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Centre for Environmental Hazard Mitigation,
Cairo University, Giza, Egypt.

Final report

Workshop
on
Remediation Technologies: Applicability and Economic Viability in Northern Africa and the Middle East

Giza, Egypt
24-28 October, 1999

UNIDO Project No. TF/GLO/96/105
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Content

Title: Workshop on Remediation Technologies: Applicability and Economic Viability in Northern Africa and the Middle East
Dates: 24-28 October, 1999
Venue: Giza, Egypt

INTRODUCTION AND BACKGROUD:

The contents of the workshop dealt with several topics related to the general problem of domestic and industrial waste remediation and management concerning the solids, liquids and gaseous wastes in the highly urbanized areas in North Africa and the Middle East as well as topics related to Remediation technologies applicable to the cleaning of polluted soils and waters. The workshop based on lectures, exercises, case studies, visits recognition and presentation of the main environmental problems of the region.

One of the most urgent problems to be faced at a global level is the decontamination of soil and waters due to domestic and industrial activities. Large polluted areas besides having lost their eco-functionality often represent a serious risk for human health. The policy for the restoration of natural resources is thus a priority in developing as well as in industrialized countries.

In the last 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. This technology is able to degrade hazardous, toxic or merely offensive pollutants by means of the enhancement of naturally occurring microorganisms or the selection and amplification of specialized metabolic capabilities. In situ bioremediation is indicated to clean-up sites contaminated by a wide range of compounds, such as pesticides, industrial chemicals, gasoline and many components of crude oil. It has also the important capability 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 microorganisms, either through direct use or through co-metabolic processes.

Another environmentally friendly remediation technology, which is only recently emerging, is phytoremediation. Particular species of plants can be used to clean up contaminated sites through different mechanisms: direct destruction of organic pollutants, indirect degradation by the support of microbial communities and by taking up inorganic contaminants from soil or water and concentrating them in the plant tissues or roots. This method, even if still more research has to be done in order to optimize it, 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 Center for Science and High Technology (ICS), within the area of Pure and Applied Chemistry, with the aim of facing the pollution problems in developing and countries with economic transition and improving their capacity building in environmental issues carried out this subprogramme on Remediation and a Workshop on "Remediation Technologies: Applicability and Economic Viability in Northern Africa and the Middle East" that has been held from 24 to 28 October 1999 in Cairo, Egypt.

Recent investigations have shown that in Egypt large areas are contaminated or damaged with consequent impoverishment of natural resources and serious effects on human health. This is partly due to the introduction and use of unclean industrial technologies with consequent heavy production of liquid and solid wastes, to the insufficiency of treatment plant facilities in the industrial and urban areas and, more in general, to an inefficient environmental strategy and management in the past years.

The introduction and implementation of new remediation technologies for the restoration of the quality of the polluted sites, the introduction of environmental friendly industrial technologies together with a proper planning and management of environmental issues seem to be the only possible policy to face these pollution problems in the Country/Region.

For these reasons there was the need of enhancing activities in this field and of helping the developing regions in particular countries like Egypt and/or other Northern Africa countries to form an indigenous class of experts/technologists who are able to act as experts in their own countries. Education and training of the greatest number of professionals towards the application of modern techniques in the art of abatement of contaminants and remediation of polluted sites is an urgent requirement. These trained professionals will have to embrace the responsibility of transmitting the acquired knowledge to other professionals and to the public in general.

With the international co-operation and the correspondent support, ICS is therefore promoting development and application of remediation technologies in developing countries and contributing with adequate programmes for local experts.

The Workshop on "Remediation Technologies: Applicability and Economic Viability in Northern Africa and the Middle East" aimed to face this environmental problems giving an up dated review on remediation technologies and their applications. The Workshop aimed also at focusing on the proper local policy for pollution prevention and control, and in general for an environmental friendly industrial development.

It has been useful for the Industry of the Region as it represents an opportunity for the regional and local industrialists to contact with up-to-date techniques devoted to remediation and control of pollution. It has been also useful for regional and local Authorities dealing with environmental matters and for the development and the implementation of projects for remediation of polluted soils and waters.

The workshop was hosted by the CEHM, at Cairo University. The Center for Environmental Hazard Mitigation (CEHM) was established to protect Egypt's environment and develop its natural resources. The center seeks to develop the expertise and capabilities of Egyptian scientists in the fields of environmental management and hazard assessment to meet the challenges of the next decades. The CEHM is located at Cairo University, Giza, Egypt.

The CEHM hosts the following facilities:
Information and data analysis laboratory for computation, image processing, database and geographical information system (GIS) applications.
Chemical laboratories for assessment of the chemical characteristics of water, air, soil and biota.
Air monitoring laboratory and associated meteorological station.
Geophysical laboratory to monitor seismic activity.

Sources of funding for the CEHM projects come from the United States Department of Agriculture (USDA) and the Egyptian Ministry of International Cooperation.

OBJECTIVES

Provide the participants from the region with updated knowledge on modern technologies for abatement of contaminants and remediation of polluted sites, envisaging its application in Northern Africa countries in order to strengthen the national expertise in mastering, using and further developing remediation technologies for local applications and adaptations;

Review, assess and collect the latest information on the methodologies for assessment of environmental pollution, waste management and remediation technologies;

Stimulate international research and technology transfer and enhance international co-operation through possible joint or follow-up projects and feasibility studies by identifying regional R&D Centers in developing countries through contacts established with the participants of the workshop, thus giving ICS the possibility of identifying qualified and academic centers for future joint ventures for the development of remediation technologies and their applications.

ORGANIZATION

The workshop was jointly organised by the International Centre for Science and High Technology (ICS) and the Centre of Environmental Hazard Mitigation, Cairo University, Giza, Egypt.

The members of the Organising Committee and scientific board:

1. Dr. Andrea Lodolo, ICS-UNIDO Ass. Area Coordinator, Pure and Applied Chemistry, Trieste - Italy.

2. Dr. M. El Zarka, Local Organizer,
   Director General Environmental development,
   Social fund for development, cabinet of ministers

3. Prof. Dr. Yehia Abdel Hady, Director, CEHM, Cairo University.

4. Dr. Adel ElFouly, Workshop Coordinator, CEHM, Cairo University.

The organizers provided the facilities and the necessities for the holding of the workshop. The organizers invited lecturers, institutional representatives and industry representatives from Egypt, Jordan, Lebanon, Bahrain, Oman, Yemen, Nigeria.

The Chairmen of the scientific sections of the Workshop were: Dr. Andrea Lodolo, Dr. El Zarka, Prof. Dr. Yehia Abdel Hady, and Dr. Adel ElFouly

LECTURERS AND PARTICIPANTS:

Participants were mainly engineers, technologists, researchers, industrialists and managers involved in the problem of remediation and abatement of pollution or willing to introduce the adequate modern technologies in their countries.

Based on ICS recommendations, the organizers invited international experts coming from Germany, U.K, Austria, and Italy. The lecturers, during the workshop, provided participants with their technical reports and case studies, as well as co-chaired the roundtablediscussions regarding the three proposal preparation for risk assessment, soil and water remediations.

The local organizers sent invitations and application forms to potential representatives from industrial areas and institutions in countries of North Africa and the Middle East. In total 13 industry representatives were invited. Applicants from the industrial areas were given a preferential status in the selection of the participants.

In summary, the workshop included the following lecturers: two from Italy, one from U.K., one from Germany, one from Austria and four from Egypt The participants who attended the workshop were the following: 1 from Oman, 1 from Lebanon, 1 from Jordan, 1 from Bahrain, 1 from Nigeria, 1 from Yemen and 19 from Egypt. (see Annex 5 for the full list).

UNIDO covered all expenses for lecturers and participants. The local organizers arranged local formalities, accommodations for the participants and the meeting rooms for the workshop. The local organizers also satisfied participant's requests.

PRINTED MATERIALS DISTRIBUTION:
All documents relevant to the workshop were prepared before and during the workshop and distributed to the participants. This included the following:

•0 All documentation i.e. application forms, Aide-Memoire.
•1 Workshop programme.
•2 Written material.
•3 List of participants and lectures including position and address.

Distributed written materials during the Workshop
Handouts:

Harmonization of soil Investigation Methods for Assessing Soil Contaminants- by Prof. Dr. Konstantin Terytze
Soil Protection act, Section1, Act on protection against Harmful chugs to soil and on remediation of contaminated sites (Federal Soil Protection Act- BbodSchG) Federal Ministry for the Environment, Nature conservation and Nuclear Safety.

Bioremediation of mineral oil contaminated sites by A.P. Loibner

Risk assessment of contaminated sites in Europe – F. Quercia

Analysis of the Amsterdam Questionnaire- Final report- Report for the Dutch Ministry of Housing, Spatial Planning and Environment (VROM) May 1999

Physico-Chemical Remediation Technologies: An Overview- by Ing. Ginseppe Girolami

Country Reports:

Environmental Problems in Yemen- by Prof. Dr. Abdulla Babaqi

Soil Quality as Influenced by Irrigation and Agricultural Practices at Jordan- by Prof. Dr. T. M. Abu Sharar

Plant succession and its optimization on Tar-polluted coasts in the Arabian Gulf region. Prof. Dr. Ahmad Hegazy

Nature and Extent of Pollution of Land Resources in Central Beqa's Lebanon Mr. Ihab Jomaa

Environmental problem and the state-of-the art of remediation technologies: applicability and Economic viability in Nigeria- by L.K. Mudashiru

Chemical Pollutants in Irrigation Water and Agricultural Land in Egypt- by Dr. Mohamed Belal.

The need for an expert committee to develop a consensus risk assessment Methodology for soil contamination – by Dr. Tarik Tawfic

Environmental law and it application in Egypt – by Prof. Dr. M. El Zarka

PROGRAMME

The organizers worked out a program according to the workshop's objectives and the lecturers' schedule. There were 6 sessions regarding the topics of the workshop.

Recognition and definition of local problems. Description and evaluation of similar problems in other Northern Africa and Middle East countries.

This workshop covered petrol and petrochemical industries, toxic wastes, general organic pollutants and pesticides, legislative aspects, and a series of country and institutional reports through the following topics:.
Flowering Plant Bioremidiation of tar polluted coastal marshes
Monitoring/Assessments (ecotox) and Remediation techniques
Harmonization of Soil Investigation Methods for Assessing Soil Contaminants.
Risk Assessment of Contaminated Sites in Europe'
Physico-Chemical Remediation Technologies: an Overview
Bioremediaton Technologies
Egyptian laws and regulation, By M. El-Zarka

Country reports for Yemen.
Country report for Jordan.
Remediation research Lebanon.
Remediation research Nigeria.
The completed programme is enclosed in Annex 1.

Roundtable discussion: to produce three multinational proposals (See annex 4) on Risk assessment, water and soil remediation.

TECHNICAL VISITS

During the Workshop visits at the National Water Research Center laboratories were offered, including the analytical laboratories and sections where experiments on pollution problems are under progress.
(see Annex 1)

WORKSHOP OUTPUTS

- Technologists, researchers and workshop attendees exposed the up-to-date abatement and remediation technologies;

- Report on up-to-date pollution assessment techniques and methodologies, remediation technologies and their applications, and on strategies for selecting the adequate technologies in the specific regulatory framework of each Middle east and Northern Africa countries, that have been accomplished through series of country reports;

- suitable co-operating industries/institutions and possible common initiatives and projects in remediation, in order to establish an international network for the diffusion of knowledge and awareness in remediation, were identified

SUMMARY AND CONCLUSIONS:

Participants summarized the main issues brought out in the workshop around three topic areas through three submitted multinational proposals on risk assessment , water and soil remediation.(see annex 4)

RECOMMENDATIONS:

The participants recommended the following for ICS activities in the region.

1. Expand networking activities in the region to cover most of the institutional, academic and industrial representatives to facilitate the flow of information between parties.

2. To provide more informing and training in the area of site characterization.

3. More frequent workshop with integrated environmental approach.

4. They recommend the least time lag possible between the project proposal prepared during the workshop and the actual effective date to begin any of the successful accepted project to guarantee continuous links between all proposal parties.

FEEDBACK:

Participants completed the evaluation - by ICS. The assessments concern the organisers, duration of the programme, training facilities and others. The participants assessed the organisation as "excellent" and "very good", including information on the process, quality of scientific programme, evaluation of lectures, training room, and breaks. They rated as "excellent" and "good" the use of small working groups, case studies, announcement and pre-course material and accommodation. The participants found information of the workshop "very profitable" application in their countries. Almost of them wanted to expand discussion of methods of the waste treatment and increased the number of the participants. Participants recommended training courses, exchange of experts, demonstration of small-scale projects to be carried out in the future.

Statistics of the evaluation forms of the participants in the workshop on REMEDIATION TECHNOLOGIES: APPLICABILITY AND ECONOMIC VIABILITY IN NORTHERN AFRICA AND THE MIDDLE EAST
24 – 28 October 1999, *SAFER HOTEL, 2 EL MISAHA SQ.,DOKKI, GIZA, EGYPT*

Organization

Chart A.2. Information process:
Excellent: 53.8%, Very Good: 46.2%, Good: 0.0%, Fair: 0.0%

Chart A.3. Announcement and pre-course material
Excellent: 23%, Very Good: 38.5%, Good: 38.5%, Fair: 0.0%

Chart A.4. Quality of scientific programme:
Excellent: 30.8%, Very Good: 69.2%, Good:0.0%, Fair: 0.0%

Chart A.4.1. Applied lecture/workshop
Excellent: 23.1%, Very Good: 53.8%, Good: 23.1%, Fair: 0.0%
Chart A.4.2. Use of small working groups
Excellent: 53.8%, Very Good: 23.1%, Good: 23.1%, Fair: 0.0%

Chart A. 4.3. Case study
Excellent: 23.1%, Very Good: 30.7%, Good: 30.7%, Fair: 23.1%

Chart A.4.4. Time spent by lectures in class and after class on specific question/examples
Excellent: 30.8%, Very Good: 69.2%, Good: 0.0%, Fair: 0.0%

Chart A.4.5. Student scientific knowledge was
Balanced: 92.3%, Unbalanced: 7.7%

B. Duration of programme

Chart B.1. Number of days
Just right: 84.6%, Too long: 7.7%. Too short: 7.7%

Chart B.2. Length of working days
Just right: 76.9%, Too long: 23.1%. Too short: 0.0%

C. Training facilities and hotel

Chart C.1. Lecture/training rooms
Excellent: 38.4%, Very Good: 46.2%, Good: 15.4%, Fair: 0%

Chart C.2. Breaks/refreshments
Excellent: 46.1%, Very Good: 30.7%, Good: 15.4%, Fair: 7.6%

Chart C.3. Hotel accommodation
Excellent: 53.8%, Very Good: 46.2%, Good: 0.0%, Fair: 0.0%

Chart C.4. Meals at the hotel
Excellent: 53.8%, Very Good: 46.2%, Good: 0.0%, Fair: 0.0%

Chart D. Organizer's response to participants needs
Excellent: 69.2%, Very Good: 30.7%, Good: 7.7%, Fair: 0.0%

Chart E. Overall programme organization
Excellent: 38.5%, Very Good: 53.8%, Good: 7.7%, Fair: 0.0%

F. Would you recommend to others from your institution/ Country to attend a similar activity in the future?
Yes: 100%, May be: 0.0%, No: 0.0%

G. Evaluation of Lectures and Speakers

Chart G.1. Course material
Excellent: 69.2%, Very Good: 30.7%, Good: 0.0%, Fair: 0.0%

Chart G.2. Resident Lecture presentation
Excellent: 38.5%, Very Good: 46.2%, Good: 15.3%, Fair: 0.0%

Chart G.3. International lecture presentation
Excellent: 46.2%, Very Good: 46.2%, Good: 7.6%, Fair: 0.0%

Chart G.4. Ability of lectures to answer specific questions
Excellent: 38.4%, Very Good: 61.6%, Good: 0.0%, Fair: 0.0%

ANNEX 1

WORKSHOP AGENDA
REMEDIATION TECHNOLOGIES: APPLICABILITY AND ECONOMIC VIABILITY IN NORTHERN AFRICA AND THE MIDDLE EAST
24 – 28 October 1999

SAFER HOTEL
2 EL MISAHA SQ.,
DOKKI, GIZA,
EGYPT

Sunday, October 24, 1999	
9:00 – 10:00	Registration
10:00 – 11:00	Welcome
	Dr. M. Al-Zarka Local Organizer Director, Social Fund for Development Dr. Yehia Abdel Hady, Director, Center for Environmental Hazard Mitigation Dr. M.N. Al Helaly, President, Cairo University
11:00 – 11:30	ICS activities, strategies and remediation programs. About the philosophy of the remediation technologies workshop *Dr. A. Lodolo, ICS, Pure and applied chemistry, Italy*
11:30 - 12:00	Refreshment Break
12:00 – 12:05	Workshop Profram Design, Dr. Adel ElFouly, Workshop Coordinator.
12:00- 1:00	Flowering Plant Bioremidiation of tar polluted coastal marshes *Professor Ahmad Kamel Hegazy, Conservation and Applied Ecology, Department of BotanyœFaculty of ScienceœUniversity of Cairo*
1:00 – 2:00	Monitoring/Assessments (ecotox) and Remediation techniques *Prof. Dr. Amar Chaudri, IACR-ROTHAMSTED, UK*
2:00 – 3:00	**LUNCH**
3:00- 4:30	Roundtable Discussion committee, workshop participants and speakers *Panel 1: Pollution sources and monitoring perspectives* (see Appendix for questions
4:30- 5:00	Discussion and Conclusion
	End of Panel 1

Monday, October 25, 1999	
9:00 – 10:30	Harmonization of Soil Investigation Methods for Assessing Soil Contaminants. Prof. Dr. Konstantin Terytze, Federal Environmental Agency and Free University of Berlin,
10:30 – 12.00	Risk Assessment of Contaminated Sites in Europe Main Topics: EU and International programs on Risk Assessment/Risk Management, Scientific basis, and tools for decision making Dott.ssa Francesca Quercia, Italy.
12:00 – 12:30	Refreshment Break
	12:30 – 2:00 COUNTRY REPORT EGYPT Prof. Dr. M. Belal, Cairo University JORDAN Prof. Dr. Taleb Abou Sharar
2:00- 3:00	LUNCH
3:00 – 4:00	Continuing: Roundtable Discussion committee, workshop participants and speakers Working Group identification for 3 project proposals (see annex4) Panel 2: Remidiation Techniques and their economic viability: Panel 3: Activity description (see Appendix for questions)
4:00 – 5:00	Discussion and Conclusion
	End of Panel 2 and 3

Tuesday, October 26, 1999	
9:00 – 10:30	"Physico-Chemical Remediation Technologies: an Overview" , *Dr. Ing. Giuseppe Girolami, Italy*
10:30 – 12:00	Bioremediaton Technologies *Prof. A. P. Loibner* IFA-Tulln
12:00 – 12:30	Refreshment Break
12:30 – 2:00	COUNTRY REPORT LEBANON Eng. Ihab Jomaa YEMAN Prof. Dr. Abd Alah Saleh Babaky
2:00- 3:00	LUNCH
3:00- 4:00	Continuing Roundtable Discussion committee, workshop participants and speakers Continue: Proposal preparation Panel 4: State Regulators and Environmental Groups Perspectives Panel 5: Regulatory perspectives
4:00 – 5:00	Discussion and conclusion of Panel 4 and 5
	End of Panel 4 and 5

Wednesday, October 27, 1999

Visit:
To the central laboratory

9:00 – 10:15 Meeting outside Safer Hotel to ride the bus.

10:15 – 10:45 The need for an expert committee to develop a consensus risk assessment methodology for soil contamination
Dr.Tarik A. Tawfic, Director, Central Laboratory for Environmental Quality Monitoring, National Water Research Center.

10:45 – 12:30 Site Seeing and Discussion
1:00 – 2:30 Short Visit to the Pyramids, Giza
3:00 – 4:00 LUNCH

End of Visit

FREE AFTERNOON

Thursday, October 28, 1999

9:00- 10:30 CONTRY REPORT: Environmental Problem and the State of the Art of remediation technologies: applicabiltity and economic viability in Nigeria. L.K.Mudashiru.
10:30 –12:00 Environmental Laws and its application in Egypt
Dr. M. Al-Zarka Local Organiser Director, Social Fund for Development

12:00 – 12:30 Refreshment Break
PROJECT PROPOSAL SESSION:
2:00- 3:00 LUNCH
PROJECT PROPOSAL SESSION:

4:00 – 5:00 Discussion and conclusion

The workshop then ended and the committee began its deliberations.

ANNEX 2

In this annex abstracts of speakers' talks are represented with the most important questions that has been asked during the discussion.

Bioremediation of Mineral Oil Contaminated Soil

A. P. Loibner, IFA-Tulln, AUSTRIA

Abstract

Bioremediation techniques offer a cost efficient possibility to remediate contaminated land. In general microorganisms already present in soil are stimulated to degrade pollutants. Dependent on the chemical structure of the contaminant an appropriate electron acceptor has to be supplied. For most mineral oil spills degradation will occur under aerobic conditions by using oxygen as terminal electron acceptor. Further requirements for microbial activity are the presence of water in soil (saturation above 50 % of max. water holding capacity) and nutrients, in particular nitrogen, in an available form.

Ex-situ techniques like landfarming, biopile remediation and bioreactor systems are widely applied. They offer the possibility to achieve relatively fast remediation (several weeks to months) however at increased costs when compared to in-situ techniques.

In-situ techniques are mostly applied if soil and groundwater are contaminated, for large sites with extended volumes of polluted soil and for sites covered with buildings. These systems are cost efficient, as there is no excavation of soils necessary. However, the subsurface soil acts like a bioreactor and since the composition and thus characteristics of the underground can hardly be changed permeability of the subsurface is a major prerequisite for in-situ remediation. Moreover, the addition of amendments like nutrients and especially microorganisms for inoculation is rather difficult compared to ex-situ systems. A comprehensive site investigation is necessary in order to gather information on subsurface conditions. In general longer remediation times have to be expected for in-situ techniques. Methods applied include pump and treat systems, air sparging, natural attenuation and reactive barriers for contaminated groundwater as well as bioventing for the vadose zone. Bioventing is one of the most cost efficient remediation techniques (2 – 90 US $ per ton) available. It can be applied for non volatile but biodegradable pollutants also in soils of low permeabilities. Prior to the application of the technique feasibility tests have to be applied in terms of biodegradability of the contamination (lab experiment or in-situ respiration test) and in terms of permeability of the subsurface (flow characteristics and radius of influence). Remediation times are case dependent and periods of 2 – 5 years can be expected.

Questions

Prof. Dr. Amar Chaudri

Are drilling costs for extraction wells included in the bioventing cost estimation?

They are not. In most cases wells already present from site investigation can be used for bioventing. Otherwise, costs of approximately US $ 50.- per meter (central European price) drilling have to be expected. For the site presented total costs would increase for around US $ 300.- - 500.- when including drilling and installation of the extraction well.

Prof. Dr. Taleb Abu Sharar

How reliable are degradation rates calculated from lab experiments?

Only an approximate degradation rate can be calculated. It is difficult to set an appropriate time frame for approximation. When using initial degradation rates (linear range) an overestimation of under field conditions achievable rates will take place mostly. Though in-situ respiration tests give no information about achievable final concentrations (residual contamination) after remediation they are often preferred for calculating the degradation rate.

Prof. Dr. Abdulla Babaqi

What's about uncertainties of in-situ techniques according the heterogeneity of subsurface soil?

Uncertainties are present. However, insecurity is already involved in site investigation when determining the spatial extension of a spill. So, even excavation may leave some contaminated soil on the site if no proper investigation was accomplished.

Physico - Chemical Remediation Technologies: An Overview

Ing. Giuseppe Girolami (*)

ABSTRACT

An overview of physical-chemical technologies for the remediation of contaminated soils is presented.

As a general definition, physical-chemical remediation technologies seek to reduce the extent of the soil contamination by means of physical-chemical processes, acting with three fundamental mechanisms: the extraction/separation of the contaminants from the contaminated matrix; the chemical degradation of the contaminants to form less toxic/less dangerous products; the reduction of the mobility and availability of the contaminants (which remain enclosed within the contaminated media).

Physical-chemical remediation processes can be utilized for the treatment of a wide variety of contaminants, including heavy metals, ionic compounds, solvents, fuels, volatile and semivolatile halogenated organic compounds, volatile and semivolatile nonhalogenated organic compounds.

Physical-chemical remediation processes can be applied with or without excavation and transportation of the soil to be treated; thus they can be ordered into three main classes: in situ, on site and off site processes.
The remediation processes described in this lecture are:

- Extraction with a gas phase (soil venting);
- Extraction with water or water solutions (soil washing/soil flushing);
- Chemical extraction with solvents;
- Extraction by flotation;
- Dehalogenation;
- Inertization – Solidification/Stabilization;
- Electrokinetic decontamination;
- Electroacoustic decontamination;
- Passive adsorption on polymer;
- Chemical Reduction/Oxidation;
- Photolysis.

For each technology a brief explanation of the process mechanism and of the process description is provided; the basic facts, as well as the field of application and the typical cost ranges are reported.

QUESTIONS & ANSWERS

Prof. EL ZARKA – Egypt
Q: Do you know if some of these technology have been applied in developing countries?
A: Physical-Chemical remediation technologies are very costly, and for this reason have rarely been applied in developing countries. Some applications are being conducted with the support of international organizations (e.g. in Vietnam).

Dr. EL SHAZLY – Egypt
Q: Have these technologies been applied in Italy? Can you give some examples?
A: Some applications have been reported for the remediation of industrial contaminated sites. Some examples are: application of soil venting for the remediation of volatile organics and solvents contamination; application of soil flushing (sometimes as biological enhanced), for the remediation of soil contaminated with chemicals; treatment of metal contaminated soil with S/S processes or particle size separation (flotation).
Due to economical reasons, in some cases the capping, or the excavation and off site disposal of the contaminated soil, has been preferred.
Q: Why metals are not recovered, instead of sending the contaminated media to landfill?
A: The recovery of metals from a soil matrix can be cost effective only if the concentration exceeds a certain minimum value. A soil is considered as "contaminated" even if the concentration of contaminants (in this case metals) is very low, if compared with the minimum concentration needed for the extraction/separation of metals.

Prof. Abdel Hady- Egypt
Q: The application of the electroacoustic decontamination causes an increase of contaminants mobility; can it result into a major spreading of the contaminants?.
A: In electroacoustic decontamination the contaminant is made free to move into the liquid phase, but his spreading into the surrounding environment is hindered because the contaminant is forced to move toward the electrodes by the electric field.

Dr. AMER - EGYPT
Q: What voltages are applied in electrokinetic decontamination? What is the distance between the electrodes?
A: Typical voltage gradient is reported to be 1 V/cm. Electrodes spacing will be chosen in order to generate such voltage gradient into the soil. Typical spacing is reported to range between 1 and 3 meters.

Prof. Abdel Hady - Egypt
Q: What is the reaction mechanism of photolysis?
A: During photolysis the contaminant is degraded to simple end products with the formation of intermediate byproducts. The first step is usually the formation of free radicals (catalyzed by radiation), but the reactions involved in the overall phenomena are very complex, and haven't been investigated in detail. However, it has been reported the initial amount of contaminants present in the media and the extent of the degradation of such compounds.

Prof BABAQY - YEMEN
Q: Is TiO_2 used also for solar detoxification of solid matrices? Should you use specific wavelength for the treatment of certain contaminants?
A: Solar detoxification with the use of TiO_2 requires the proper mixing of the media to be treated with the catalyst; for this reason, this method has been reported for water treatment. As a soil remediation technology, it could be used for the treatment of contaminants once they have been removed from the soil and transferred into a water phase (e.g. with soil washing or with soil venting).
The use of specific wavelengths for the degradation of specific contaminants has been reported. As an example, PCB degradation has been carried out with low pressure Hg lamps, emitting at 253,7 nm.

Dr EL KASSAS – Egypt
Q: What are the treatment cost referred to square meter?
A: Usually costs are reported as a function of the weight/volume of contaminated soil to be treated. This is because the extent of contamination must be evaluated in terms of surface and depth spreading. As an example, in soil flushing the treatment cost could be expressed as a function of the surface treated, but the depth of the contaminated region (or at least the depth of the water table) must be taken into account, since it affects the depth of the extracting wells, thus causing the cost to be expressed as a function of the total volume of soil treated.

HARMONIZATION OF SOIL INVESTIGATION METHODS FOR ASSESSING SOIL CONTAMINANTS

Prof. Dr. Koustantin Terytze Federal Envurinmental Agency
And Free University of Berlin, Germany

Abstract:

The soil plays a central role within ecosystem and fulfills a multitude of functions, of which its ecological functions in particular (as a habitat: regulatory and production functions) are of major importance. When reaching soils, pollutants can adversely affect these functions for the long term. When, for example, the soil loses its buffering capacity, which is one of its regulatory functions, the pollutants can move to other media and thus cause damage to other components of the ecosystem.

In activities to protect soils against pollutants, two objectives should. Therefore, be pursued to the same extent. On the one hand, effective measures designed to prevent pollutant inputs are to ensure that the soil fully retains all of its functions for the long term. This is the object of proactive soil protection. On the other hand, where soils have already undergone harmful changes, the object is to evaluate the environmental hazards that could be caused by these changes and to take appropriate measures, if necessary. The initiation of measures requires an evaluation of hazards to be performed.

Thus, the long-term preservation of intact soil, as a regulative component of the ecosystem, is the object of proactive soil protection. The soil's ecological functions are to be considered the assets to be protected. Ideally, the functions most sensitive to the action of contaminants should determine the assessment. In so far, proactive soil protection aims at keeping substance concentrations at natural levels and, hence, at preventing emissions and environmental pollution; it thus applies its level at a stage far in advance of the possible occurrence of 'damage.

Diffuse inputs have already caused pollutants to accumulate in soil over large areas. If only for its sheer magnitude in terms of land area affected, accumulation form diffuse sources is a major concern of proactive soil protection. Even though contamination levels are in part not very spectacular, the continuity of the inputs and the fact that, once present, the contamination is often irreversible make it necessary to minimize further inputs or to prevent them from arising altogether. The yardstick to be used in relevant assessments is the substances' natural concentrations, which sometimes vary considerably from region to region. In doing so, any damage possibly emanating from such geogenic, or natural, concentrations has to be accepted as given.

The problem in determining natural concentrations in soil is that hardly any recent-epoch soil exhibit exclusively natural (i.e. geogenic) pollution. Therefore, in proactive soil protection practice, the only option is to determine the present

state of pollution- made up of geogenic and anthropogenic pollution – as a yardstick in the assessment, in the form of so-called normal, or background, concentrations.

In assessing pollutant concentrations in soil within framework of comprehensive soil protection schemes, the aspects outlined above to be taken into account.

<u>Questions and Answers:</u>

1- Necessity investigation in harmonization and standardization efforts in the field of risk assessment.

Harmonization soil evaluation methods are necessary to generated data using standard methods, to compare the results of remediation methods.
Methods in soil protection and risk assessment of contaminated sites have been developed and binding in the form of standards. Projects to harmonize the methods in Northern Africa and the Middle East are absolutely necessary.

2- Transfer of heavy metals in pathway „soil-plant", Extraction „total content", „mobile fraction".

Total content of heavy methods was determined as an expression of the maximum hazard potential.
Interlaboratory comparition with aqua regia HCl HNO3 in Germany, standard method in Federal Soil Protection and contaminated sites Ordinance in Germany.
Trigger and action levels for pathway „soil-plants" (transfer), agriculture, green area ecologically relevant fraction „mobile fraction" is more relevant to determinate the level of results by bioremediation.
For transfer of heavy metals method with ammonium nitrate NH4NO3, Trigger action levels in Germany.

3- The role of organic matter for the transfer of heavy metals and organic substances for the remediation of contaminated sites with plants „phytoremediation".

Organic matter is a very important pedological parameter for remediation for organic contaminant and cardinal factor for the activity of microorganism and for heavy metal for the accumulation reduction and oxidative condition for the transfer by „bioremediation".

4- Strategy for the assessment of contaminated sites and to determinate the result of remediation methods.

Determination of contaminants
Chemical analysis - total content
bioavailable contaminants

mobile contaminants
bound contaminants
Ecological analysis - single species test
biochemical testbattery
Assessment of contamination: comparation with precautionary-, tigger- and action values.

5- Problem of reference soils: how to determinate characterization, storage.

Reference soil independent for soil formation in every country are necessary for:
Chemical and ecotoxicological analysis to control the result of remediation activities
Quality assurance, reference materials and certification.
Governmental coordination is very important.

6- Investigations to determinate background values and comparision with remediation results; Precaution any levels for heavy metals and organic substances.

Background values are representative of the background contents of a substance or group of substances in soil occurring generally background values are necessary for:

Description of the e substance-related soil condition
Evaluating of the existing soil pollution
Soil values for the utilization of residue materials and excavated soil material
Assessment of contaminated sites for the regional related soil protection.

7- Determinations limits for organic soil contaminants.

Determination limits for organic soil contaminants is important for background values and to determinate the level of remediation results.
In the practice to assessment contaminated sites.

Aldrin/dielrin	- 0.5 ug/kg
DDD, HCB, HCH	- 0.5 ug/kg
PAH'S	- 2.0 ug/kg
PCB	- 0.5 ug/kg

8- Requirements to be met in comprehensive quality assurance.

Sampling network, sampling treatment, analysis (determination limits, parallel determination, blanch values, interlaboratory tests), evaluation of analytical results.

9- Accreditation of laboratory for the evaluation of soil contaminants and hazard assessment.

Environmental quality and accreditation.

In Germany are more than 1000 Laboration with accreditation for environmental quality. In the Federation Ordinans for soil protection is accreditation determinate (DINISO 45001), also govermental institutes. The accreditation in the field of environmental quality is an important point in the further.

10- Derivation of precautionary values and methodical consideration for implementation of requirements

- Deal on the accumulation and effect of pollutants in soil.
- Comparasion with data on background contents.
- Concept for consideration of further pathway-specific effects.
- -10 Differentiation of soils.
- -11 Determination of the use form of soils after remediation.
- -12 Proposal for supplementation of data basis, monitoring programs.

Risk assessment of contaminated sites in Europe

F. Quercia

Abstract:

A review of the international and European programs on contaminated land assessment and rehabilitation has been presented.

Outputs and on going activities of European actions CARACAS-CLARINET-MCOLE have been detailed together with networking with the other international groups (International Ad Hoc group or contaminated land, NATO/CCMS, ISO/TC190, RACE/CEE countries, European Environment Agency).

An overview of the Human Health and Ecological Risk Assessment process has been presented with description of the main components as applied to contaminated sites evaluation: hazard assessment, exposure and toxicity assessment, risk evaluation together with building of the conceptual model of the site.

Different applications of risk assessment in decision making processes have been outlined: genetic versus site-specific assessments for regulatory objectives (i.e. setting of national soil standards), for setting priorities and for the estimate of site specific clean up objectives.

A few examples of available tools for contaminated sites risk assessment and for risk management have been presented.

Questions and Answers:

1) What is your advice for implementing risk assessment of contaminated sites in our countries? (Prof. Abdel Hady- Egypt)

I suggest that you follow our European and International Programs on this field, and try to actively participate by passing your needs and refund programs.

2) Where do I find precise references for purchasing the software tools that you mentioned? (T.M. Abu-Sharar, Jordan)

Some references are given in the handout. I'll he happy to send you more detailed information.

3) How does contaminated sites risk assessment influence liability? (Prof. El-Zarka, Egypt)

Site specific risk assessment may in fact clarify site as contaminated or not and imply the need for remediation or not of course it may assign a left liability from the response party. Many countries have then dedicated ratification provisions for site/risk assessors and results of the evaluation and strict control from government authorities.

ANNEX 3

Roundtable discussion panels

Question that has been used to guide the process of the three projects preparation during the workshop as shown in Annex 4.

Panel 1: Pollution sources and monitoring perspectives

(1) What major source of pollution do you now ?
(2) How can levels of pollution be monitored and assessed?
(3) What scientific information on pollution sourcing do you use? Could you improve the process with better information by using better sampling and analysis strategies?
(4) What would be your ideal monitoring process?
(5) What are the barriers to implementing the current and ideal processes today?

Panel 2: Remidiation Techniques and their economic viability:

(1) What effective remediation techniques do you now use or will you need to use in the future?
(2) How are the state regulators and environmental groups, unions, etc. involved in your decision process for your remediation technique selection and application?
(3) What scientific information on remediation techniques do you use in your application? Could you improve the process with better information?
(4) What would be your ideal remediation technique selection process with respect to its economic viability?
(5) What are the barriers to implementing some of the remediation techniques today?

Panel 3: Activity Description

(1) What major remediation decisions affecting public, worker, and environmental health do you now make or will you need to make in the future?
(2) How are the state regulators and environmental groups, unions, etc. involved in your decision process for your remediation techniques selection and application?
(3) What scientific information on environmental and health risk do you use in your application for remediation techniques? Could you improve the process with better information?
(4) What would be your ideal remediation technique selection process?
(5) What are the barriers to implementing the current and ideal processes today?

Panel 4: State Regulators and Environmental Groups Perspectives

(1) How are you now involved in remediation program?

(2) What important factors do you feel should be considered when major remediation decisions should be made about a site?

(3) What scientific information on environmental and health risk do you feel should be used prior remediation? What role do you feel your constituency should play in this process?

(4)What would be your ideal remediation decision process?

(5) What are the barriers to implementing the current and ideal processes today?

Panel 5: Regulatory Perspectives

(1) How is your organization now involved in remediation program? What role, if any, does risk assessment play in your regulatory activities?

(2) As a regulator, what do you believe are the most important obstacle facing remediation application?

(3) What scientific information on environmental and health risk do you use in your remediation technique application? Could you improve the process with better information?

(4)What would be your ideal regulation process for remediation ?

(5) What are the barriers to implementing the current and ideal processes today?

FINAL DISCUSSION QUESTIONS

Question 1: How can scientific information on environmental and health risks assist those setting priorities for remediation activities to reduce the risks to the public, workers, and environment?

Question 2: Can scientific information on environmental and health risks assist in ensuring that funds are so distributed as to reduce health and environmental risks at different sites in an equitable manner?

Question 3: Do the countries of the region have sufficient data on site characterization, health effects, and exposure to develop scientific information on environmental and health risks?

Question 4: Does the scientific information on environmental and health risks permit the countries in the region to improve and extend the application decision tools in setting remediation priorities?

Question 5: Can public participation in the development of assessment guidelines improve the credibility and value of remediation application? If so, how can the public most effectively participate in the development of these guidelines and their eventual application at sites?

Question 6: Are there institutional, regulatory, statutory, or other impediments to the use of scientific information on environmental and health risks in managing the risks associated with each of the remediation?

ANNEX 4

FIRST PROPOSAL

REMEDIATION OF HEAVY METAL METAL POLLUTED SOILS IN THE MIDDLE EAST

Background and Justification:
With growing industrial development in the Middle Eastern countries heavy metal pollution soil is going to be the increase and affect both land use and public health.

Recently, countries have undertaken steps towards improving the environment and public health. This has been done through the establishment of Environmental Affairs Agencies and through the implementation of environmental protection measures.
Furthermore measures have been taken to enforcement existinglous governing industrial pollution.

However, there is limited data on sources and degrees of pollution, as well as a lack of remediation technologies. This has improved the capabilities of relevant authorities and organizations to respond fully and in a satisfactory way leading to effective remediation of polluted soil in the Middle East countries (e.g. in Egypt, Syria and Yemen).

In Egypt, by instance, despite the fact that heavy metal pollution is well documented in some agriculture lands around industrial sites, other areas which may be not industrial contaminated may have concentration much higher than probably expected.

Generally, there are many sources of anthropogenic heavy metal pollution in the Middle East, such as:
a- phosphatic fertilizer use,
b- sewage sludge
c- recycled drainage water
d- use of pesticides
e- industrial emissions and
discharges to waterways.

Some work has been done in the Middle East countries in order to improve soil water and crop management practice. Inspite of this hardly any work has been carried out remeding heavy metal polluted soils in these countries.

The problems of soil quality degradation, around the industrial areas, due to high concentration of heavy metals are now of major concern and they can lead to reduction in food production and transfer of toxicity to animal and humans.

This is further excerpted by the fact that the solutions given are incomplete and ambiguous. Consequently there is a lack of knowledge on exactly how to manage these problems practically and satisfactory.

Numerous multi-scale industries are located through greater Cairo (Helwan), Alexandria, Port Said in Egypt, Damuscus and Laziqia in Syria, and finally Sana'a Yemen. The discharges of these industrial areas to the surrounding lands and water bodies cause extensive pollution of soils.

Hence, the present proposed project, Therefore, is intended to fill this gap in our practical knowledge in remediating and improving the quality of the heavy metal polluted soils for agricultural productivity and soil fertility by optimum technologies.

Objectives

There are three major objectives of this research proposal:

1- Analyses will be carried out to obtain comprehensive data on soil physicochemical properties. These will focus on mineralogical and heavy metal analyses.
2- The main objective of the proposal is to in-situ remediate polluted soils through stabilization (i.e. fixation) and phyto extraction models with a view to restoring agricultural productivity and soil fertility.
3- The final objective is to introduce and implement these technologies on a large-scale form on industrial land polluted with heavy metals.

This proposed applied research project include two main stages:
The first stage: Physicochemical study
This stage includes:
1- Base line studies (i.e. site selection for pilot studies and site description).
2- Soil sampling.
3- Physicochemical analysis e.g.:
  - -1 Particle size analysis
  - -2 Mineralogical analysis by microscopy technique, XRD, SEM, EDAX and IR.
  - -3 Electrical conductivity (EC).
  - -4 Soil pH.
  - -5 Organic matter contents
  - -6 $CaCo_3$ contents
  - -7 CEC analysis of soils

-8 Determination of total chemical extractability and fractionation of heavy metals.
-9 Heavy metal analysis to know which metals are causing the problems and to know the typical concentration in pollution soils.

The second stage:
In-Situ Remediation

Remidiation methods will be investigated so that the best possible technologies can be devised to reduce the heavy metal loading of soils in the Middle East (i.e., in certain model areas in Egypt, Syria and Yemen in areas in Egypt, Syria and Yemen in cooperation with UK experiences.

To reach this goal the following steps will be carried out:-
a) Evaluation the quality of soils before and after the remediation experiments.
b) Carry out some pilot studies on natural materials (e.g. zeolites) which could be used from removing the toxic heavy metals from soils.
c) In-situ stabilization using:
    i) Soil amendments e.g. Zeolites.
    ii) Red mud (iron oxide).
    iii) Phosphate, but low in Cd.
    iv) pH experiments
    v) Organic matter addition.

a) Field application of phytoremediation techniques using selected hyperaccumulator plants such as:
    i) Sunflower
    ii) Brasica sp.
    iii) Other natural hyperaccumulator plants

a) Carry out experiments on recovery of heavy metals on recovery of heavy metals from hyper accumulators.

EXPECTED OUTPUTS:
1) Identify hyperaccumulators from local areas.
2) Clean up soils to acceptable levels of contamination.
3) Reducing the bioavailable fractions of heavy metals.
4) Reducing phytotaxicity.
5) Reducing toxic Cd metal uptake in food and hence the food chain.
6) Reaching the most economic feasible model process to be applied on larger scale to form lands around industrial regions in the Middle East countries.

Tentative Budget

Space:

The work will be carried out at

Egypt (represented by Cairo University Center for Environmental Hazard Mitigation- CEHM)
Syria (represented by scientific research and Environment Center – RESC)
Yemen (represented by Sana'a University center for Environment and water – YEWC)
With coordination of soil science department at IACR- Rothamsted at Harpenden, UK.

The tentative budget is suggested to be 1Million sterling pound.

The items of the budget:

-1 Salaries and incentives.
-2 Equipments and consumables
-3 Travels and transportation (Field Trips)
-4 Periodicals of data in forms of meetings or seminars or workshops.
-5 Miscellaneous.

MEMBERS OF THE ROUND TABLE:

The following members have participated in suggestion of the research proposal of Remediation of heavy metal polluted soils in the Middle East during the round table discussion:

1) Dr. Mohamed Ibrahim El-Anbaawy (Egypt) – Project Coordinator.
   Cairo University, Center for Environmental Hazard Mitigation.
2) Dr. Amar Chaudri (UK)
   IACR- Rothamsted
3) Dr. Kamel K. Sabet (Egypt)
   Cairo University, Faculty of Agriculture.
4) Dr. Hesham Ibrahim El Kassas (Egypt)
   Institute of Environmental research, Ain Shams University.
5) Dr. Adbulla S. Babaqi (Yemen)
   Sana'a University, Center of Environment and water research.
6) Dr. Hoda Abbas El-Shayed (Egypt)
   EEAA, Environmental Chemistry.
7) Dr. Amina El-Shazly (Egypt)
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8) Dr. Moataz Mohamed Gabr
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9) Walid Abdel Kader
   Safety and Environment Dept. Egyptian Cement Co.
10) Dr. Mahmoud Saleh Soliman (Syria)
   RESC- Damascus
11) Salem S. S. El-Maskry (Oman)
   Ministry of Environment.

SECOND PROPOSAL

Risk Assessment and Environmental Quality

Background:

1- The existence of numerous contaminated sites in the Middle East and North Africa due to inappropriate chemical waste treatment and disposal.
2- The ill practices of chemical waste disposal has increased the proportion of contaminated soil and water, and associated health risks and hazards to the general public.
3- Due to increasing contamination, an increasing proportion of land has been driven out of original functions.
4- European countries have experience with risk assessment approaches for contaminated sites, therefore their cooperation is needed to implement the project in the region.

Justification:

1- Lack of national guidelines and standards for environmental quality and risk assessment in the region.
2- Inapplicability of international standards of environment quality and risk assessment to the region.
3- Inappropriate and insufficient waste treatment and disposal practices in the region.
4- Lack of awareness of the environmental risks and hazards of chemical wastes.
5- Increase of uncontrolled chemically based development activities.

Objective:

1- Create a screening/selection criteria for determining potentially contaminated sites.
2- To establish a harmonization risk-assessment methodology for setting trigger limits for specific soil contaminants.
3- Verification of the pre-set trigger limits in each of the participating countries.
4- Initiate legislative ordinances aiming at defining contaminated sites.
5- Establish a database containing all information obtained from the contaminated sites in the engaged countries. In addition each site is categorized according to the degree of contamination.
6- Develop a ranking system for contaminated sites.

Expected Outputs:

1- To develop a set of guidelines on the basis of risk-assessment to enable classification of a site as contaminated (or not) by priority pollutants.
2- Harmonization strategy to determine trigger levels for contaminated for each country according to critical national scenarios.
3- Practical implementation of the guidelines in steps 1 and 2 to specific case studies. e.g. : sludge disposal, chemical waste dumping.

Project duration: three years

Partnerships:

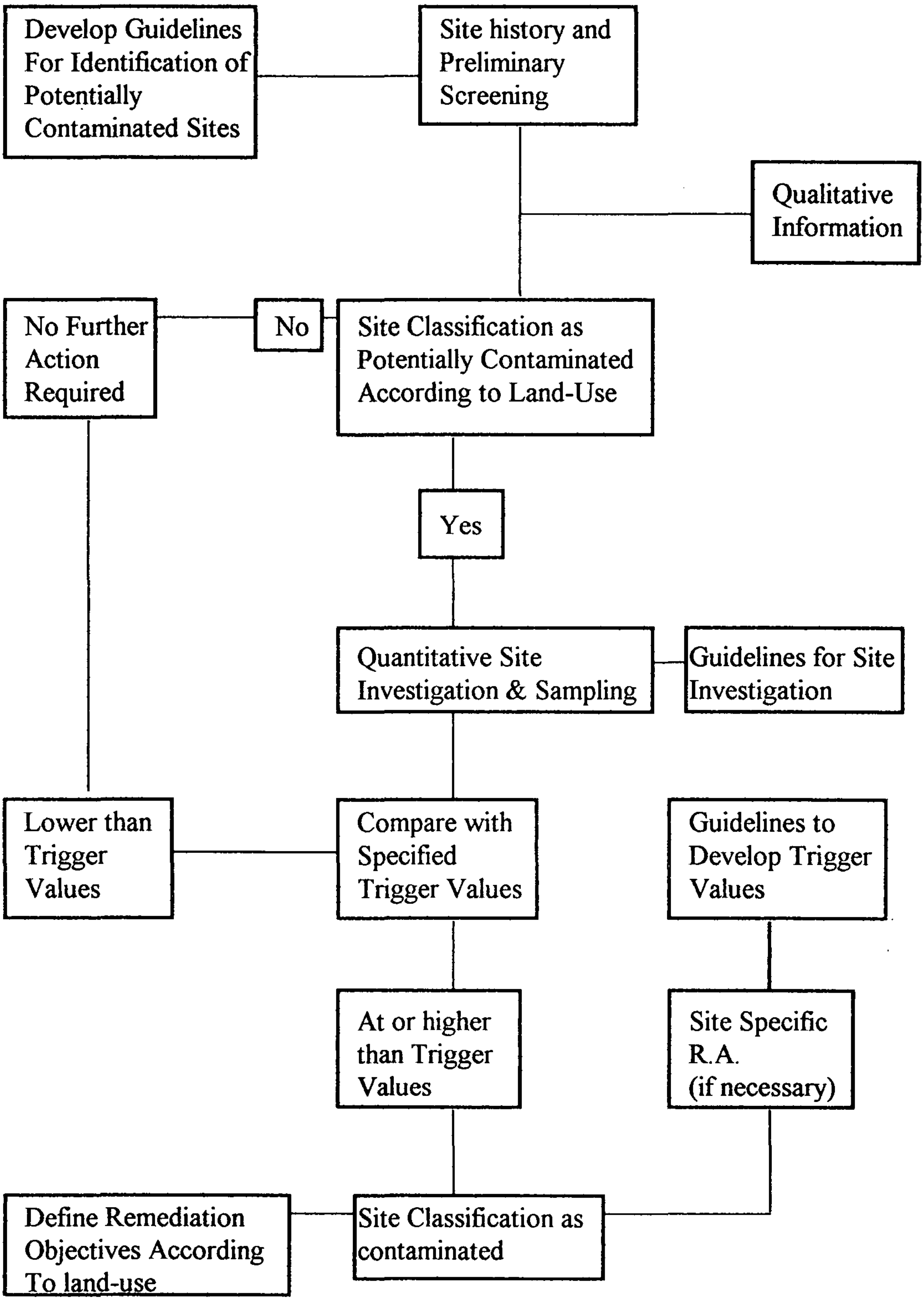
1- Governmental agencies.
2- Research centers/laboratories.
3- Industrial/ Agricultural firms and companies.
4- Relevant NGO's

Tentative Budget: $2,000,000

Deliverables:

1- Progress report every 6 months.
2- 3 workshops to be held in 3 different countries from the Middle East and North Africa (to include the countries of concern) at the end of each year.
3- Final report after 3 months of project termination.

Contents:


Develop Guidelines For Identification of Potentially Contaminated Sites
Site history and Preliminary Screening
Qualitative Information
No Further Action Required
No
Site Classification as Potentially Contaminated According to Land-Use
Yes
Quantitative Site Investigation & Sampling
Guidelines for Site Investigation
Lower than Trigger Values
Compare with Specified Trigger Values
Guidelines to Develop Trigger Values
At or higher than Trigger Values
Site Specific R.A. (if necessary)
Define Remediation Objectives According To land-use
Site Classification as contaminated

3rd PROPOSAL

ASSESSING FEASIBILITY AND EFFECTIVE WAYS TO TREAT INDUSTRIAL WASTEWATER: DEVELOPING A PLAN TO TREAT AND REUSE WASTEWATER

Background

The main water resources in Egypt and Lebanon are rivers and ground water. In the areas far from the rivers, ground waters is the only source of water. Industrial waste is being mixed with the domestic wastewater and damped into open streams. This water is percolating to pollute the ground water with many highly toxic contaminants. Moreover. The polluted water is discharged into rivers.

Justification

Ground water is becoming one of the main water resources for Egypt and Lebanon. More than 70% of the population in Lebanon relies on the ground water as good potable water. Egyptian are using this water in higher volumes day after day. The open streams holding the industrial disposals run toward the agriculture lands. Industries like battery making, paper making, hospitals, steel manufacturing, ceramics. Food industries and polishing cars... etc. are the ones that they dump the wastewater into the open streams and sewage network. In addition farmers tend to use this water to irrigate their lands during the dry seasons.

Objectives

Developing a viable plan to treat and reuse the industrial wastewater.

Contents

Selecting 300 industrial locations to be examined;
Identifying the quantity of industrial wastewater discharged.
Collecting existing data on the amount and quality of industrial wastewater.
Collecting topographical, geological and hydrological data referred to the selected industrial locations.
Identifying the contaminants and the different characteristics of the disposal water, through collecting existing data and developing a monitoring system.
Grouping the industries to different potential and quality of contamination.
Evaluating the most effective ways to treat and reuse the wastewater.
Identifying and locating the possible places to conduct and construct the treatment plan.
Define the output and the further project.

Expected Output

Assessment of the actual amount and quality of discharged wastewater, and evaluation of their environmental impact on receiving bodies.

A feasible and applicable plan for the treatment and reuse of industrial water.

Possible creation of other sources water (water recycling).

Duration
Expected duration is 3 years in total. There will be four phases.
First phase: assessment of the existent situation, data collection and planning of monitoring system.
Second phase: monitoring and analysis of selected samples.
Third phase: organization of available data and creation of database.
Fourth phase: developing the final plan for industrial water -------

Partnership
UNIDO, ICS, Italy: Ministry of housing, utilities and new communities.
Egypt and NCRS- National Center for Remote Sensing Lebanon.
Partnership of Nigeria will be furtherly evaluated

Budget
Tentative budget is $550 000 based on:
1 external supervisor
2 local coordinators (1 for each country)
2 working persons for the first year and 3 working persons for the second and third year.
300 industrial locations.

ANNEX 5

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ANNEX 6
FINACIAL REPORT

The Budget items will be discussed in the following few paragraphs:
Due to inavailable space in the Safer Hotel- 12 reside in Safer and 18 in Cairo University Guest House

Description of Items	Proposed	Actual	Difference
Accommodation of five invited lectures full board for 5 days	**$2,500**	**$2,795.87**	**-295.87**

The accommodation of five invited lectures almost fit the proposed budget with deficiency $295.87

Description of Items	Proposed	Actual	Difference
Accommodation of 7 international participants full boards for 5 days	**$3,000**	**$3,840.50**	**-840.5**

The accommodation of the seven international participants exceeds the proposed budget due to the presence of one extra participant.

Description of Items	Proposed	Actual	Difference
Accommodation of 4 lecturers from the country full board for 5 days	**$2,000**	**$2,087.30**	**-87.3**

The accommodation of the 4 lecturers fit the proposed budget.

Description of Items	Proposed	Actual	Difference
Accommodation of 14 participants from the country full board for 5 days	**$6,000**	**$7,271.20**	**-1271.2**

The accommodation of the 14 participants show 1,271 difference than the expected budget.

Description of Items	Proposed	Actual	Difference
Travel of five invited lecturers average air-faire	**$6,250**	**$5,687.97**	**+562.03**

The actual travel expenses of the five invited lecturers show $562.03 less than the proposed budget.

Description of Items	Proposed	Actual	Difference
Travel for seven international participants	$6,000	$3,546.86	+2,453.14

The actual travel expenses for the seven international partipants show $2,453.14 less than the proposed budget.

Description of Items	Proposed	Actual	Difference
Local transportation	$1,000	$654.63	+345.37

The local transportation cover only the limosine expenses for each lecturer and participant from air port to hotel and VS.VS. Beside the rented bus for the outdoor lab visit. It shows $345.37 less than the expected budget.

Description of Items	Proposed	Actual	Difference
Publications of proceedings	$1,000	$1,859.65	-859.65

Due to the large amount of the published matterials for the actual budget exceed 859.65 than the proposed.

Description of Items	Proposed	Actual	Difference
Local travel for participants from the country	$1,250	$439.06	+810.94

Two rented buses for the local participants to take them back home. The first toward the Delta and other to Upper Egypt. The actual budget show $810.94 less than the proposed one.

Description of Items	Proposed	Actual	Difference
Miscellaneous	$1,000	$1,839.2	-839.2

The Miscellaneous cover the Banners for the work shop and the printed portfolio. Beside incentives for 3 assistants $250/each. That made the actual budget exceed $839.2 than the proposed budget.

Description of Items	Proposed	Actual	Difference
TOTAL	$30,000	$30,022.24	-22.24

The total actual budget fit in the same amount of the proposed budget.

FINACIAL REPORT

Description of Items	Proposed	Actual	Difference
Accommodation of five invited lectures full board for 5 days	**$2,500**	**$2,795.87**	**-295.87**
Lodging		EGP4,675	
Lunch and coffee		EGP3,327.62	
Dinner		EGP1,129.23	
Local Phones		EGP430.01	
Accommodation of 7 international participants full boards for 5 days	**$3,000**	**$3,840.50**	**-840.5**
Lodging		EGP6,545	
Lunch and coffee		EGP4,658.68	
Dinner		EGP1,580.9	
Local Phones		EGP350	
Accommodation of 4 lecturers from the country full board for 5 days	**$2,000**	**$2,087.30**	**-87.3**
Lodging		EGP3,420	
Lunch and coffee		EGP2662.1	
Dinner		EGP960	
Local Phones		EGP96.4	
Accommodation of 14 participants from the country full board for 5 days	**$6,000**	**$7,271.20**	**-1271.2**
Lodging		EGP11,970	
Lunch and coffee		EGP9,317.35	
Dinner		EGP3,360	
Local Phones		EGP220.15	
Travel of five invited lecturers average air-faire	**$6,250**	**$5,687.97**	**+562.03**
London		EGP5549	
Austria		EGP4653.28	
Italy		EGP2,228	
Germany		EGP2,375.6	
Italy		EGP4,647	
Travel for seven international participants	**$6,000**	**$3,546.86**	**+2,453.14**
Bahrain		EGP2,277	
Lebanon		EGP995	
Syria		EGP1,070.40	
Nigeria		EGP2,382	
Oman		EGP2,831.60	
Yemen		EGP1,720.26	
Jordan		EGP854	
Local transportation	**$1,000**	**$654.63**	**+345.37**
Publications of proceedings	**$1,000**	**$1,859.65**	**-859.65**
Local travel for participants from the country	**$1,250**	**$439.06**	**+810.94**
Miscellaneous	**$1,000**	**$1,839.2**	**-839.2**
WS Banner		EGP2,600	
Printed Portfolio		EGP1,125	
Incentives for 3 assistants $250/each		$750	
1$= EGP3.42			
TOTAL	**$30,000**	**$30,022.24**	**-22.24**

Yehia Abdelhady