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International Centre for Science and High Technology
United Nations Industrial Development Organization

in cooperation with

The Institute of Soil Science, Chinese Academy of Sciences

Final Report of the Workshop

Environmental Pollution and Application of Remediation Technologies in East Asian (EA) Countries

Nanjing, 18 - 20 September 2002

UNIDO Project **TF/GLO/00/105**

UNIDO Contract No. **2002/203**

Background

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 many countries, both industrialized and with economies in transition, and there is the need to allocate extensive financial as well as scientific and technical resources for environmental protection and recovery. Environmental situation in each country is specific by type, distribution and extent of contamination and a proper integrated environmental strategy together with the availability of sound and suitable decontamination technologies is one of the priorities for the years to come.

In this regard, together with other initiatives, ICS-UNIDO in cooperation with the Institute of Soil Science, Chinese Academy of Sciences (ISS-CAS), has organized a workshop on "Environmental Pollution and Application of Remediation Technologies in EA Countries", which represents one of further steps of the ICS programme.

Objectives

- To survey strategies, criteria, methodologies and tools for the assessment of environmental pollution and the management of environmental recovery activities.
- To survey modern technologies for remediation of polluted sites, envisaging its application in the EA region in order to strengthen the national expertise in mastering, using and further developing remediation technologies for local applications and adaptations.
- To survey the environmental situation in EA countries and identify key common problems.
- To stimulate international research and technology transfer and enhance international co-operation through possible joint projects and feasibility studies between ICS-UNIDO and qualified Centres/Institution of the Region.
- To define possible actions to be taken for the establishment of a network on remediation in the EA Region.

Organization

The workshop was organized by the Institute of Soil Science, Chinese Academy of Sciences (ISS-CAS) in Nanjing between 18 and 20 September 2002.

Funding

The ICS-UNIDO approved contribution was US$ 17,500.
The amount received on 23rd August was US$ 14,000. The total expenditure was of 17,859 USD.
As a result of not being able to book in advance, airfares of most international lecturers and participants were well exceeding the budget. Also transportation to and from airport to hotel cost more than twice that of the budget.
Although the three lecturers from China managed to cover their own travel, all Chinese participants are self-financed and accommodation and meals cost much less due to bulk booking and discount, still 359 US$ was overspent. .The amount of the over-expenditure of 359 USD will be covered by the local institution, thus the amount of 3,500 USD as remaining part of UNIDO contribution should be transferred to the local organizer.
The hosting country contributed 3,663 USD for the administrative support of the workshop, rent of premises and equipment.
A summary of the final budget is given in ***Appendix 1.***

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Lecturers

	Name	Affiliation	Country
1	Michele Amedeo	UNIDO office representative in China	Italy
2	Surin Aree	Pollution Control Department	Thailand
3	Jan Japenga	ALTERRA Green World Research	The Netherlands
4	Sung Ho Kong	Hanyang University	Korea
5	Jian Liu	Chinese Academy Sciences (CAS)	China
6	Andrea Lodolo	ICS-UNIDO Trieste	Italy
7	Yongming Luo	Institute of Soil Science, CAS	China
8	Sivannakone Malivarn	Environmental Research Institute	Lao PDR
9	Dietmar Müller	Federal Environment Agency of Austria	Austria
10	Jim Philp	School of Life Sciences, Napier University	United Kingdom
11	Chrin Sokha	Dept. of Environmental Pollution Control	Cambodia
12	John Vijgen	Secretary IHPA	Denmark
13	Ming Hung Wong	Hong Kong Baptist University	China
14	Po Keung Wong	The Chinese University of Hong Kong	China
15	Liyu Xu	Institute of Soil Science, CAS	China
16	Sandagjav Zorigsaikhan	Environment Protection Agency of Ulaanbaatar	Mongolia

Participation
Participation was opened to scientists, experts in remediation, governmental representatives, decision makers, responsible persons of international and national organizations dealing with environmental protection and recovery issues.
The total number of registered participants and lecturers was 73.

The full list and addresses of lecturers and participants are in **Appendix 2**.

Participants by their sphere of operation

Country	Government	Industry	Sci. & Res.	Others	Total
China	1	8	44	1	54
Lao PDR	1				1
Mongolia	1				1
Korea		1			1
Total	**3**	**9**	**44**	**1**	**57**

Material

Each workshop participants received a badge, a folder with final agenda, a notepad and a pen at registration. Lecture notes, group photo and workshop questionnaire were distributed during the workshop. All foreign delegates and part of Chinese participants received before their departure a disc containing abstracts, full paper or PowerPoint of all invited presentations as well as list of participants. More copies of workshop disc has been made and sent to participants by post. All the written contributions of the speakers were in **Appendix 3**

Opening Ceremony

More than 70 people were present at the opening ceremony.
The workshop was opened by Prof. Dr. Lin-zhang Yang, Deputy Director of the Institute of Soil Science, Chinese Academy of Sciences.
Other welcome speeches were delivered by Dr. Andrea Lodolo, ICS-UNIDO, Trieste, Italia and Mr. Jian Liu, Director of Ecology, Environment and Agriculture Division, Chinese Academy of Sciences.

Agenda

The final agenda of the workshop is in **Appendix 4**.

Site visit

A half-day site visit was organized on 20 September to the following two sites:

1. Industrial wastewater treatment plant affiliated to SINOPEC Yangzi Petrochemical Company, a state-owned extra-large key enterprise in Nanjing.
2. Wastewater treatment plant of Suo-jin Cun, Nanjing, built in 1985 aimed to treat domestic wastewater from a residential area with about 100,000 residents so as to protect adjacent Xuanwu Lake, which receives its effluents.

Assessment of the workshop

A questionnaire was distributed to the participants. The results are summarized in the table below.

Item	Excellent (%)	Very good (%)	Good (%)	Fair (%)	No reply (%)
The information process was	19	60	21	0	0
Announcement & pre-course material	22	54	24	0	0
Scientific program (general)	28	62	10	0	0
Lecture / Workshop	15	57	28	0	0
Small working groups	14	35	40	0	11
Case studies	35	43	22	0	0
Extra-time specific question / example	32	56	12	0	0
Students:	Balanced	Unbalanced	No reply		
Scientific knowledge	75	18	7		
During of program:	Just right	Too long	Too short		
Number of days	80	3	17	0	0
Length of working days	72	6	22	0	0
Training facilities and hotel	17	51	32	0	0
Lecture / training room	10	58	23	0	9
Breaks / refreshment	20	63	17	0	0
Hotel accommodation	17	67	12	0	4
Meals at the hotel	12	66	14	2	6
Organizer's response	15	61	19	0	5
Overall program organization	21	69	7	0	3
Follow-up:	Yes	Maybe	No	0	0
Would you recommend to others	82	10	8	0	0

As can be seen from the table above, the participants' feedback was very positive. The insufficiency was related to late distribution of written contributions.

Achievements of the meeting

On 18th September, 8 lecturers gave a total of 13 talks, which covered a wide range of topics with respect to international initiatives & programmes for environmental protection and recovery (4 talks), state of the art of integrated approach for assessment and remediation of polluted sites (3 talks), and topical pollution sources and applicability of remediation technologies (6 talks).

On 19th September, 3 more talks on pesticides and 1 talk on UNIDO's Environmental programmes and activities in North East Asia were followed by 6 talks on remediation initiatives and programmes in China and 5 other East Asian countries.

After the presentation of the country reports and the plenary discussion, the following key problems/issues in each country have been identified:

Country topical problems

China:

- Non-point source pollution of N, P, pesticides, herbicides in lakes and agricultural areas
- Need of low-cost and efficient remediation technologies
- Petroleum-polluted soil
- Groundwater pollution (mainly due to nitrates and pesticides)
- Point pollution by small size rural industry
- Need for quality standards for remediation and monitoring, particularly for the criteria for organic pollutants detection and measurement
- Collaboration between research institutes, universities and private companies needed

Cambodja:

- Pesticides/ human health/environment
- Landfill related pollution
- Surface and groundwater pollution from agriculture and industry
- Domestic sewage and related pollution problems
- Improper disposal of hazardous industrial waste

Lao PDR:

- Obsolete pesticides at dumping sites
- Identification of Agent Orange polluted sites (methodologies/tools)
- After identification need for technological solutions
- Human resources and funding
- Lack of research centres

Mongolia:

- Domestic sewage and related pollution problems (lack of suitable infrastructures/treatment plants)
- Domestic solid waste management/landfill related problems
- Agricultural run-off and industrial effluents induce surface and groundwater pollution
- Improper storage/disposal of hazardous chemicals and industrial waste
- Need of control/monitoring of internal and trans-boundary movement of hazardous waste.
- Need of proper management of medical waste

South Korea:

- Underground storage tanks (petroleum)
- Yellow Boy: heavy metals from mining area
- Old/abandoned landfills, management and remediation

Thailand:

- After identification of polluted sites need for prioritisation and management
- Industrial wastewater discharge
- Illegal dumping, relevant soil and groundwater pollution

It was commonly agreed that all the above key issues can be categorized in three common general problems/needs:

1. Need of improving the Institutional Awareness (WG1)
2. Need of suitable strategies, methodologies and tools to identify the environmental problems (WG2)
3. Need of technology development in the field of remediation (WG3)

Due to the complexity of the above issues and with the aim of better analyzing and discussing each general topic in respect to the specificity of the countries of the EA region, it was agreed to form three working groups (WG1, WG2, WG3), each dealing with one selected category. Participants have been requested to join a working group, on the basis of their specific interest.
Moreover, in order to properly address the environmental problems in the EA region, during the discussion it has been also underlined the importance of considering the ***different type of development stage and land use*** of the various countries/provinces.

At the end of the working group session the rapporteurs of the working groups have been requested to summarize and present the results of the panel discussions:

WG1-Institutional Awareness

As conclusion of the discussion the following general considerations have been presented:

- The need of law enforcement and transparency
- Difficult application of regulation and monitoring
- Environment Vs. growth
- Lack of technical capabilities in some countries
- Need of better links between central and local government.
- Better integration of programmes among different ministries

with the following **proposals for possible solution:**

- ✓ Continuous exchange of experiences (lessons learnt) among different government. bodies in the same country and among different countries of the region
- ✓ Training at all levels (starting from basic environmental education for people dealing with agriculture....)
- ✓ Exchange of experiences at international level
- ✓ Common integrated environmental policies for transboundary pollution problems

- ✓ Regional environmental policies

WG2 - Strategies, methodologies and tools to identify environmental problems

As conclusion of the discussion the following general considerations have been presented:

- ✓ Lack of systematic approaches/planning for the identification of soil/water contamination problems
- ✓ Priority is generally given to air pollution
- ✓ Need of suitable protocols/guidelines for assessment of contaminated sites and identification of hot spots;
- ✓ Need of suitable strategies/methodologies for prioritization
- ✓ Lack of economic and human resources for environmental planning
- ✓ Gap between universities/research centres' and government. activities in environmental planning

WG3 -Technology development

As conclusion of the discussion the following general considerations have been presented:

Soil contamination:

- ✓ Due to extensive agricultural land use in the EA region, importance of "soft" remediation technologies for agricultural lands, e.g. phytoremediation, bioremediation, ...
- ✓ Advantage of the use of bio remediation: improvement of the ecosystems, bio+phyto = integrated method for environmental recovery, plants as key element of environment dynamics, phytoremediation also suitable for water treatment integrated systems;
- ✓ Need of better experiences in heavy metals decontamination in EA countries (e.g. hyperaccumulators, ...)
- ✓ Need of more experiences in the application of phytoremediation to organic contaminants;
- ✓ Need of info on suitable remediation technology, and on "lessons learnt" from other countries (EU, USA, ...);

Moreover, the importance to take into account the "Agent Orange" diffused contamination in some countries and to consider the erosion/deforestation problems for a proper integrated planning of environmental recovery initiatives have been underlined.

Groundwater contamination:

- ✓ Landfill impact: leachates/abandoned landfills as a part of general lack of suitable waste management systems;
- ✓ Need of guidelines for landfill construction, management and maintenance;
- ✓ Need of regular soil monitoring systems;
- ✓ Need of ecological agricultural practices (awareness building, training,...)
- ✓ Need of suitable methodologies/tools for the assessment of groundwater quality

In respect to the above issues, the importance of giving priority on capacity building and prevention measures has been also stressed.

Proposal for possible follow-up activities

During the last session of the Workshop, the opportunity and possibilities to establish a Network on Remediation in East Asia has been also discussed. The concept of the possible initiative was already presented in the first sessions of the workshop and on the basis of the general contents of the above project concept a general discussion took place.

The Network would serve as a cooperative forum for representatives from concerned agencies on Environmental Research, Technology Development and Management, which would help to efficiently transfer available experiences of OECD countries to East Asian countries and to strengthen their integration. Proposed themes would be: knowledge and technology transfer, fund raising, standard setting, policy implication, R & D, and training.

The initiative could support EA countries in tackling problems related to soil and water (particularly groundwater) contamination, with special regard to:

- ✓ information validation: streamlining of existing/relevant information and activities
- ✓ better understanding and effective implementation of sound legislation and standards
- ✓ exchange of data and expertise with regard to contaminated sites management
- ✓ improvement of knowledge transfer esp. technology development and implementation
- ✓ support the adoption and implementation of decision support tools
- ✓ provision of latest information concerning funding possibilities
- ✓ support in the implementation of financing strategies for contaminated land and groundwater remediation

The East Asian Network should consist of MoE representatives of EA Countries, International Organizations, UN Agencies, R&D centres, all stakeholders. Participation of and communication with representatives of other already existing international networks/organizations/initiatives in the field of environmental protection and recovery would be of a mutual benefit.

Taking into account the previous discussions and the relevant analyses of common key problems/needs, all participants agreed that the above initiative would be of great benefit for all the countries of the region and a valid instrument to face the environmental problems in the present and future years, in particular for the planning of EA common strategies and policies in the field of environmental protection and recovery.

Appendix 1

Budget breakdown

Exchange rate: 1 USD= 8.19 CYN						
Description	Budget in USD	Budget in CYN	Disbursement in USD	Disbursement in CYN	Difference in USD	Difference in CYN
Travel: International lecturers	**4800**		**7366**		**-2566**	
Jan Japenga			1559			
Dietmar Müller			2067			
Jim Philp			2390			
John Vijgen			1350			
Travel: International participants	**4800**		**6337**		**-1537**	
Surin Aree			572			
Uyanga Dorjgotov			360			
Sung Ho Kong			385			
Sisouphanh Luangrath			1179			
Sivannakone Malivarn			1179			
Chrin Sokha			1108			
Ming Hung Wong			438			
Po Keung Wong			444			
Sandagjav Zorigsaikhan			672			
Travel: National lecturers	**900**		**0**		**900**	
Jian Liu			0			
Yongming Luo			0			
Liyu Xu			0			
Total travels	**10500**		**13703**		**3203**	
Accommodation & meals						
Prepaid lodging for Dorjgotov			24	200		
4 invited international lecturers	**1200**		**3505**	**28710**		
3 invited lecturers from China	**900**					
8 international participants	**2400**					
15 participants from China	**2250**		0	0		
Total Accommodation & meals	**6750**		**3530**	**28910**	**3220**	
Local transportation						
transport of guests to and from the airport to hotel			559	4580		
Coaches for the site visit			67	550		
Total local transportation	**250**		**626**	**5130**	**-376**	
Grand total	**17500**		**17859**	**34040**	**-359**	

Appendix 2

List of participants

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Appendix 3

1 of 14: Abstract of the first talk given by Dr. D. Müller

EUROPEAN AND INTERNATIONAL INITIATIVES/NETWORKS IN THE FIELD OF REMEDIATION AND ENVIRONMENTAL POLLUTION REDUCTION

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Over the past decade, various international networks have been formed to share expertise and to co-ordinate RTD activities on specific aspects related to perceived contaminated land problems. They are important for assessing the international state of the art and for identifying priority research needs to improve the currently existing knowledge. These networks are essential to avoid unnecessary duplication of RTD activities on a national basis and to develop jointly a broader basis of scientific peer reviews. The results from these international partnerships provide useful sources of information for practitioners in the field. The following will highlight goals of major networks and includes references to more detailed information:

COMMON FORUM FOR CONTAMINATED LAND IN THE EUROPEAN UNION

The Common Forum is an expert group of national and regional regulators from the EU-Member States, Accessing countries and EFTA-countries, specialised in contaminated land management. The latter implies taking into account possible impacts on the surroundings and focussing on turning threats into assets, as land is a precious and limited resource for future development.

Objectives

The objectives of the Common Forum are:

- being a platform for exchange of knowledge and experiences;
- establishing a discussion platform on policy, research, technical and managerial concepts of contaminated land;
- being a platform for initiating international projects among members;
- acting as partner to the European Commission;
- acting as partner to European networks.

European Topic Centre on Terrestrial Environment

The European Topic Centre on Terrestrial Environment (ETC-TE) is one of five Topic Centres designated by the European Environment Agency (EEA) for the period 2001 - 2003 to assist in its work of collecting, analysing, evaluating and summarising information relevant to national and international policies for the environment and sustainable development. The consortium of the ETC-TE consists of 10 partners with Universitat Autònoma de Barcelona (Spain) as the leading organisation. The consortium covers the main thematic issues linked to terrestrial environment and spatial analysis comprising EEA member countries as well as the Phare Accession countries and the Mediterranean candidate countries.

The ETC-TE will concentrate on providing relevant information on past trends, current status and prospective developments relating to land and soil in Europe, in order to support legislative frameworks on sustainable land use, soil protection and integrated coastal zone management. These are priority issues, included in the *6th Environmental Action Programme* and the Sustainable Development Strategy. They will be developed further through specific thematic strategies (on soil, land use and urban environment).

Within the ETC/TE the Federal Environment Agency of Austria is managing the work package on local soil contamination and has experts in the project team on soil sealing and diffuse soil contamination. The main activities include contribution in the field of data collection, contribution to EEA reporting and integrated environment assessment and to indicator development. Focus will be put on the Central and Eastern European Countries by strongly involving these countries into the data collection and indicator development process.

NICOLE - Network of Industrially Contaminated Land in Europe

NICOLE is a network for the stimulation, dissemination and exchange of knowledge about all aspects of industrially contaminated land. Its members come from industrial companies (problem holders), service providers/technology developers, universities and independent research organisations (problem solvers) and governmental organisations (policy makers). The network started in February 1996 as a concerted action under the 4th Framework Programme of the European Community. Since February 1999 on NICOLE has been self supporting, financed by the fees of its members.

NICOLE has organised various workshops and conferences on specific aspects of contaminated site management. NICOLE's newsletter and Web Site provide actual information on all relevant issues concerning contaminated land. Priority research needs have been identified and recommended for inclusion in future R&D programmes. For further information: http://www.nicole.org

AD HOC INTERNATIONAL WORKING GROUP FOR CONTAMINATED LAND

The Ad Hoc International Working Group was initiated in 1993. This initiative involves more than 20 different countries, represented by their national environmental regulators, and international organisations such as FAO and OECD. The Ad Hoc Working Group covers aspects of contaminated land policies, particularly on legislative and administrative aspects. The main purpose of the Ad Hoc International Working Group is to provide a Forum, open to any country, in which the issue and problems of contaminated land and groundwater can be discussed at a national level and information can be freely exchanged to the benefit of all participants.

Contaminated land regulators world-wide provided actual data on various issues concerning national approaches on contaminated land (Vienna Questionnaire 1994, Amsterdam Questionnaire 1996). These questionnaires include information on policy, liability, funding, assessment, prioritisation, and remedial treatment aspects. The reported data was analysed and published by the UK Department of the Environment (1996) and the Dutch VROM (1997). These surveys aim to evaluate the state-of-the-art of contaminated land policies and approaches world-wide and to predict future developments.

NATO/CCMS Pilot Study: Evaluation of Demonstrated and Emerging Technologies for the Treatment of Contaminated Land and Groundwater (Phase III)

The Council of North Atlantic Treaty Organisation (NATO) established the Committee for Challenges to Modern Society (CCMS) in 1969. The CCMS was charged with developing meaningful environmental and social programmes that complement other international initiatives in solving specific problems of the human environment. A fundamental precept of the CCMS is the transfer of technological and scientific solutions and experiences among nations with similar environmental challenges. In 1997 the CCMS adopted a proposal from the USA and Germany for this Pilot Study on treatment technologies. It is the third in a series of Pilot Studies examining remediation technologies, which began in 1986 following an earlier UK led Pilot Study on contaminated land issues in general. It will run from 1998 to 2002, with a final report in 2003.

The Pilot Study is designed to identify and evaluate innovative, emerging and alternative remediation technologies and to transfer technical performance and economic information on them to decision makers and potential users. Innovative remediation projects are selected by the Pilotstudy Group and their performance annually reported. Actual developments in the participating countries are continously reported and published.

The pilot-study published various excellent reports (Proceedings of technical conferences, Final Reports) which are available for download from http://clu-in.com/. All reports are also available at the NATO web site at http://www.nato.int/ccms.

More detailed information and all links are available at the CLARINET-homepage http://www.clarinet.at

2 of 14: Abstract of the second talk given by Dr. D. Müller

CRITERIA AND METHODOLOGIES FOR RISK ASSESSMENT,
THE IDENTIFICATION OF HOT-SPOTS AND DECONTAMINATION PRIORITIES

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Introduction
A major issue for international policies is to find solutions which reduce the costs of dealing with land contamination without compromising public health and water quality or business confidence in the benefits of land regeneration and the sustainable use of soils. During the last decade risk assessment of contaminated sites has been developed and is not any longer just a site-orientated task of hazard and exposure assessment but the heart of a management process. Within this management process more flexible solutions, which still can guarantee a safe environment but also cost-effectiveness, are possible and should underlie an open and structured communication process.

Environmental Quality Objectives
As introduced by the Netherlands in the early 1980ies it is quite common to use generic trigger values or Risk-Based Screening Levels within simplified risk assessments or for setting remediation targets. A comparison of generic trigger values for polluted sites in Europe and North America shows variations of intended parameters as well as a wide range of proposed concentrations. Therefore it is of utmost importance to be well informed about national backgrounds like legislation and to have an insight on the way national RBSL's have been derived.

Major Lines of Risk Assessment
Classic toxicological risk assessment tries to estimate chronic risks of pollutants for humans and assumes longtime to lifelong pollutant exposures. The exposure assessment usually follows the Source-Pathway-Receptor-Paradigm. To work on this approach a 'Conceptual Site Model' has to be developed. It is a tool to identify major exposure routes and mechanisms, to design investigation programs and to revise and reconsider preliminary risk assessments according to new results.

Frameworks for Risk-based Decision Making
Since the early 1990ies a couple of frameworks have been developed to provide streamlined approaches applying risk assessment practices to develop a cost-effective corrective action

process to address potential site contamination issues and integrate mid- to long-term sustainability goals. The US-EPA has been the first to introduce the RBCA-Approach (Risk-Based Corrective Action) for contaminated sites. All frameworks recommend tiered approaches for decision making. It is assumed that one starts with relatively little site data, and therefore uses conservative generic assumptions and sets of generic trigger concentrations. By conducting additional investigation, analysis and modelling, more site-specific knowledge is used in developing subsequent clean-up targets. Basic ideas are that the results are fully protective for human health and the environment, the conservatism is reduced along the tiers and the outcome or solution is cost-effective.

Identification of Hot Spots

Nowadays the growth of cities often brings about that surrounding former industrial areas have to be used for urban development. This brings about a clear need for a cost-efficient approach to manage contaminated groundwater and land. Strategies based on an integral identification of hot spots, considering a complete industrial area instead of individual sites, are under development. Generally starting with a screening of soil and groundwater at the scale of the whole industrial area, and ending with the remediation of hot spots. The major advantage of this approach is that the area to be considered for further investigation and remediation is reduced from one step to the next. Consequently, a large contaminated area is screened but only small high polluted areas may be ultimately remediated.

Decontamination Priorities

In 1980 the US-EPA was the first to set up a list of sites to rank referring to decontamination priorities. Several other industrialised countries built similar systems. The criteria were usually restricted to a pure risk based conception. The observed differences of methodologies were less due to scientific or technical knowledge but caused by different objectives of the prioritisation process itself and simple questions of mathematical aggregation. The experiences gained show that highly sophisticated systems tend to be inflexible and pretend a accuracy. Therefore some countries revise their priority setting methodologies to simplify and to develop new systems not restricted to risk considerations but also incorporating aspects of social and economic needs to redevelop land.

Conclusions

During the last decade risk assessment of contaminated sites has been developed and is not any longer just a site-orientated task of hazard and exposure assessment but the heart of a management process. Within this management process more flexible solutions, which still can guarantee a safe environment but also cost-effectiveness, are possible and should underlie an open and structured communication process.

3 of 14: Abstract of the first talk given by Prof. Dr. M.H. Wong

Ecological restoration of mine degraded soils, an integrated approach

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ABSTRACT

Mine degraded soils are man-made habitat which experience a wide range of problems of establishing and maintaining vegetation, depending on the types of mines such as metal mines, coal mines and quarries. The physico-chemical properties of the degraded soils tend to inhibit soil-forming processes and plant growth. These included absence of topsoil; periodic sheet erosion; drought; surface mobility; compaction; wide temperature fluctuations; absence of soil-forming fine material and organic matter; reduced microbial activity; shortage of essential nutrients; and presence of elements toxic to plant growth. This paper reviews the ecological aspects of mine soil restoration, with special emphasis on maintaining a long-term sustainable vegetation on toxic metal mine sites.

Selection of appropriate plant species:
The normal practice is to choose drought-resistant, fast-growing crops or fodder which can grow in nutrient deficient soils. Some plant cultivars tolerant to toxic metals are available commercially. These "pioneer species" can modify the man-made habitat and render it more suitable for subsequent plant communities. Planting of different grass species, rotating with legumes and native species will be able to restore soil fertility and accelerate ecological succession.

Application of suitable amendments:
Organic wastes such as sewage sludge and refuse or manure compost can be used as soil amendment and to certain extent as a slow release nutrient source. Plant residues (e.g. rice or barley straw) can be used as a mulch to insulate the surface from temperature extremes, permits the soil to absorb moisture and reduce water erosion. Inert materials including colliery spoils and steel slag are very often necessary to serve as insulation layer, to avoid upward migration of toxic elements to the topsoil. Low pH acidic condition prevailing in many mine degraded soils is a major concern for the establishment of vegetation. It is a common practice to apply liming materials to overcome some of the problems associated with acidic condition.

Topsoil quality:
Topsoil is used to cover poor substrates and to provide improved growing conditions for plants. To maintain a good topsoil quality is a must for any revegetation scheme. In addition to a suitable physical property, application of appropriate fertilizers, and inoculation of nitrogen-fixing bacteria and mycorrhiza would facilitate reconstruction of self-sustained ecosystems. The role of other soil organisms, e.g. earthworms in maintaining soil fertility should not be overlooked.

Phytoextraction and phytostabilization:
There is sufficient evidence showing that plants including certain species and clones of trees can remove sufficient heavy metals from soils to clean-up at least low-level contaminated soils. Planting trees such as willows could stabilize mine spoils, by immobilizing toxic metals in soils whilst potentially also providing improved conditions for natural attenuation.

Maintenance of biodiversity and environmental health:
Special attention should be given to restore wildlife communities. Diversified crops and fruit trees should be planted, and agriculture should be integrated with forestry and animal husbandry, appropriate to local conditions. Assessment and monitoring should be made in order to ensure toxic substances are not transferred and accumulated through food chains, if the sites are used for agriculture and animal husbandry purposes.

4 of 14: Abstract of the second talk given by Prof. Dr. M.H. Wong

Regionally Based Assessment of Persistent Toxic Substances

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ABSTRACT

Persistent organic pollutants (POPs) are a subgroup of persistent toxic substances (PTS). The 12 POPs which have received the most attention are the pesticides aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, mirex, and toxaphene; the industrial chemicals polychlorinated biphenyls (PCBs) and hexachlorobenzene (which is also a pesticide); and the combustion by-products dioxins and furans. For example, dioxin is a powerful hormone disrupting chemical and could bind to a cell's hormone receptor, modifying the function and genetic mechanisms of the cell, causing a wide range of effects, from cancer to nervous disorders and to birth deformity. In general, these chemicals are highly persistent, being concentrated in the food chain, accumulated in body lipids, and imposed human health hazard. They may not only lead to losses but also lead to the appearance of new genes and ecotypes, resulting in changes of structural and functional biodiversity. Thus they not only influence mono species, but also populations.

Sound management of chemicals on a global scale is vital. In order to achieve this, it is vital to (1) ensure that all countries have the information, expertise, and resources with which to manage chemicals safely under the conditions in which the substances are actually produced and use; and to (2) help bring about global action when national actions alone will not suffice, as can be the case with aspects of commerce, use, and release of chemicals to the environment.

The Regionally Based Assessment of Persistent Toxic Substances (PTS) project sponsoring by Global Environment Facility (GEF) and United Nation Environment Program (UNEP) has been officially started after diplomats from 122 countries finalized (Johannesburg, 10 Dec. 2000) the legally binding treaty that will require governments to minimize and eliminate some of the 12 persistent PTS. The objectives of the two-year project are to: (1) measure damages and threats of PTS; (2) provide GEF and UNEP rationale to assign priorities for future action on chemical issues; and (3) determine differences in priority among regions. The following results will be achieved: (1) identification of sources of PTS in the region; (2) assessment of impact of PTS on human health and the environment; (3) assessment of transboundary transport of PTS; and (5) identification of regional and global priority PTS environmental issues.

5 of 14: Abstract of the first talk given by Dr. J. Japenga

A Decision Support Tool for polluted site management

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Abstract

A realistic planning of management schemes for polluted sites ideally requires a (semi-) quantitative evaluation of the advantages and disadvantages of different technologies, including bioremediation approaches. To achieve this, a Decision Support Tool (DST), based on the so-called "REC-approach" was developed by scientists and remediation companies in close co-operation with problem owners and decision makers. This "REC-model" has already been applied successfully in the design of management schemes for polluted sites throughout Western Europe.

In the REC-approach a number of potential remediation strategies are compared in terms of Risk reduction, Environmental merits and Costs, for a specific polluted site. Input parameters include a combination of site characteristics (pollution level, soil parameters) and technology characteristics (use of resources, costs). Output parameters for specified target methodologies and for a target polluted site are R-, E-, and C-indexes. These indexes enable decision makers to decide upon polluted site management. This decision can be made on the basis of a "decision rule", agreed upon previously by stakeholders (politicians, land-owners, industries, representatives of the affected population) each having their own priorities. When such a rule was not negotiated before, bargaining between stakeholders is required which can be based on REC-output and additional factors (e.g. public acceptance level, noise).

An emerging technology like phytoremediation is difficult to be introduced into a REC-type DST, due to the number and complexity of natural processes which affect the REC-indices (e.g. duration, efficiency and remediation end-point). Results from an on-going EU-funded RTD project on phytoremediation, however, enabled the development of a REC-based phytoremediation-DST. The resulting "Phyto-DST" is constructed in such a way that it can be inserted as a subroutine in the existing REC-model. Specific features of Phyto-DST will be presented as well as the way it is linked to the REC-model.

6 of 14: Abstract of the second talk given by Dr. J. Japenga

The use of information systems to set soil remediation priorities

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Abstract

It is necessary to set well-argued priorities in the remediation of polluted sites, as company and government funds generally are not sufficient to simultaneously tackle all sites where soil quality criteria are exceeded. When setting priorities the present tendency is not only to look at the degree to which criteria are exceeded, but also to regard additional factors. These factors include (among others):

Actual or planned land use. The urgency of soil remediation is more obvious when dealing with a densely populated area where housing projects are at stake than when dealing with a remote abandoned industrial or mining area. Very important is also the question whether the groundwater near the site is used for drinking water production or whether the soil is used for food or non-food agricultural production.

Risk assessment. When dealing with the same level of pollution, local conditions may be so varying that the urgency of soil remediation of the corresponding sites is very different as well. Heavy metal pollution will have more environmental impact at a site, characterised by a low-sorption sandy soil and a groundwater table near surface than at a site, characterised by a high sorption clay or peat soil and a deep groundwater table.

The main difficulties in assessing soil remediation priorities are:
Frequently, available soil data are not sufficient nor can data be made available easily; soil data include pollutant levels but also data on soil characteristics, land use, groundwater.
Methods to use soil data for risk assessment or to relate soil data to land use are not yet applied on a regular basis.

To solve the first problem, probability calculations (e.g. "kriging") can be carried out, meant to use the scarce data as efficient and accurate as possible. This presentation will not focus on that, because such systems are already available as computer-programmes.

This presentation will focus on how pollutant level maps (resulting from analytical data in combination with "kriging") can be compared in a quantitative manner with general soil maps, groundwater data, land use data etc. Based on a hypothetical cadmium pollution case study, it will

be shown that focusing on (i) groundwater levels and use and on (ii) land use, can lead to different priorities, even for the same polluted area.

7 of 14: Abstract of the first talk given by Prof. Dr. P.K. Wong

Photochemical Treatment of Pentachlorophenol (PCP) in Industrial Wastewater

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ABSTRACT.

Pentachlorophenol (PCP) is a polychlorinated hydrocarbon and a common wood preservative that was used in large amount in the past. Unfortunately PCP is toxic to various organisms and has been classified as a B2 probable carcinogen by the USEPA. There is an urgent need to remove or detoxify PCP in the contaminated environment. In the first part of this study, optimal physico-chemical conditions of PCO for the degradation of PCP were determined. The optimized conditions for PCO to degrade 100 mg/L of PCP were: 200 mg/L of TiO2, 6.7 mM of H2O2, 17 mW/cm2 of UV (365 nm) intensity and pH 10. After 60 min of PCO treatment, 100% of PCP was degraded and total organic carbon (TOC) reduction was more than 95%.

In the second part of this study, the pathway of PCP degradation by PCO was elucidated by determining the intermediate(s) and degradation product(s) by gas chromatography/mass spectrometry (GC/MS) analysis of the samples collected at various time intervals during the PCO process. The major intermediates were tetrachlorohydroquinone (TeHQ) and tetrachlorobenzoquinone (TeBQ).

In the final part of this study, in order to ensure the detoxification of PCP by PCO treatment, Microtox® and amphipod survival tests were employed to determine the toxicity of the samples collected at various time intervals during the PCO process. Results of Microtox® test showed that the toxicity of PCP completely removed after 60 min PCO treatment, while residual toxicity to the amphipods was still observed for the sample treated for 60 min.

8 of 14: Abstract of the second talk given by Prof. Dr. P.K. Wong

Wastewater Treatment in Hong Kong

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Abstract

Everyday, the people in Hong Kong produced more than 2 million cubic meters of sewage that is enough to fill up 1,2000 Olympic-size swimming pools. Most (about 98%) of sewage produced is being collected and treated in plants with preliminary (screening), primary (screening and sedimentation), or secondary (biologically convert degradable organic compounds to inorganic compounds to reduced biochemical oxygen demand (BOD) treatment. In this talk, I will focus on the secondary (biological) sewage treatment in which "activated sludge" process forms the core.

The first part of the talk introduces the major types of pollutants carrying by wastewater and their potential problems to human and the environment. Then a brief review on the Hong Kong government policies to control water pollution is given. The second part of the talk focuses on the goals, degree and types of wastewater treatment and the major methods involve in different types of wastewater treatment are discussed. The details of each step of secondary sewage treatment using "activated sludge" process are described. The last part of the talk reports some new development of wastewater treatment in Hong Kong.

9 of 14: Abstract of the Country report of P.R. China

Yongming Luo

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China has recently experienced massive industrial development and economic growth. Rapid economic development has accelerated rural industralisation, urbanization and expansion of small towns and infrastructure construction over the country. Adjustment of agricultural structure further speeds up the changes of land use patterns. All those changes resulted in significant decline of national agricultural land. Meanwhile, the population of the Asian countries still grows at high rate. The heavy and over-application of chemical fertilizers and pesticides for the increasingly intensive agricultural and aquaculture production, the uncontrolled discharge and irrigation of polluting industrial and livestock effluents, and the unregulated disposal of the ever-increasing industrial, municipal, domestic and agricultural wastes have posed additional deteriorating land, water and marine environments. Besides the agricultural sources, the industrial emission and vehicle exhaust have also caused severe air pollution. In the South-East coastal areas of China the environmental quality degraded and deteriorated due to combination and/or mixed pollution.

The river eutrophication, lake algae blooming and estuary red-tide incidents resulted in not only difficulty in drinking water but substantial economic loss due to the vast amount of fish killed. Soils and sediments acting as sinks for both organic and inorganic contaminants represent a potential time bomb for the agricultural and aquatic ecosystems. Millions ha land has been contaminated

with toxic chemicals such as heavy metals and persistent organic substances (eg., organochlorine pesticides, PCBs, PAHs and dioxin). Environmental and public health has become a major environmental issue in China in view of the rather common food contamination, health hazards and biodiversity changes by the persistent toxic substances.

In China agronomically and/or chemically based traditional mitigations of polluted sites have been used. Recently much interest has been increasing paid to bioremediation technologies for polluted land and waters, but still in early stage. Phytoremediation by using native hyperaccumulator plants has been particularly focused on as a new and potential environmental biotechnology. However, the criteria and guidelines, environmental regulation and policy for clean-up activities as well as sound bioremediation technologies are urgently and largely required in the region.

Several academic institutions and foundations in China are recently responsible for sponsoring research projects of bioremediation. The Ministry of Science and Technology of China funded first major bioremediation program in 2001: Phytoremediation of soils contaminated with heavy metals, and will funded other major programmes in 2002: Bioremediation of drinking water, large-scale freshwater lakes and estuary. The National Natural Science Foundation of China has also funded a number of research projects on bioremediation. The future remediation initiatives in China may include: (1) bioremediation of soils and groundwater contaminated with petroleum and persistent organic pollutants; (2) bioremediation and restoration of mined, landfill and wetland sites; (3) bioremediation and recovery of solid wastes; (4) key factors and criteria for evaluation of bioremediation techniques; and (5) guidelines for bioremediation and management of polluted or bioremediated sites.

Using natural green resources to remedy artificially polluted habitats should be encouraged. Phytoremediation and its hybrid technologies are emerging as green environmental technology with a huge profitable but heavily competitive market in China and other Asian countries. However, bioremediation and eco-restoration of polluted land and water should also be emphasized for sustainable agriculture and environmental and public health in Asian countries.

10 of 14: Abstract of the Country report of Cambodia

Mr. Chrin Sokha

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ABSTRACT

The Kingdom of Cambodia has abundant natural resources for serving the national development field. Besides natural resources, the Kingdom of Cambodia also designated agricultural sector that plays important roles in development processes, including nutrition in according to more than 85% of people are farmers. Industrial, tourist, transportation, etc., are crucial sectors for the national development.

Indeed! Above captioned development sources are raised in the Socio-Economic Development Plan 2001-2006 (SEDP). Environmental management and protection is a vital tool to accomplish the SEDP 2001-2006 in a sustain manner as well as to achieve the Government Policy on Poverty

Alleviation. Vice versa, development will become either devastation or to deplete environmental quality, if development occurs without consideration of environmental maintenance and protection.

The Royal Government of Cambodia is now taking much attention to deal with the environmental quality management. Environmental legal instruments are evidently established such as: (i) Law on Environmental Protection and Natural Resources Management; (ii) Sub-Decree on Water Pollution Control; (iii) Sub-Decree on Solid Waste Management; (iv) Sub-Decree on EIA Process; and (v) Sub-Decree on Air Quality and Noise Pollution Control. Although based on these legal instruments, within the implementing process, the Ministry of Environment still confronts with many constraints that requires improvement. Capacity building, institutional strengthening, and key stakeholder participation as well as the cooperation among concerned ministries/ institutions and international organizations and NGOs, and with other countries in the region, all these are key elements aiming at phase out the above constraints.

In addition to self-environmental management, Cambodia also gets involve with Stockholm Convention, Montreal Protocol, Basel Convention; 1995 Mekong Agreement, etc. It is clarified that Cambodia is considered not merely adverse impacts on its territory, but also for other countries in the region/world.

As conclusion, the socio-economic development, including poverty alleviation will be proceeded forward successfully while environmental pollution is recognized and phased out.

11 of 14: The Country report of Lao PDR

Environmental Pollution Problem in Lao PDR

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I. INTRODUCTION:

The Lao People's Democratic Republic (Lao PDR) is a centrally located country in South-East Asia with a land area of 236.800 Square Kilometers. The country shares borders with Cambodia, China, Myanmar, Thailand and Vietnam. About two thirds of the country is mountains.

The Lao PDR has a population of 5.5 Million (2000), which is currently increasing at annual average of 2.5 %. Population density remains one of the lowest in the region, at 19 inhabitants per Km2. About 80% of the population live in the rural areas and are engaged in agriculture, broadly defined to include farming, livestock, fisheries and forestry.

The Lao PDR is a tropical country. The climate is tropical and dominated by the southwest monsoon, which brings high rainfall, high humidity and high temperatures between mid-April and mid-October. While over 70% of the rainfalls during the wet season, the climate is characterized by high inter-annual variability with relatively frequent occurrence of flooding and drought. Average temperatures range from around 20°C in the mountainous areas and on the highland plateaus to 25°C-27°C in the plain.

Forest resources are an important source of income, construction material, fuel wood and other non-timber product in the Lao PDR. The total forest area of the country is 11.17 Mha, covering 47% of the total land area. 80% of domestic energy consumption in based on fuel wood. The last three decades forest areas have been decreased due to many causes, such as: shifting cultivation practices, poorly planned logging activities, forest fire and other.

The development of the economy is heavily reliant on the primary sector. Agriculture is the principal economic sector in the Lao PDR, accounting for 56% range of activities from subsistence production to agriculture-related industries. Approximately 3% of the total areas are under cultivation, 81% of which is devoted to cultivation. Since the New Economic Mechanism was adopted in 1986, income from industrial and tourism sector have been increased. The industrial and service sectors account for 17.5 and 24.0 percent of the Gross Domestic Product, respectively.

Environmental Pollution Problems in Lao PDR:

The main environment issues in Lao PDR is rapidly decreasing the amount of forest due to intensive slash and burn shifting cultivation of the upland and high land farmers, expanding commercial exploitation of forests, poorly planned logging activities, forest fire and domestic demand for non timber forest products for food, with growing population. As a result , loss of biodiversity, landslide, soil erosion particularly at the rivers bank. Moreover, the increasing of industrial and number of population leads to urban environment problem such as solid waste, waste water and air pollution.

At present the air and water pollution in Lao PDR is not serious problem because of slowly economic development, the industrial sector has been not highly increased and the density of population is still low.

Air pollution :

Agriculture and forestry are the most important sector that cause of air pollution in Lao PDR. The effect of the expansion of permanent agricultural land and the intensive slash and burn shifting cultivation of the upland and highland farmers, mismanaged logging and conversion of forestland to other used under rapid population growth had contributed to the depletion of Lao PDR forest resource. In the last three to four decades, the country's forest cover has decreased significantly from 70% in 1950 to about 47% in 1989. According to the Department of Forestry in 1999, there are about 300,000 ha of forestland is cleared annually by shifting cultivation practices concomitant with forest fire.

These activities lead to increase the amount of CO_2, SO_2 and NO_x in atmosphere that cause of air pollution in Lao PDR such as green house effect, smog and etc.... Mostly, the event of smog happened depend on season for example it was started in the end of dry season and disappeared when it's ran. In mid 1999, there was the smog event from forest fire in Namlike reservoir areas. The sky was cover with smog and the cars had to use light in daytime. About one week this event became to disappear and it was not find that this event risked to people health.

Air pollutant caused from transport sector such as dust, smoke and gas were particularly a problem in urban areas and big city. The largest contributions come from combustion of fossil fuels of motor vehicle traffic.

According to inventory emissions of GHG, Energy is major source of CO_2 emissions in most of country, which the largest contributions come from wood burning for space heating of single-family home.
Anaerobic decomposition of organic matter by methanogenic bacteria in solid waste disposal and the handing of wastewater streams with high content of organic matter including domestic and commercial wastewater and some industrial wastewater stream can emit significant amount of methane to the atmosphere

There are 582 industrial establishments in the Lao PDR, most of these are small and middle size but it is difficult to know the exact quantity of the emission of air pollutants from these sources, because most industrial units are located in different places. Among the more important industrial enterprises, which might cause emissions of air pollutants are cement factories, a paint factory, paper mills and bricks burning facilities because all of these factories didn't use technologies and install the necessary air pollution control facilities.

chemical Pollution:
Current situation of Pesticide and POPs Management in Lao.

Persistent organic pollutant use in the agricultural, health (for Vector controls) and industrial (PCBs)sector.

Pesticide in the Agricultural Sector.
There is no manufacturing in Lao PDR, all pesticides are imported into the country. Before 1988 the Ministry of Agriculture and forestry is the sole institution responsible for pesticides imports.

Presently pesticides are imported through three channels: 1) state company, 2.) private company, 3) smuggling into Lao PDR by traders of farmers.
Now to protect ecological environment, the Government of Lao has prohibited and restricted some pesticides that pose risks on human health or pollute environment, so far there are 26 pesticide, which were banned and prohibited to import.

The very important sector using POPs is agriculture, in 1998, Ministry of Agriculture and forestry has issued the regulation on management and usage of plant protection products, which ban the use of the most dangerous agrochemicals and prescribes the rules for handling as follows:
to curb and restrict the use of sub-standard hazardous Plant Protection products in order to protect humans, plants resources, animals and environment of the Lao PDR.

to prescribe rules and standards as well as techniques for the usage of plant production products in the Lao PDR, the ultimate purpose is the protection of human health and the environment, as well as the support to increased economic activities in connection with the expected increase in the use of chemicals.

Outdate agrochemicals:
The biggest event in the disposal of outdated agrochemicals was the dumping of approximately 32,5 tons of obsolete pesticides in 1995. At that time, there was no regulation pertaining to the protection of the environment from chemical pollution. The consignment of agrochemicals consisted of Monocrotophos, Malathion, DDVP, Aldrex, Lonacol (Zeneb), Dithane M-22 (Zaneb) and copper oxychloride. The burial site is located near the municipal garbage dump of Vientiane Municipality, 18 km from the town.

War time defoliants in Laos:
The Lao PDR is one of the most heavily bombed countries in the world. During the Indochina war from 1964 to 1973 Laos was subjected to both ground battles and aerial bombing .In that period a total of 580.344 bombing missions were launched on the country, dropping more than 2 million tones of explosive ordnance. The bombing equates to one planeload of bombs being dropped every eight minutes for nine years. up to 30% of these munitions failed to function according to their purpose, living a legacy of widespread unexploded ordnance (UXO) contamination that still causes death and injury.

Active agents used in ware time defoliants, dioxins and furans, are mentioned under POPs, because they do not originate from Economic activities of our country.

Defoliants, such as Agent Orange (one contaminant of it being dioxin 2,3,7,8 – T4CDD) was widely sprayed along the Ho Chi Minh Trail in the border area between the Lao PDR and Vietnam. From 1994 – 1998, a dioxin survey of sample area (Aloui Valley in Thua Thien Hue Province, Central Vietnam) bordering to the Lao Province of Sekong was carried out found widespread sighs of contamination in humans, animals, plants, water and soil. A proposal for in-depth surveys in sekong province was presented to international donor and is awaiting for approval. Lao UXO (1999), based on the U.S. Humanitarian Demining Office's herbicide mission report, further concluded that spraying mission were also undertaken in the central Lao province of Savannakhet, covering the districts of Vilabouly, Sepon, Phine and nong.

For the visual evidence, one can conclude that the Lao PDR was also affected by Agent Orange. This is further indicated by documentation on aerial herbicide spray missions from 1965 to 1971 which record spraying over Lao territory.

Because the study in Vietnam indicated that contamination is of a level, which in other countries would justify the marking of an area as off limits, it is war time spraying missions indicate that planes often operated on both sides of the Lao and Vietnam Border.

Furthermore, Contamination was found heaviest in the vicinity of former US air bases on of such bases was located in Tateng Distric, Sekong province. It remains to undertake a survey there as well.

The main of those surveys shall be the development of dioxin mitigation plans for local villagers the ones being most affected by the toxin.

Analytic Facilities.
Main laboratories are all located in Vientiane Municipality. There are three out of six laboratories capable of heavy metal analysis. Regarding the survey of PCDD/PCDF it is understood that only a few laboratories in the world are capable to do reliable analysis.

III. Environment Reguratory Framwork and National Policy Structure:

The Lao PDR has been realized that Environmental pollution is not only the international problem, which requires a common response, but it was also the national problem and it is necessary to prevent and control the problem in early.

III.1 Legislation:

The government's policy is to integrate environment environmental concerns into other development planning, particularly the national socio-economic development plant and developed strategies to protect environment.
There are number of legislation which are either directly of indirectly associated with pollution and natural resource management in Lao PDR, such as:

National constitution (Adopted August 14, 1991, article 17): All Lao citizens must protect the environment and natural resources: land, subterranean, forests, fauna, water source and atmosphere.
Law on Water and Water resources (Promulgated in 1996).
Forest Law (Promulgated in 1996).
Land Law (Promulgated in 1997).
Mining Law (Promulgated in 1997)
Environment Protection Law (Adopted April 3, 1999, chapter III): Pollution control

The Lao PDR has been cooperated with other countries and international agencies to protect environment as well as an atmosphere such:
Party of Convention to Combat Against Desertification (December 19, 1996)
Party of Framework Convention on Climate Change (January 5, 1995)
Party of Convention on Biological Diversity (December 19, 1996)
Party of the Montreal Protocol on Substances that deplete the Ozone Layer (August 11, 1997)
Party of Vienna Convention for the Protection of the Ozone Layer (May 1998)

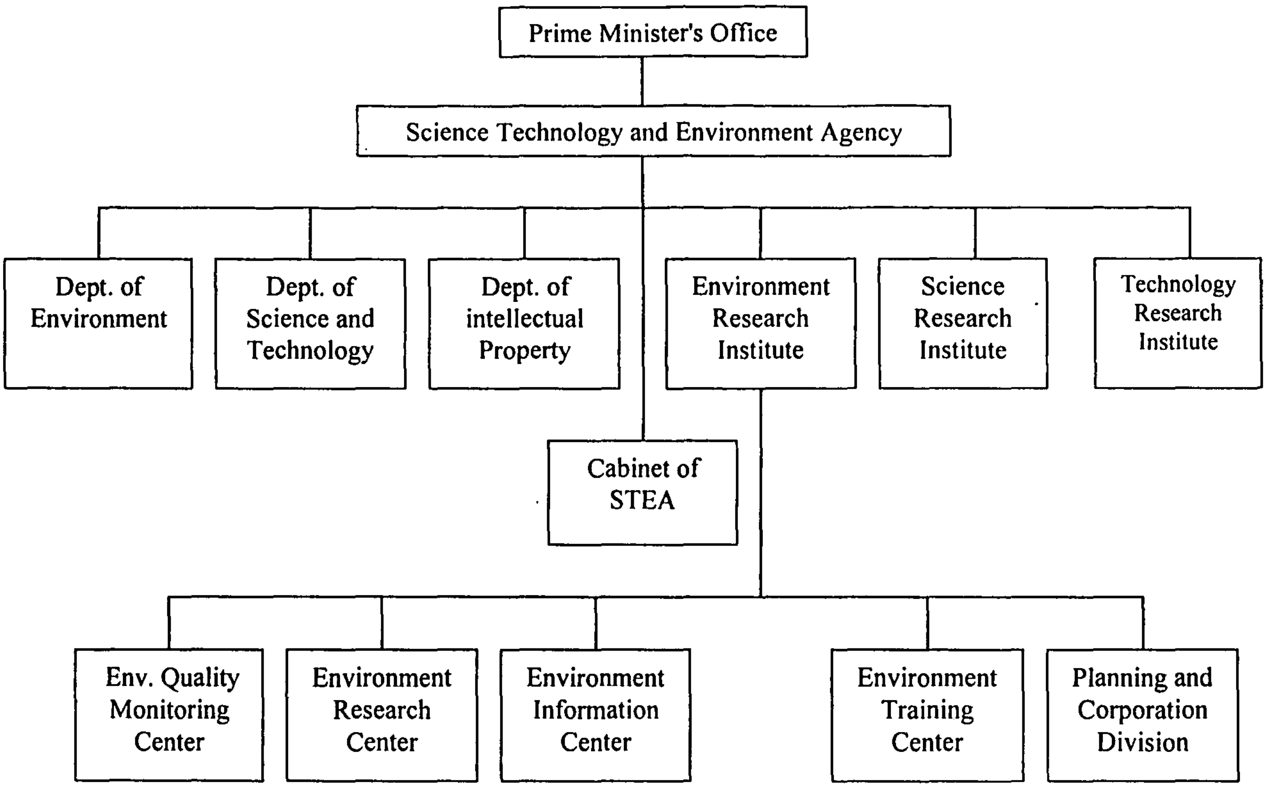
III.2 Monitoring System:

The mandate for inspection, survey and the introduction of rules relating to management and control of Environmental pollution on macro-level rests with STEA (Science, Technology and Environment Agency). Other Ministries have the responsibility to issue regulations and follow up, monitor and control Environmental pollution problem, which are caused from their own sector.

Now, it is difficult to monitor Environmental pollution because the Environment quality standard for pollution control in the national level has not been developed yet. And an analysis of Environmental pollution in the Country could not be done because of a lack of funds and experience in this field.

To protect environment in Laos, the government had set up Science Technology and Environment Organization-STENO in 1973, which has duty to protect the Environment in National Level. And in 1999 the government has approved and enacted the Environment Protection Law. This Law defined strong power to STENO to protect Environment. To implement this law, STENO was reorganized and changed STEA, which consist of 3 departments, 3 Institutes and 1 cabinet. Beside that, the Environment Quality Monitoring Center was established and has in charge of Environment Research Institute. This Center plays role to monitor and control pollution in all country as well as setting Environment Quality Standard.

ORGANIZATION STRUCTURE



IV.Conclusions

Environmental Pollution Problems are not evident in the Lao PDR because of its early stage in development. The most important sector that caused to Environmental pollution was agriculture and forestry sector. The majority of the population didn't have awareness about Environmental pollution. The Environment Quality Standard at national level has not been developed yet and an analysis of the pollutant emission could not be done yet due to lack of funds, equipment, instruments and skilled staff to deal with this matter.

12 of 14: The Country report of Mongolia

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Among the temperate zones of the Northern Hemisphere, few nation compare to Mongolia in the size, diversity and health of its natural ecosystem. Though altered by human activity, Mongolia still contains relatively intact examples of Asia's deserts, steppe, forests, and mountain, and the wild creatures and plants that inhabit them. However, as Mongolia undergoes a massive socioeconomic transformation. Threats to the natural areas, flora, and fauna are rapidly mounting Ecologically, Mongolia occupies a critical transition zone in Central Asia: here the great Siberian taiga forest, the central Asia steppe, the high Altai Mountains and the Gobi desert converge large distance and high mountain chains separate the country from the oceans.

Since 1995 in Mongolia has established legal framework for environmental protection. Environmental laws in Mongolia, as it is over the world, is a vast subject converting all the major natural resources and government bodies, which manage them. Mongolia has a long and rich environmental legal tradition by dating back to the time before Chingis Khan.

In 1991, Mongolia reaffirmed its commitment to this tradition by enacting a new Constitution guaranteeing the right of all Mongolian citizens to live in clean and healthy environment. Since that time Mongolia Government has been actively developing a legal framework capable of conserving natural heritage while the same time responding to the demands of the newly introduced market economy. The Mongolia law on environmental protection is the umbrella law for all environmental and natural resources laws in Mongolia government policy is reduction of air, water, and soil pollution particularly in urban areas. Hereby environment pollution problems of Mongolia.

AIR POLLUTION

Air quality is a significant environmental problem in urban areas of Mongolia, particularly in Ulaanbaatar. Primary sources of air pollution in are three Ulaanbaatar thermal power plants, about 200 small and medium sized heating boilers, about 60000 traditional gers and wooden houses, and over 40000 automobile. Topography and meteorology exacerbate ambient air quality condition in the country, and particularly in Ulaanbaatar. Mountains surround Ulaanbaatar up to 2250 meters in height-inhibited dispersion of pollutants. To compound the situation, a stable atmosphere inversion forms during the winter season. As a result, ambient pollution concentrations often remained for days or weeks at the time to exceed Mongolia and other international ambient air quality standards. Burning of coal and woods in the household in urban cities has been identified as major sources of air pollution, which affects ambient air quality and human health.

Air pollution problems in can be attributed to power generation, growth of vehicles and industrial activities.

ENERGT: during the winter season, three large diesel power plants in releases 4.5million cubic meters of gaseous pollutants, 4.14 tones of particulate matter, and 6.76 kilograms of carbon monoxide into the air every hour. The energy sector accounts for around 64% of Mongolia's green house gas emissions. More than 250 steam boilers burn over 400000tones of goal every year. Gers and wooden houses with manual heating, use over200000otones of goal and more than 160000cubic meters of fuel wood each year. For the cold season the atmosphere content of carbon monoxide exceeds the permissible norm by 2-4times.

TRNSPORTATION: transportation is the major source of air pollution in urban cities. The number of motor vehicle has increased vary rapidly in big cities and settlements in a short period of time. In 1955, it was estimated that over 60% of the vehicles emitted pollutants exceeded the maximum allowable limits.

INDUSTRY: Industry activities are also one of the major source of air pollution in Mongolia. As an estimated approximately one fourth of greenhouse gas emission is emitted from industrial activities. Urban air quality is monitored to assess sulfur dioxide and nitrogen dioxide concentration at 20 stations in 16 cities. In Ulaanbaatar, there are 4 air quality-monitoring stations. The level of air pollution in Ulaanbaatar varies across the districts, depending on pollution sources, contents of emission and meteorological conditions. During winter season, occurrence of temperature inversion increase air pollution level in the city. Corresponding to a rise in number vehicles concentration of nitrogen dioxide (NO2) has been increasing over the years.

It is reported that the air pollution in Ulaanbaatar and other cities has affected human health. Acute respiratory diseases, tuberculosis and other lung disease are reported to be higher during winter in Ulaanbaatar. For instance, respiratory diseases of children under 5 years old is 2-3 times higher than rural areas.

Problems associated with air pollution have been recognized under the air (pollution) Act adopted in 1995.Under the act, the government is mandated to regularly undertake air quality monitoring and provide information to concerned organization and the public. The provision in the act include the permit based on the volume of discharge, restriction on air pollution discharge and hazardous impacts, and provisions for the actions to reduce Greenhouse Gas discharge and ozone layer protection

The Government has undertaken many measures to control air pollution that include:
Substantial activities are being undertaken to replace old household stoves with advanced ones under the assistance of GEF/World bank.
Emissions from all vehicles were measured in 2000 and this activity would be continued over the years.

The government has also planned to seek donor assistance for the reduction of air pollution in capital in capital city and other towns through-
Local manufacturing and utilization of gas emission filters and catalyzing tools, establishment of special laboratory for control and analysis of transport emission.
Manufacturing, promotion and distribution of cost efficient and low smoke stoves for household living in a ger.
Establishing local set up for manufacturing pollution control devices.
Setting up special laboratories for measurement and analysis of transport emission.

WATER RESOUCE AND POLLUTION
Mongolia has more than 3800 rivers and streams with regular run-off, creating a waterway network of 6,500 km. In addition, 3500 lakes and 186 glaciers add up to a total surface water volume of 63 million cubic maters. Despite such abundance, only half of the surface water resources are available for industrial, agricultural and human use, and they apply only 20% of the total water consumed.

Domestic sewage, industrial effluents, agricultural run-off, and untreated solid and dry waste are polluting surface and groundwater in Mongolia. In addition, improper storage and use of chemicals and fertilizers, and violations of regulations to protect sanitary zones further exacerbate the problem. To date, 60 percent of the total population is served by public water system, and 25 percent of it has access to sanitation. Most urban centers possess a centralized wastewater collection and treatment facility, however the majority of this infrastructure is in poor condition at full capacity. There is no sewerage of wastewater collection system in ger areas. Each plot has pit latrines, which are usually crudely constructed, resulting in odors, flies and possible ground water contamination. The natural purifying capabilities of rivers in Mongolia are limited by seasonal variations in flow, and freezing winter temperatures. In the past 10 years, the quantity and quality of ground water have also been adversely affected by pollution. Increasing groundwater use and slow or declining aquifer recharge have leg to saline intrusion and pollution of groundwater from domestic sewage, factory waste and agricultural chemicals. Water quality monitoring is extremely limited or non-existent in many parts of the country, and treatment system are lacking, thus posing a significant health treat.

The Government is moving to incorporate the polluter-pays-principle into its policies. The Law on wastewater discharges fee is awaiting parliamentary approval. Over the past 5 years several development programs have rehabilitated and upgraded the infrastructure for water supply and sanitation in an attempt to improve service delivery throughout the country. National water quality standards for both rural and urban water supply are being reviewed, and equipment and training for water quality testing are being updated. The Government has also developed the Tuul River Pollution Mitigation Action Plan to assess the river's pollution, and design and implement pollution mitigation activities.

SOLID WASTE

According to 1999 data, Mongolia's Waste situation in terms of the origin, collection, transportation, storage, recycling, minimization or elimination of waste (not including Ulaanbaatar), there are 448 waste disposal points covering 31.54 hectares of land. 500 thousand cubic meters of waste is produced in Ulaanbaatar City annually and is disposed at three points. Due to lack of sufficiently organized waste disposal structure in the country unit recently, the land beneath urban areas is polluted heavily and this pollution presents a significant risk to public health and the environment. Current waste recycling, treatment and reuse actions have not been implemented properly. There are a limited number of businesses involved in producing items such as household soap and toilet paper from reusable waste, such as bones, glass, paper and metals.

TOXIC CHEMICALS AND HAZARDOUS WASTE MANAGEMENT

A system for classifying waste according to its harmful, toxic, and infectious characteristics and specifications and the need for treatment urgently needs to put into practice. Industries and other economic entities have been importing various chemicals without adequate control or permission. This situation creates a significant health hazard to the Mongol people exposed these waste. Tough control should be imposed that classify the wastes, their specific origin, and types of harms and health and environment hazards associated with the particular substance. It is important to strengthen and further develop a system of strict controls over the internal transportation and the Tran boundary movements of hazardous waste. Of equal importance is the development of an effective system of monitoring and disposal of medical wastes since pose substantial risk for the spreading of infection diseases through the population.

Mongolia is committed to Agenda 21 in order to pursue the sustainable development objectives in the 21st century. Development took place in the past decades has put pressure on country's natural resources and environment. Government policy on environment was developed in 1997 to protect the environment and natural resources through legal mechanism as well as economic tools. Socio-economic policies are also being reformed to enhance the sustained economic growth through ecologically sound technology and production of high quality goods.

While the economic development is important to improve the quality of life people, strong policies, planning and institutional mechanism would need to preserve environment and natural resources. A strong partnership amongst government, business and civil society would be required to bring about the desired positive changes. The government of Mongolia is committed to achieve the goal of sustainable development.

13 of 14: Abstract of the Country report of South Korea

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In Korea there're many sites that are contaminated with hazardous materials such as heavy metals, petroleum, or organic solvents, etc. Most of them are resulted from carelessness during industrial activities and leaking from underground storage tanks or pipelines. Recently it has been also reported many contamination problems in military bases including USF bases. Little is open to public and most contaminated sites are classified. Even in contamination problems in industrial complexes have been also kept classified.

In 1996 "Soil Environment Preservation Law" has been initiated by the Ministry of Environment and it has been revised in 2002. It defines the standards for maximum contamination levels of various organic contaminants and heavy metals, etc. in soils. There have been many research funds from the government on environmental technology development; however, no major national fund has been initiated yet for clean-up activities.

Many remediation technologies have been developed and modified through governmental and commercial research projects. Various soil remediation processes, physicochemical and biological processes, have been also introduced to Korea from foreign countries and they have been properly modified to apply to Korean soil environment. For petroleum/organic solvent contaminated sites SVE, bioventing, soil washing/flushing, chemical oxidation and/or bioslurping have been mostly used either under in situ and/or ex situ conditions. Land-farming or composting technology has been also applied to remediation sites. For heavy metal contaminated sites soil washing and flushing processes have been applied although most of them are rather small scale processes. Along with remediation technologies, Environmental Site Assessment (ESA) and site monitoring technology also have been developed and modified for better site remediation.

To develop remediation technologies and governmental policies regarding on soil contamination tremendous efforts have been applied in Korea recently; however, more public awareness and international cooperation are required to solve environmental pollution problems.

14 of 14: The Country report of Thailand

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A1. Environmental Pollution Problems in the Country

A1.1 Topical Pollution Problem:
Contamination of land with hazardous chemicals has caused health problems in a many locations across Thailand. These have included:
Arsenic contamination of soil, surface water and groundwater from tin ore mining at Ronphiboon;
The outbreak of black fever was found in Ronphiboon, Nakhon Sri Thammarat province caused by arsenic (As) contaminating in drinking water wells. This contaminant was the by-product of Tin and Wolfram mining, and released to the environment. It was reported that As in some wells was 50-100 times more than the standard (The standard = 10 μg/l). The site was cleaned up by off-site secure landfill and has been monitored continuously.
Dioxin and pesticide contamination of soil at the Bo-Fai airport;
2,4-D, 2,4,5-T, dicamba, arsenic and dibutyl disulfide and dioxins were found underground during expanding the runway in Bo-Fai Airport, Prachuabkirikhun. The site was cleaned up and the chemicals were treated by secure landfill.
Lead contamination of surface water and sediments at Huey Klity;
The mine had produced lead contaminating in sediment and water in Kli-Ti Creek in Kanchanaburi province. The chemical in water was about 3 times more than the standard, which is 0.05 mg/l. Moreover, in the sediment, it was found that the average amount of lead was about 28,300 mg/kg, which is 71 times over the limit. Also, it was reported that lead in fish down the creek had almost 13 times more than the standard. The site had been cleaned up. The 10,000 tons of sediment were taken to secure landfill.
52 former municipal waste disposal sites generating leachate contaminated with heavy metals and approximately 7,000 more unlined sites currently in operation;
Insufficient hazardous waste treatment facilities, resulting in over 1 million tons per year being disposed of with inadequate containment;
Illegal dumping cases; and
Chemical accidents and spills.

A1.2 Transboundary Impacts of National Contaminated Sites:
Thailand doses not have transboundary impacts. Because Thai government does not have the permission for transporting hazardous waste - both in and out country.

A 1.3 Priority Sites to be addressed Under International Co-operation
Ronphiboon Tin Ore Mining
For over 50 years tin ore mining in Ronphiboon district, Nakhon Sri Thammarat province has caused arsenic contamination of the adjacent watercourses and groundwater. The contaminated water was used by local residents, causing skin diseases, including alternate pigmentation. Hyperkeratosis of palms and soles, purplish-red flush and skin cancer.
Monitoring of arsenic contamination in surface water, groundwater, river bed sediments, soil and agricultural products has been conducted since 1988. Ore residues were collected and stabilized by using lime, then placed in a secure landfill for safe storage. Former mining areas have been covered with soil and planted with trees to prevent arsenic being washed to the surrounding areas.

However, the local residents are still living there. Thai government has to distribute clean drinking water to them. So, Ronphiboon site needs the better remediation technology for soils and water in order to give a better life for local residents.

A 1.4 Register/Inventory of Contaminated Sites

In 1988, the Pollution Control Department conducted a study of municipal waste disposal sites across Thailand. The survey included sites in the following areas:
Eastern Region, 10;
North-Eastern Region, 10;
Upper Southern Region, 14;
Lower Southern Region, 15;
Western Region, 13;
Central Region, 26; and
Northern Region, 26.

To assess the severity of leachate contamination, surface water and groundwater monitoring was conducted at selected disposal sites. Modeling was developed to simulate and assess leachate contamination. It was found that there were a significant health risk when groundwater supply wells were immediately located down-gradient from disposal sites.

A Hazard Ranking System (HRS) was developed by applying the U.S.EPA method. The assessment process focussed on the surface water and groundwater exposure pathways. Three risk factors were potential for migration, waste characteristics and potential receptors. The selected sites were then ranked. It was recommended that fifty-two sites were needed to remediate to reduce leachate generation.

A 1.5 Monitoring Systems

An operation municipal landfill required ongoing monitoring of surface water and groundwater to ensure that site operations did not impact on the health of the surrounding community or environment.

Six groundwater monitoring wells were installed and three surface water sampling sites were identified. These points were sampled on a six-monthly basis, with a report prepared each year. The water samples were tested for pH, electrical conductivity, heavy metals (iron, copper and lead) and nutrients (Biological Oxygen Demand, Sulfate and Nitrate).

The sample results indicated that there was some leaching of contaminants from the landfill. However, this was unlikely to have any health impact on the surrounding area. Regular monitoring will be continued up to approximately ten years after the landfill has been closed and a final capping layer has been installed.

Although, Thailand does not have any monitoring systems with regard to bigger contaminated sites or any means of observing their impact on long distances, over national boundaries. But Pollution Control Department has a chemical emergency response team who will control the situation, clean up, and remediate the site. And the site has to be monitored to ensure that the contaminants do not pose any problems on to human health and environment.

A 2. Environmental Regulatory Framework and National Policy for Cleanup Activities.

A 2.1 State Policy and Specific Legislation for the Management of Contaminated Sites.

Thailand does not have any specific legislation for the management of contaminated sites. However, we have some sections of existing laws that can apply to contaminated sites. They are shown as the followings.

The Enhancement and Conservation of the National Environmental Quality Act A.D.1992

For the purpose of environmental quality enhancement and conservation, the National Environment Board shall have the power to prescribe by notifications published in the Government Gazette the following environmental quality standards:
Water quality standards for river, canal, swamp, marsh, lake, reservoir and other public inland water sources according to their use classifications in each river basin or water sources according to their use classifications in each river basin or water catchment.
Water quality standards for coastal and estuarine water areas.
Groundwater quality standards.
Atmospheric ambient air standards.
Ambient standards for noise and vibration.
Environmental quality standards for other matters,

Environmental quality standards already issued under this Act include surface water and groundwater. It is proposed to issue a soil quality standard under the Act.

Public Health Act
Factory Act
Minerals Act
Town Planning Act
Hazardous Substances Act
Atomic Energy for Peace Act

A 2.2 National Funds for Clean-up Activities

Thailand has a national fund for clean-up activities, which is managed by Office of Environmental Policy and Planning (OEPP), Ministry of Science, Technology and Environment. It has supported over 50 projects that cost about 10,000 million baht. The projects can be classified into two types. The first one is wastewater treatment (70-75%). The second one is solid waste disposal management (20-25%).

But the fund does not have enough budgets to support other projects now. This is resulting from local authority management that cannot make a profitable from their wastewater treatment system and/or solid waste disposal landfill. Moreover, other municipalities have sought to establish new municipal landfills and have been prevented by public opposition. Some of these had already purchased land, and were prevented from constructing the new landfill.

A 2.3 Bilateral Agreements/Programmes for Clean-up Activities.

A 3 Technological Background

A 3.1 Technical background in the field of environmental protection and recovery.

There is now only one private company available to treat hazardous waste, which is "General Environmental Conservation Public Company Limited (GENCO)." The company has an R&D laboratory to test and improve the efficiency of treatment methods.

A 3.2 Informatic Infrastructures/Networks

There are no informatic Infrastructures available for the gathering/exchange of information/data relevant to contaminated sites. But we have Automatic Voice Emergency Response System (AVERS) providing how to handle hazardous chemicals in case of emergency. We have, additionally, Material Safety Data Sheet (MSDS) online on the web site that everyone can access 24 hrs.

A 3.3 Guideline, Decision Support Tools

Since Thailand has never had the standards of hazardous chemicals in groundwater and soil, Pollution Control Department has planned to set up these standards to protect the environment. Groundwater quality standard has become the regulation on October 2000. In this standard, the limitations of volatile organic compounds, heavy metals, pesticides, and others - benzo[a]pyrene, cyanide, PCBs and vinyl chloride - have been set up. However, the soil quality standard is in the process of legislation.

Meanwhile, it is proposed to establish "Guideline for Contaminated Site Assessment and Management." This guideline has been prepared for Local Officials, to provide them with an understanding of the methodology for assessing and managing the health and ecological risks caused by contaminated sites across Thailand.

A 4 On-going and Planed Remediation Initiatives

A 4.1 On-going and planned clean-up initiatives/programmes in the country.

Chemical contamination of soil, surface water and groundwater causes serious health and environmental problems across Thailand. These effects have caused great suffering and financial difficulties for people living on or adjacent to contaminated sites.

Contaminated sites waste land and money required to make them safe. It would be better if industry avoid creating contamination by operating site responsibly. This involves using and storing chemicals carefully, adopting Cleaner Production techniques and disposing of wastes to licensed facilities. Making occupiers responsible for contamination will give them an economic incentive to operate in a responsible manner.

Once a site is contaminated, it is important that the health and ecological risk is assessed. If a site has a landuse that is not sensitive to contaminant, such as a factory, landfill or mine, it may only require on-going monitoring rather than remidiation.

When "soil quality standard" and "guideline for contaminated site assessment and management" were legislated, Local Officials will have the same standard operation nationwide to handle and manage contaminated sites. Furthermore, Local officials are responsible for ensuring that contaminated sites with potential health or ecological risk are assessed. Where a health risk is identified, Officers are able to issue orders to the occupier to manage their site to avoid unacceptable impacts on the surrounding area. Consequently, occupiers and owners are responsible for assessment and management costs because contamination is the result of poor practices at their site.

Appendix 4

INTERNATIONAL CENTRE FOR SCIENCE AND HIGH TECHNOLOGY

Workshop

on

'ENVIRONMENTAL POLLUTION AND APPLICATION OF REMEDIATION TECHNOLOGIES IN EAST-ASIAN (EA) COUNTRIES'

People's Republic of China

18-20 September

Agenda

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

Organizing committee

Prof. Stanislav Miertus (ICS-UNIDO, Italy)
Dr. Andrea Lodolo (ICS-UNIDO, Italy)
Dr. Martin Schamann (ICS-UNIDO, Austria)
Ms. Emanuela Corazzi (ICS-UNIDO, Italy)
Prof. Dr. Yongming Luo (SEBC, ISSAS)
Dr. Jian Liu (CAS)
Dr. Changqing Song (NSFC)
Prof. Dr. Minghong Wong (HKBU)
Dr. Bin Ke (MOST)
Dr. Yanbin Chen (MA)
Dr. Zhiquan Liu (EPAC)

Invited lecturers & Country representatives

Dr. A. Lodolo; Mr. M. Amedeo; Dr. D. Müller, Dr. Y.M. Luo, Dr. J. Liu; Dr. M.H. Wong; Dr. J. Japenga; Mr. J. Philp; Mr. P.K. Wong; Prof. L. Y. Xu; Mr. J. Vijgen

Mr. C. Sokha; Mr. S. Malivarn; Mr. S. Zorigtsaikhan; Mr. S.H. Kong; Mr. S. Aree and Mr. N.T. Viet

Co-sponsored by

- International Centre for Science and High Technology, United Nations Industrial Development Organisation (ICS-UNIDO)
- Chinese Academy of Sciences (CAS)
- National Science Foundation of China (NSFC)
- Soil and Environment Bioremediation Research Centre, Institute of Soil Science, Chinese Academy of Sciences (SEBC, ISSAS)

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Mr. Sergio M. Miranda-da-Cruz (UNIDO Representative for China, Mongolia, the Democratic People's Republic of Korea – DPRK and the Republic of Korea – ROK); Mr. Nguyen Khac Tiep (UNIDO Regional Office in Bangkok) and Mr. M. Amedeo (UNIDO Office representative in China).

Workshop on

'ENVIRONMENTAL POLLUTION AND APPLICATION OF REMEDIATION TECHNOLOGIES IN EAST-ASIAN (EA) COUNTRIES'

(Nanjing – China, 18-20 September 2002)

Wednesday, 18 September 2002

Morning

08:00–09:00	Registration of participants

Opening session

09:00–09:15	Welcome addresses and greetings *(Mr. J. Liu, CAS, Mr. A. Lodolo, ICS-UNIDO, UNIDO Office representative)*

Session One

International Initiatives and Programmes for Environmental Protection and Recovery

(Chairperson: Mr. J. Liu)

09:15–09:20	Presentation of the Workshop *(Mr. A. Lodolo, ICS-UNIDO)*
09:20–09:40	ICS-UNIDO international programmes/initiatives in the field of remediation and environmental pollution reduction: goals and strategies. The subprogramme on remediation. The concept of the ICS-UNIDO Forum on Remediation *(Mr. A. Lodolo, ICS-UNIDO)*
09:40–10:00	European international initiatives/networks in the field of remediation and environmental pollution reduction: NICOLE, CLARINET, IMAGE TRAIN, etc. *(Mr. D. Müller, Austria)*
10:00–10:20	International initiatives/networks in the field of remediation and environmental pollution reduction in East-Asian Countries *(Mr. Y. Luo, SEBC, China; Mr. J. Liu, CAS, China)*
10:20–10:40	Regionally based assessment of persistent toxic substances (UNEP/GEF) *(Mr. M.H. Wong, Co-ordinator of East and Central Asia, China)*
10:40–11:15	*Group Photo and Coffee Break*

Session Two

Integrated Approach for Assessment and Remediation of Polluted Sites: State of the Art

(Chairperson: Mr. A. Lodolo)

11:15-11:45	Criteria and methodologies for the identification of hot-spots and decontamination priorities. Risk assessment *(Mr. D. Müller, Austria)*
11:45-12:15	Computer-based information systems, setting priorities in soil remediation (*Mr. J. Japenga, the Netherlands*)
12:15-12:45	Decision support tools for the management of environmental recovery activities *(Mr. J. Japenga, the Netherlands)*
13:00–14:00	*Lunch Break*

Afternoon

Session Three

Topical Pollution Sources and Applicability of Remediation Technologies (Part A)

(Chairperson: Mr. M.H. Wong)

14:00-14:30	Established and emerging remediation technologies: characteristics, applicability, advantages and limitations — I *(Mr. J. Philp, U.K.)*
14:30-15:00	Established and emerging remediation technologies: characteristics, applicability, advantages and limitations — II *(Mr. J. Philp, U.K.)*
15:00-15:30	Remediation and ecological restoration of mine degraded soil (*Mr. M.H. Wong, INREM, HKBU, China*)
15:30-15:45	*Tea Break*

Topical Pollution Sources and Applicability of Remediation Technologies (Part B)

(Chairperson: Mr. J. Japenga)

15:45-16:15	Wastewater treatment in Hong Kong *(Mr. P.K. Wong, CUHK, China)*
16:15-16:45	Photochemical Treatment of Pentachlorophenol in Industrial Wastewater *(Mr. P.K. Wong, CUHK, China)*
16:45-17:15	National vetiver network for erosion control, slope stabilization, and civil construction protection in China *(Prof. L. Y. Xu, CNVN, China)*
17:15-17:35	Discussion
19:00	*Dinner*

Thursday, 19 September 2002

Morning

Session Three (Continued)

Topical Pollution Sources and Applicability of Remediation Technologies (Part C)

(Chairperson: Mr. J. Philp)

08:30-09:00	General situation of obsolete pesticides and its management *(Mr. J. Vijgen, Denmark)*
09:00-09:30	Technologies for the destruction of pesticides waste *(Mr. J. Vijgen, Denmark)*
09:30-10:00	Integrated pest management: an option for sustainable pest management? *(Mr. J. Vijgen, Denmark)*
10:00-10:15	*Coffee Break*

Session Four

Remediation Initiatives and Programmes in China and other East Asian Countries

(Chairperson: Mr. J. Vijgen)

10:15-10:30	UNIDO-programmes on environmental management and on the implementation of international conventions in China *(Mr. M. Amedeo, UNIDO Office representative in China)*
10:30-11:00	Environmental pollution and remediation situation in China: An Introduction *(Mr. Y.M. Luo, China; Mr. W.M. Shi, China)*
11:00-12:40	Reports of other EA Countries (*In alphabetic order of country names*)
11:00-11:20	Country report of Cambodia (*Mr. C. Sokha*)
11:20-11:40	Country report of Lao PDR (*Mr. S. Malivarn*)
11:40-12:00	Country report of Mongolia (*Mr. S. Zorigtsaikhan*)

(Chairperson: P. K. Wang)

12:00-12:20	Country report of South Korea (*Mr. S.H. Kong*)
12:20-12:40	Country report of Thailand (*Mr. S. Aree*)

Main topics to be dealt with:

- *Topic environmental pollution problems in the Countries: Sources for soil, surface water and groundwater pollution*
- *General strategy for contaminated sites remediation: Long term and short term objectives; Priority sites.*
- *Environmental regulatory framework*
- *Funding opportunities for remediation activities.*

- *Technological background: Applied remediation technologies, Facilities for contaminated soil and water treatments, etc.*
- *On-going and planned remediation initiatives*

12:40-13:00 Discussion

Possible topics:

- *Identification of key common problems in EA Countries*
- *Identification of possible common initiatives*
- *Identification of possible funding mechanism*

13:00-14:00 *Lunch Break*

Afternoon

Session Five

Follow-up Activities and Common Initiatives

(Chairperson: Mr. D. Müller)

14:00-15:00 Identification of priority programmes, possible common initiatives/projects and relevant financial resources

15:00-16:00 Discussion and preparation of the forum on remediation in EA Countries, and further promotion of important projects (working groups):

Possible topics:

- *Research*
- *Decision support tools*
- *Case Studies and Pilot Projects*
- *Financing mechanism*
- *EA standards and legislation*
- *Knowledge and technology transfer*

16:00-16:15 *Tea Break*

16:15-17:15 Proposal's development

17:15-18:00 Presentation of proposals and discussion

18:00-18:30 Recommendations on the actions to be undertaken and conclusions of the workshop

19:00 *Banquet*

Friday, 20 September 2002

Site visit: (08:00-13:00)

- SINOPEC Yangzi Petrochemical Company in Nanjing *(Industrial wastewater treatment)*
- Waste water treatment plant of Nanjing *(Municipal wastewater treatment)*
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08:00 Set out

09:00 Arrival at Yangzi Hotel of Yangzi Petrochemical Company

09:00-10:00 visit

10:00 leave for Suojincun Municipal watstewater treatment

11:00 Arrival at Suojincun Municipal watstewater treatment

11:00-12:00 visit

12:00 back to HanFu Hotel

13:00 Lunch