that the name shall be African Envirobmental Pollution Prevention Organisation (AEPPO).

Proterm Officers were niminated:

President	=	Rev. F. E. Oronsage
Secretary	=	Okeke Chidi
Tresurer	=	Anyamene Chris
PRO	=	Adedayo A. Adewumi

It was agreed that members wil be drawn from all over Africa and that participants from other African countries present during the FADIB workshop will be the cordinators for their various countries. They are also to furnish the protern executives with their address and e.mail for proper cordination.

Cordinators were appointed for the various regions. We agreed to go on membership drive. Every members to inform people from his or her zone on the benefits of the proposed organisation. Members are expected to have an e.mail address for easy and fast communication. We also agreed that a committee be set up to over see the registration of the organisation at the coperate affairs

commission but that will be after consultations with Prof. Nduka Okafor.

AIMS AND OBJECTIVES:

(1) Environmental awareness and consciousness among the population at all levels.

(2) Education and training on pollutants]to encourage young scientists to major in environmental pollution prevention studies.

(3) Remediation and intervention

METHODOLOGY

1) Organising seminars, workshop, lectures, conferences and campaings.

2) Research work on pollution in Africa.

3) Collection and dissemination of data on pollutants of pollution sites in the countries.

4) Publication of research finding in jounals, bulletin etc.

5) Liason and collaborating with other NGOs and government parastatals, Ministry of Environment, Ministry of Health, Ministry of Science and Technology, Local Government Organisation and International Bodies with similar objectives.

On financial obligation of members, we agreed to pay a minimum sum of N200 each and a registration fee of N1000 each and they include:

Zonal coordinators elected to represent various regions of Nigeria Include:

A. A. Bakare	-	South West
Mrs. Lucy Nwuba	-	South East
Adedayo Adewumi	-	North
A. G. Atpheus	-	South South

Cordinators from other African countries include:

Anthony Njogu Njurai (Kenya)

Kodazounde Jacques (Benin Republic)

We also agreed to meet at UNEC guest house to put up a proposal to be presented today (19/7/2001).

We agreed to have a general meeting on 6th September 2001 at Mela motel, uwagboe Street, Off Ugbowo Lagos Road, Opposite Ohonba Line.

The meeting was adjourned to Thursday with a short prayer said by Rev. F. E. Oronsage.

ENVIRONMENTAL POLLUTION PREVENTION ORGANISATION (EPPO) AN NGO MEMBERSHIP LIST.

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Annex 5 A

PROPOSAL ON ADAPTABLE WASTE MANAGEMENT TECHNIQUES IN AFRICA

Background/Justification

In Africa, waste disposal continues to be a serious environmental problem. Population explosion, industrialisation and poorly controlled urbanisation have been suggested as being responsbile for the high waste generation rates and quantities in the continent. The waste management techniques in the continent are grossly ineffective, thereby leading to the continous accumulation of waste in the environment. Thus, the ecosystem is affected as air, waste surface and underground and soil become contaminated. This is of great consequence to Man as health problems are posed. In view of the above, waste management techniques become imperative. The initiative involves participanting contries, which are Nigeria, Ghana, Kenya, Senegal, Benin and Sudan.

OBJECTIVES

- To evolve effective waste management
- To make the environment more safe and friendly for sustainable life
- To complement the efforts of standard environmental bodies in Nigeria
- To train high-level manpower
- To awaken consciousness of people on environmental issues.

CONTENT:

1) Microbial degradation of pesticides
2) Sorting of wastes
3) Waste to wealth technology
4) Microbial degradation of crude oil
5) Training of personnel.

TOOLS:

Analytical Instruments

TIME FRAME: 24 Months

EXPECTED OUTPUT:

1) Evolvement of appropriate technology for waste management
2) Ensure environment rid of wastes.
3) Bioremediation of polluted sites
4) Man-power capacity building.

BUDGET:

Consumables	$30,000
Staff/Personnel	$100,000
Equipment	$250,000
Transportation	$50,000
Field assistance	$50,000
Secreaterial work	$15,000
Correspondences	$2,000
Miscellaneous	$10,000
	$507,000

PARTNERS:

(1)	ICS – UNIDO	(2)	Ford Foundation
(3)	UNICEF	(4)	UNDP
(5)	UNEP	(6)	Fed Min. of Environment
(7)	Fed. Min. of Sience & Tech.	(8)	FAO

(9) ICGEB
(10) TWAS
(11) British Council
(12) NSERC
(13) AU
(14) FADIB
(15 Fed. Min. of Health

POSSIBLE AVAILABLE SUPPORT:

About ₦200,000 to be sourced from within, laboratories for research work are on ground.

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Annex 6

A Proposal on Education and Networking Concerning the Proper Use of Agro-Chemicals

Background
Unqualified use of agrochemicals leads to health problems of the rural population

Justification
Increased health of rural population

Objectives
-Education of users of agrochemicals
-Control of the use of agrochemicals
-Communication of problems related to the use of agrochemicals

Contents
Inventories of agrochemicals: storage areas, production places, types of products used, health problems related to the use of agrochemicals

Expected outputs
-Database (ev. on Internet)
-Information publications
-Training of extension officers
-Information/communication network across national borders

Time-frame
Phase 1) 2 - 3 years: data collection
Phase 2) 2 - 3 years: risk assessment, education, training, communication
Phase 3) Workshops: follow-ups, international exchange of information

Tentative budget
6 Mio USD, project can be divided into 2 phases

Partners
Nigeria, Ghana, Kenya, Sudan, Benin, Senegal
a) Universities and research institutes and other relevant agencies, FADIB, governments,
b) FAO, Int. pesticide association

Contributions from partners (in-kind support)
Workforce of university/research partners, existing infrastructure in institutes