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INTERNATIONAL CENTER FOR SCIENCE
AND HIGH TECHNOLOGY

FINAL REPORT

Workshop on
Industry and Environmental Managemental
Hanoi, 19 - 24 October 1998

UNIDO

INTERNATIONAL CENTER FOR SCIENCE
AND HIGH TECHNOLOGY

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CONTENTS

ABREVIATIONS

CECS	Center for Environmental and Chemical Safety
CEE	Center for Environmental and Education
CEETIA	Center for Environmental Engineering of Towns and Industrial Areas
CEST	Center for Environmental Science - Technology
CIA	Concentrated Industrial Area
CMESRC	Center for Marine Environment Survey, Research and Consultation
DOSTE	Department of Science, Technology and Environment
DSS	Decision Supporting System
EIA	Environmental Impact Assessment
ICS	International Center for Science and High Technology
IM	Institute of Mechanics
GIS	Geographic Information System
MOI	Ministry of Industry
MOSTE	Ministry of Science, Technology and Environment
MPI	Ministry of Planing and Investment
PST	Process Simulation Techniques

ACKNOWLEDGMENT

The workshop was organized by International Center for Science and High Technology UNIDO (ICS - UNIDO) with the collaboration of the Center for Marine Environmental Survey, Research and Consultation (CMESRC).

We would like to give special acknowledgment to

- The United Nations Industrial Development Organization for the financial Support
- Professor Dr. Enrico Feoli, the ICS Scientific Coordinator under the director of which the whole activities of the workshop have been carried out
- Professor Maurizio Fermeglia, Dr. Do Thanh Bai, Dr. Bui Cong Quang, Dr. Nguyen Hong Khanh, Dr. Nguyen Thi Viet Lien, Eng. Phan Ngoc Vinh for their lectures and case study presentations.
- The CMESRC's staff for the logistic arrangements
- And all the others who have contributed to the success of the workshop.

1. Background

The triangle of economic zone of Hanoi - Hai Phong-Quang Ninh is becoming more and more important in the economic development of Vietnam. For this zone, about decade ago, it was drawn a master plan until 2010, however in this master plan the environmental issues were not taken into consideration appropriately especially as far as the small and medium enterprises siting is concerned. The need to integrate environmental issues in the master plan of economic development of the area is an urgent task especially for planning the use of water resources. For doing this technological tools supporting the decisions such as Geographic Information Systems (GIS), Decision Support Systems (DSS) and Process Simulation Techniques (PST) have to be introduced within the R&D institutions supporting the industrial development (Ministry of Industry of Vietnam (MOI-CECS, DOSTE, etc.). These modern computer based technologies are powerful decision support tools which can help planners to visualize and represent complex spatial problems such as those related to the interaction between environment and industrial plants at different hierarchical levels (from the single process within the plant to the processes outside the plants). ICS-UNIDO, the CMESRC and IIC (CECS) have already organized in June 1997 a training course on the matter. Out of this course a project concept was drawn as a first step to prepare a project document on "Developing an Information Systems for Environmental management of Industrial Area in the Northern Economic Zone of Vietnam - Balancing Industrial Growth with Environmental Protection" to be submitted to donors.

2. Justification

The Workshop is organized for improving the cooperation between Vietnamese institutions and ICS-UNIDO in developing a operational framework for completing the project document on "Developing an Information System for Environmental Management of Industrial Areas in the Northern Economic Zone of Vietnam - Balancing Industrial Growth with Environmental protection " and for assessing the capabilities of these institutions. This is essential to plan the technology transfer concerning the above mentioned information technologies,

3. Objectives

The general objective of the Workshop is to contribute in improving the application of management systems to implement industrial development policies taking into account the relationships between the industry and environment with special emphasis on water management. Specific objectives are:

- To develop and strengthen institutional capacity of relevant environmental R&D institutions in Vietnam with respect to GIS, DSS and PST application in environment management;
- To conceptualize and evaluate systems for proper water management in industrial areas and for environmental protection in function of the project document "Developing and Information Systems for Environmental Management of Industrial Areas in the Northern Economic Zone of Vietnam - balancing Industrial Growth with Environmental Protection".
- To draw guidelines for integrating the master plan of economic development of the triangle Hanoi-Hai Phong-Quang Ninh with environmental management system and for planning a monitoring system for the industrial development.

4. Achievements

4.1. The workshop

- Key addresses at opening ceremony

- Prof. E. Feoli, ICS - UNIDO, Trieste described the objectives content of the workshop.
- Prof. Dang Vu Minh, Director of NCNST expressed appreciation and support to the workshop and wished the workshop to be successful
- Mr. Pietro Seque, a representative of Italian Embassy delivered a speech concerning the significant meaning of the workshop in the capacity building for Vietnam on Industrial Development. He also mentioned

about the increasing cooperation between Vietnam and Italy recent years, especially in the field or science and technology transfer.

- Prof. Nguyen Cao Menh, Director of Institute of Mechanics welcomed all participants of the workshop and expressed strong support of IM to the workshop

- Lectures

- Dr. Cao Ngoc Lan, presented the Master Plan for socio - economic development of the Northern Economic Zone. In this presentation, Dr Lan introduced the overview about three economic zones of Vietnam including the Northern, Central and Southern ones and presented in details the plan the Northern zone focusing on its industrial development aspects.
- Prof. E. Feoli, gave a lecture on the industrial ecology and sustainable development of industrial zone. The other part of his lecture is concerning with the development of projects on the environmental management industrial zones of large scale to ensure the balance between industrial development and environmental protection. Prof Feoli also presented the application of GIS technique in the planning and management of the industrial areas.
- Prof. M. Fermeglia, presented the lectures concerning the process simulation of the industrial activities and emphasized on the modelling of the chemical, biological and mechanical processes related to the waste treatment, food processing and raw material use. He also gave series of examples and results achieved in the field of process simulation in the University of Trieste

- Case studies

- Dr. Nguyen Thi Viet Lien, presented the use of GIS technique in the marine coastal zone management in Vietnam. Beside the introduction of GIS capacity some examples related to the environment and natural resources such as mangrove forest and coral reef distribution in Vietnam's coastal waters and oil spill sensitivity map of Vietnam coast have also been reported.
- Dr. Do Thanh Bai, introduced the Decision Support System which composes from expert system, equipment softwares, ... and can give a scientific basis and practical assessment for decision makers.
- Dr. Nguyen Hong Khanh, informed the workshop about the air quality modelling activities at Institute of Mechanics and gave some results for illustration.
- Dr. Bui Cong Quang, presented some hydraulic and water quality models used in Vietnam, their advantages and disadvantages and some important remarks for using the models.

- Eng. Phan Ngoc Vinh, reported about results of Random walk technique application in the study of pollution propagation and oil slick spreading, carried out at CMESRC.

- ***A round-table discussion***

Prof. E. Feoli has presented the main concerns of environmental management project for industrial zones.

In the afternoon, 22 October, the Vietnamese participants of the workshop formed into two groups for independent discussion about the concept of the project "Application of GIS in Environmental Management in the Northern Industrial Economic Zone of Vietnam - balancing Industrial Growth with Environmental protection". All information and comments provided by workshop members have been analysed and synthesised to produce a general and preliminary proposals for the desired project and presented by representatives of each groups on 24 October.

The round-table discussion has also been conducted for the subject of integrating the envieronmental management into the master plan of the Hanoi-Hai Phong-Quang Ninh Triangle socio-economic development and the planing of a monitoring system for industrial development in the areas. The result of it is a draft of a guideline attached.

Remarks: Some case studies and around-table discussion was conducted in Vietnamese language for the convenience of the participants because it is workshop among Vietnamese persons only.

- ***Field trip***

The field trip has been conducted on 23, October 1998 with the purpose of sightseeing of some parts of the Northern Economic Zone along the road 5 from Hanoi to Hai Phong, the road 18 from Hai Duong to Sao Do and from Hai Phong city to Do Son Beach.

With the knowledge gained during the previous days the workshop, the participants have better overview on the Zone especially the industrial development, urbanization and environment aspects at present and in future. The delegation has stopped at several industrial areas such as Sai Dong (Gia Lam, Hanoi), Pha Lai thermo-power station (Sao Do, Hung Yen) and NOMURA (at Hai Phong) for detailed observation on various aspects which would be needed for later all assessment.

- ***Participants***

There are 16 participants and 4 observers from National Environment Agency, Ministry of Planing and Investment (MPI), Ministry of Industry (MOI), Departments of Science, Technology and Environment (DOSTE) of Hanoi, Hai Phong, Quang Ninh, Hai Duong provinces, Center for Environmental and Chemical Safety (CECS), Center for Environmental Engineering of Towns and Industrial Areas (CEETIA), Center for Environmental Science and technology (CEST), Center for Environmental and Education, Institute of Mechanics (CEE), Center for Marine

Environmental Survey, Research and Consultation (CMESRC). Lecturers are 3 and speakers on case studies are 5, resource persons are 3. In general it is according to the expected number of participants, lectures, speakers and resource persons.

4.2. Memorandum

Between ICS - UNIDO and CECS and CMESRC there is memorandum of understanding for creating a network for developing the project document "Application of Geographic Information System in Environmental Management" in the Northern Economic Zone of Vietnam - Balancing Industrial Growth with Environmental Protection" as follows:

1. CECS, CMESRC and ICS - UNIDO and participants from MOI, MPI, MOSTE, DOSTES Hanoi, Hai Phong, Quang Ninh, Hai Duong, CEST, CEETIA, CI agreed that an Information System for Environmental Management of Industrial Areas in the Northern Economic Zone of Vietnam - Balancing Industrial Growth with Environmental Protection is urgently needed for creating necessary supporting tools for decision making processes in this Triangle Zone and forming a network for implementing the project later all.
2. Based on the concept of the former project document submitted to the Vietnamese related governmental bodies and the ideas on the concept of this project of the participants of the workshop on "Industry and Environmental Management" held in Hanoi from 19 to 24 October 1998 with the format given in "the guideline on content of regional risk management project plan, IAEA - TECDOC - 994 ICS - UNIDO", a detail project document will be prepared by CECS, CMESRC and ICS - UNIDO.
3. The new project document in which all comments from the in evolved institutions has been taken into account will be submitted to the MOI and then submitted to the MPI together with a new official letter of MOI's leadership. As a official procedure the Project Document will be submitted to the Italian Embassy in Hanoi by MIP. All necessary activities in Vietnam will be taken by CECS and CMESRC, while ICS - UNIDO will take effort to find out the donors.
4. Participants from MPI, MOSTE, DOSTES Hanoi, Hai Phong, Quang Ninh, Hai Duong CEST, CEETIA, CI will do their best in their capacity to support and to realize the project in its preparation and implementation as well.

Hanoi, 23 October 1998

On behalf of ICS UNIDO	Prof.: E. Feoli
On behalf of CESC	Msc. D. T. Bai
On behalf of CMESRC	Prof. P. V. Ninh

4.3. Guideline draft

Guidelines for integrating the Master Plan of Economic Development of the Triangle Hanoi - Hai Phong - Quang Ninh with environmental management system and for planning a monitoring system for the industrial development (draft).

Step 1: To develop an Integrated Environment Plan for industry which must consists of:

- Specific targets
- EIA of Concentrated Industrial Areas (CIA) with the planned productive and waste capacities taken into account. Most attention will be paid to the location, the land use, the kinds of solid, gas and liquid wastes, sewer system, treatment system and its capacity. Assessment of carrying capacity of the area, especially, the river, lake, basin in which the CIA is located.
- To assess the present environment of the Triangle Zone
- To predict environment problems of the Triangle Zone in to 2020 year.
- To plan the treatment of solid, water and gas wastes.
- To develop a plan for pollution prevention based on improving technology of the plants for economy of inputs and minimal of waste.
- To develop a plan to evaluate risk assessment of incidents within the plants and within each CIA and to treat transport toxic and hazardous substances.
- To foster the application of Environmental Management Systems ISO 14000
- To assess the Environmental Impact of the Triangle Zone on the out side the Triangle Zone environmental and from the out side on the Triangle Zone, especially from China, on the Triangle Zone.
- To develop an information system in supporting the industrial development taken into consideration the physical environment social contest, human activities etc. To use the information system for EIA of new industrial settlement.
- To use the information system to optimally flow allocation of resources in the public health protection and environment risk management process.
- To use the information system for finding solutions able to minimizing the wastes within the Triangle Zone in a way that the refuse in one sector can be recycling in other.

- To plan a monitoring system of the air, the water qualities in the Triangle Zone outside the plants, the CIAs with the minimal number of idiators, sampling times, and it must cover the whole Triangle Zone, the influence of out side and inside impacts.
- To enforcement environmental services of DOSTES by development of an information system supporting the industrial development.

Step 2: - To make recommendation on the location of CIA, the plan of waste Treatment especially the toxic and harardous ones, the information system in Supporting the industrial development, the improved technologies for environmental protection, the monitoring system, the application of Environmental Management System ISO 14000 and the improvement of DOSTE's capacity in environmental services.

- To organize a committee consisting of heads of DOSTES of provinces Hanoi, Hai Phong, Quang Ninh, Hai Duong and the representative of industry in each mentioned provinces and MI, MOSTE and MPI to solve the environmental problem in the Triangle Zone in process of industrial development of the Triangle Zone, including consideration of recommendation from the Integrated Environment Plan, the process of realization of industrialization process, the monitoring system and so on.

4.4. Capacity asessement of CECS and CMESRC plans to improve their capacity

1. Evaluation of the capacity of CECS and CMESRC

a) CECS

- Function and Tasks

- Research and Development in the field of industrial environment and chemical safety
- Consulting on the field of environment and chemicals safety
- Training and education on the field of environment
- Promote international and local cooperation in the field of industrial environment and chemical safety.

- Field of activities

- Research on planing, especially chemical industry
- Research on issues relating to chemical's safety
- Build up databases on industrial environment, chemical's safety and chemical environment.
- Provide information services on chemicals and chemical management
- Research and implement of cleaner production, technology and engineering for industrial wastes management and treatment.

- Carry out wastes auditing for existing industries.
- Promote international and local cooperation in the field of industrial environment and chemical safety.
- Carry out training and education in these fields
- Research and Development in the field of industrial environment and chemical safety
- Consulting on the field of environment and chemicals safety
- Training and education on the field of environment

- Staff and organization

14 permanent staffs among them 3Msc of science and much more asseciated staff from the laboratories coorlalorated, devided into three division.

- Divison of Administration - Informations - Databases
- Divison of Research on Planing and EIA
- Divison of Cleaner production and Environment engineering

- Equipment

Has sufficient portable equipment for assessing the air and water quality in situ and a system of laboratories of Institute of Industrial Chemistry for Chemical for analyzing air and water samples.

Softwares ans hardwares for databases and processing data and presenting results

In general it is able to carry out research and application of industrial Environmental Problems in Vietnam and taking part in carrying out the proposed project.

- Weakness: lack of

- Drell 2000, and censor pakage to analyse the air quality, stack emision samplers
- Softwares on industrial process modelling
- Serve and scanner A3
- Trained persons in industrial process modelling

b) CMESRC

- Field of activities

1. Survey for data collection:

- Hydrometeological parameters (current, wave, seawater level, depth, wind, air pressure, temperature, humidtity)
- Water quality (T, S, pH, DO, turbidity, TY)
- Water and sediment sampling for analyzing of nutrients, heavy metals, organic chlorine, oil, Coli, plankton, other environmental parameters: air quality, noise, biological indicators, ...
- Monitoring the marine coastal waters of the central part of Vietnam, from Quangbinh to Quangngai provinces (the task given by the National Environmental Agency, MOSTE).

2. *Research*

- Hydrodynamical processes (circulation, wave transformation, tide, storm surge, erosion and accumulation, pollutant diffusion, wave load on structures).
- Marine pollution, coastal water quality

3. *Consultation*

- Natural marine conditions for structure design.
- Environmental impact assessment for marine social, economical projects.

4. *Training courses*

- Marine Environment
- On GIS
- Marine Hydrodynamics

- ***The most important achievements***

- Regime characteristics of typhoon surge along the beach of Vietnam for planning, dike building, reclaiming
- Oil slick spreading on the sea surface software, Prelimanary contingency plan for oil spills, Sensitive mapping from Camau (Minhhai prov.) to Phanthiet, for oil spill contingency plan.
- Prediction of Wind wave, Tide, Typhoon surges in Marine Areas of Vietnam
- Riverine pollution input assessment
- Oil pollution of not dentified sources in the coastal areas
- Land based pollution assessment in marine and coastal waters
- COMEMIS, UNEP, ADB RETA 5552 Environment Projects
- Training courses on GIS, marine environment, GIS application in coastal zone evironmemt management
- Vungang Port (Hatinh prov.) EIA, Cailan Port (Quangninh prov.) environmental condition, Dungquat (Quangngai prov.) and Haiphong Ports hydrological and sediment processes, Condao Island marine hydrological and environmental conditions for master planning and structure design. EIA for Ha Long, Do Son, Sam Son, Vung Tau, Hue, Van Phong, Nghe An tourism development.
- Erosion State along the coast of Vietnam up to 1992
- Environmental consideration for the master plan to 2010 years of Hanoi-Haiphong-Quangninh economical development triangular zone
- A significant amount of date collected for various parts of the sea surrounding Vietnam (Cai Lan Port, Red River delta coastal zone, Middle part of the coastal zone, Qui Nhon Port, Tien Giang river mouth, Tho Chu, Hon Khoai, Con dao, Spratlies islands ...), cross section of the mouth of the Gulf of Tonkin, ...

- Various softwares for 2D wind drift circulation, 2D tidal transformation, 1D+2D coupling for River-sea system circulation, oil slick spreading on the sea surface, 2D diffusion based on diffusion equation and on Random walk techniques, Monsoon and typhoon waves, Wave load on large obstacles, Ship oscillation, Wave refraction and sediment transport, water qualities.
- A big number of Contracts signed between CMESRC and various companies, local authorities.

- Equipment

Wave recorders and seawater level recorders, Current meters, Echosounders, Pump for water sampling, Water and sediment samplers (including Horizontal Alpha one), Multiwaterqualitimeters (T, S, pH, DO, Turbidity), Drel/2000 waterqualitimeter (spectrophotometer, pH meter, TDS meter), BOD, Coli, Oil, ... meters. PC computers and related softwares, Air quality, Air toxicity, Air condition meters (T, pressure, humidity, ...), GIS equipment and the Coorlaborated Chemistry Analytical Laboratory (Institute of Chemistry)

- Scientific staff and structure

35 persons including 12 doctors. Among them: - Prof Dr Pham Van Ninh, (Marine hydrodynamics, pollution, environment); Dr Nguyen Xuan Duc (Marine biology, ecology); Prof Dr Trinh Xuan Gian (Chemistry); Prof Dr Nguyen Hoan (Marine morphology). Ass. Prof. Dr Do Ngoc Quynh (Oceanology), Dr Nguyen Manh Hung (Oceanology), Dr Nguyen Minh Son (Hydrodynamics, environment), Dr Nguyen Tien Dat (Hydrodynamics, Construction), Dr Pham Trung Luong (Remote sensing). Dr Nguyen Khac Lam (Chemistry), Dr Le Xuan Hong (Marine morphology), Dr. Nguyen Thi Viet Lien (Marine hydrodynamics and pollution) divided into Administration, Planing and Cooperation division, Marine Hydrodynamics division, Marine Environment division, Database and GIS division.

In general it is able to carry out research and application of industrial Environmental Problems in Vietnam and take part in accomplishment of proposed project.

- Weakness

- it needs large scanner, digitiger and injet ploter
- it need more people trainned in GIS and Dicison Support System

- Plans to improve their capacities

- The way to improve their capacities is to accomplishement of the proposal project in it CECS will carry out the activities concerning Decision Support System (DSS) and process Simulation Techniques

(PST) and the related matter while CMESRC will carry out the activities concerning Geographics Information Systems and related matters especially the database.

- By needed equipment purcharge and training personal staff indicated in weakness of both two institutions it is sure that the capacibilities of CECS and CMESRC will be rizen up to conduct successfulll the proposed project.

4.5. Evaluation

Based on 17 questionaire distributed to the participants we can conclude that the workshop was very successful:

- *Organization:*

  Excellent and very good varies from 12 to 16, good from 2 to 4

- *Duration of Programme:*

  Just right 14-17, too long 1, too short 2

- *Training facilities and Hotel:*

  Excellent and very good: 14-15; good: 2-3; fair: 0

- *Organizer's reponse to participants needs:*

  Excellent and very good: 15, good: 2, fair: 0

- *Recommendation to others to attend the similar activity in the fiture:*

  Yes: 16, maybe: 1, no: 0

- *Evaluation of lectures and speakers:*

  Exellent and very good: 15-16, good: 2, fair: 0

The most useful part of the workshop is lectures, discussion. The part of activity should be expanded are lectures and case studies on GIS, DSS, PST, industrial ecology and discussion. For the fiture improment to the progamme it is suggested more discussion, more details in GIS application and the aspect of EIA for Concentrated Industrial Areas and evolvement of participants from other related organization should be made. The participants agreed that GIS, DSS, PST must be and can be used in process of integrating environmental issues into the master plan for the Northern Triangle Economic Development Zone, that information system is urgently needed and we should follow the integrated environmental management way.

Some contradictory opinions about case studies are related to DSS system which are still not used now in Vietnam, the variety of background of participants and to the busy level of participants in the number of days of the workshop.

Many participants commented on the new knowledge, understanding and express their willing to apply them into their job, their wishes to have the similar activities in the future. More details of the evaluation is shown in annex 4.

5. Recommendation

- It is to recommend that ICS - UNIDO should play the role of main technical adviser for the project "Application of GIS in Environmental Management in the Northern Industrial Economic Zone of Vietnam - balancing Industrial Growth with Environmental protection".
- That ICS - UNIDO should organize in the future training courses/workshop on
  - Integrated Management for large industrial areas,
  - EIA for large industrial areas,
  - Process modelling techniques,
  - Dicision supporting systems,
  - Integrating environmental consideration in to a master plan with more participants from various organization, more discussion between participants. The venue of those training courses/workshop should be far from Hanoi in order to have participants free from their daily work and duties. A such like course/workshop should prolonge not more than one week because it is optimal time period for most of participants.
- ICS - UNIDO should help DOSTEs to prepare related pilot project proposal to be implemented for participants provinces

6. Immediate follow - up works

- All participants of the workshop will apply their knowledge gained during the workshop to their daily work, to the development process of master plan of each province in the Northern Triangle, and the master plan of the whole Triangle
- All participants depending on their duties, level of responsibility will create a possibility to apply GIS into their environmental management.
- ICS, CMESRC will follow-up the memorandum signed between them and ICS - UNIDO, especially the point 2 and 3 and to make their wishes realistic.
- ICS, CMESRC and ICS - UNIDO will keep each other informed on the status of their effort.

ANNEX 1

INTERNATIONAL CENTRE FOR SCIENCE AND HIGH TECHNOLOGY

in collaboration with the

Institute of Marine mechanics,
Center for Marine Environment
Survey, Research and Consultation

AIDE-MEMOIRE

Workshop on Industry and Environmental Management

Hanoi, Vietnam
19-24 October, 1998

UNIDO

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BACKGROUND

The triangle of economic zone of Hanoi - Haiphong-Quangninh is becoming more and more important in the economic development of Vietnam. For this zone, about decade ago, it was drawn a master plan until 2010, however in this master plan the environmental issues were not taken into consideration appropriately especially as far as the small and medium enterprises siting is concerned. The need to integrate environmental issues in the master plan of economic development of the area is an urgent task especially for planning the use of water resources. For doing this technological tools supporting the decisions such as Geographic Information Systems (GIS), Decision Support Systems (DSS) and Process Simulation Techniques (PST) have to be introduced within the R&D institutions supporting the industrial development (Ministry of Industry of Vietnam (MOI-CES, DOSTE, etc.). These modern computer based technologies are powerful decision support tools which can help planners to visualize and represent complex spatial problems such as those related to the interaction between environment and industrial plants at different hierarchical levels (from the single process within the plant to the processes outside the plants). ICS-UNIDO, the CMESRC and IIC (CECS) have already organized in June 1997 a training course on the matter. Out of this course a project concept was drawn as a first step to prepare a project document on "Developing an Information Systems for Environmental management of Industrial Area in the Northern Economic Zone of Vietnam - Balancing Industrial Growth with Environmental Protection" to be submitted to donors.

JUSTIFICATION

The Workshop is organized for improving the cooperation between Vietnamese institutions and ICS-UNIDO in developing a operational framework for completing the project document on "Developing an Information System for Environmental Management of Industrial Areas in the Northern Economic Zone of Vietnam - Balancing Industrial Growth with Environmental protection " and for assessing the capabilities of these institutions. This is essential to plan the technology transfer concerning the above mentioned information technologies,

OBJECTIVES

The general objective of the Workshop is to contribute in improving the application of management systems to implement industrial development policies taking into account the relationships between the industry and environment with special emphasis on water management. Specific objectives are:

- To develop and strengthen institutional capacity of relevant environmental R&D institutions in Vietnam with respect to GIS, DSS and PST application in environment management;
- To conceptualize and evaluate systems for proper water management in industrial areas and for environmental protection in function of the project document "Developing and Information Systems for Environmental Management of Industrial Areas in the Northern Economic Zone of Vietnam - balancing Industrial Growth with Environmental Protection".
- To draw guidelines for integrating the master plan of economic development of the triangle Hanoi - Haiphong - Quangninh with environmental management system and for planning a monitoring system for the industrial development.

EXPECTED OUTPUTS

- A memorandum of understanding between ICS - UNIDO and the participating institutions for creating a network for developing the projec document "Developing an Information System for Environmental Management of Industrial Areas in the Northern Economic Zone of Vietnam - Balancing Industrial Growth with Environmental Protection".
- A document reporting the evaluation of the capability of Vietnamese institutions to carry out the project and detailed plans to improve their capacity.
- Guidelines for integrating the master plan of economic development of the triangle Hanoi-Haiphong-Quangninh with environmental management systems and for planning a monitoring systems for the industrial development.

STRUCTURE OF THE WORKSHOP

The structure of the workshop is based on round-tables in which some lecturer will present the state of the art of information technology and softwase available, and where participants will present their experience on specific case studies.

PARTICIPATION

The workshop is directed to technologists, planners, decision-makers, who are working in close contact with industry or in landscape assessment in urban and rural areas of Vietnam. A maximum of 15 participants will be admitted to the training course coming from Vietnam. About 4/5 experts will be invited to lecture on specific topics.

TENTATIVE PROGRAMME

Monday, 19 October

Morning

- Opening Ceremony (National Center for Natural Sciences and Technology institute of Mechanics).
- Participants' presentation.
- Presentation of the Master Plan of Economic Development of the triangle Hanoi-Haiphong-Quangninh.

Afternoon

- Discussions.

Tuesday, 20 October

Morning

- The state of the art of integrating GIS and Remote Sensing for assessing environmental situations and management industrial areas.

Afternoon

- Discussions on the application of GIS technologies in Vietnam

Wednesday, 21 October

Morning

- The role of Process Simulation Techniques for improving the production production processes in industrial areas.

Afternoon

- Discussions on the evaluation of the current technology and its impact on the environment.

Thursday, 22 October

Morning

- Creation of alternative scenarios by GIS technology.
- Presentation of the Project Concept "Developing an Information System for Environmental Management of Industrial Areas in the Northern Economic Zone of Vietnam - Balancing Industrial Growth with Environmental Protection".

Afternoon

- Discussion on case studies in the triangle Hanoi - Haiphong - Quangninh.

Friday, 23 October

Morning and Afternoon

Field trip to industrial areas of the triangle Hanoi-Haiphong-Quangninh

Saturday, 24 October

Morning

Round - table on the evaluation of the Vietnamese institutions to carry out the project, and plans for improving their technological capacity.

Afternoon

- Discussion on the role of participants in the project "Developing an Information System for Environmental Management of Industrial Areas in the Northern Economic Zone of Vietnam - Balancing Industrial Growth with Environmental Protection".
- Closing ceremony

DOCUMENTATION

The documents available for the Workshop will be:

1) Aide - memoire of the Workshop
2) Programme and list of participants.
3) Lecture notes.

ANNEX 2

PROGRAMME OF THE WORKSHOP
ICS-UNIDO AND CMESRC
Hanoi, 19-24 October, 1998

Monday, 19 October

9h00-10h00 Opening ceremony with the presence of:

- Prof. Dang Vu Minh, Director, National Center for National Sciences and Technology (NCNST)
- Dr. Trinh Quang Khuynh, Chief of Department of International Cooperation (NCNST)
- Prof. Nguyen Cao Menh, Director, Institute of Mechanics (NCNST)
- Mr. Petro Sequi, Representative of Italian Embassy in Hanoi

10h30 - 12h00: Master Plan for Socio-economic Development in the Northern Economic Zone for the period 1996 - 2010.
By Cao Ngoc Lan, Strategic Development Institute, Ministry of Planning and Investment

14h00-16h30: Guidelines to formulate a project for environmental management of large industrial areas
By E. Feoli

Tuesday, 20 October

9h00 - 10h30: Industrialecology and framework for the sustainable industrial development
By E. Feoli

10h45-12h00: GIS application to marine and coastal environment
By Nguyen Thi Viet Lien, Le Nhu Nga, Center for Marine Environment survey, Research and Consultation

14h00-15h00: Decision Support System
By Do Thanh Bai, Center for Environmental Safety and Chemical Industry

15h00-16h30: The use of simulation models in the air quality studies
By Nguyen Hong Khanh, Institute of Mechanics

Wednesday, 21 October

9h00-10h30: Process Simulation
By Maurizio Fermeglia

10h00-12h10: GIS application
By E. Feoli

14h00-17h00: Process simulation models: examples
By Maurizio Fermeglia

Thursday, 22 October

9h00-10h00: Hydraulic and water quality models
By Bui Cong Quang, Institute for Water Resources

10h00-11h00 Risk assessement of oil spill rearching the coast of the Northern Vietnam
By Phan Ngoc Vinh CMESRC

11h00-12h00: Presentation of the proposed Project

14h00-17h00: Working groups on Project concept

Friday, 23 October: Field trip

Saturday, 24 October: Round table discussion and conclusion on guidline for integrating the master plan of triangle with the environmental management system and for planing a monitoring system for the industrial development.

ANNEX 3
LIST OF PARTICIPANTS

I. Participants

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ANNEX 4

Evaluation questionnaire

Based on 17 questionnaires distributed to participants the following summary can be made:

A. organization.

1. How did you obtain information about this workshop all:

Participants answers are "from the invitation of local organizer".

2. The information process was:

Excellent: 3, very good: 12, good: 2, fair: 0.

3. The announcement and precourse material was

Excel: 5, very good: 8, good: 3, fair: 0.

4. I found the scientific programme

Excellent: 7, very good: 8, good: 2, fair: 0.

- Applied Lecture/workshop: Excel: 5, very good: 9, good: 3, fair: 0.
- Use of small working groups: Excel: 4, very good: 11, good: 2, fair: 0.
- Case studies: Excel: 4, very good: 12, good: 2, fair: 1.
- The time spent by lectures in class and after class on specific questions/examples: Excel: 7, very good: 5, good: 4, fair: 0.
- Students scientific knowledge was: balanced: 15, unbalanced: 1.

B. Duration of programme.

1- Number of days: just right: 14, too long: 1, too short: 2.

2- Length of working days: just right: 17, too long: 0, too short: 0.

C. Training facilities and hotel

1- Lecture/Training Room: Excellent: 12, very good: 3, good: 2, fair: 0.

2- Breaks/refreshment : Excellent: 5, very good: 9, good: 3, fair: 0.

3- Hotel accommodation : Excellent: 0, very good: 15, good: 2, fair: 0.

4- Meals at the hotel : Excellent: 3, very good: 12, good: 2, fair: 0.

D. Organizer's response to participants needs:

Excellent: 8, very good: 7, good: 2, fair: 0.

E. Over all programme organization:

Excellent: 8, very good: 7, good: 2, fair: 0.

F. Would you recommend to others from your institution/county to attend a similar activity in the future:

yes: 16, may be: 1, no: 0.

1. Which part of the activity did you find more useful.

- Industrial Ecology and frame work for sustainable industrial development
- Master Plan for Northern triangle

- Lectures (GIS, modeling)
- GIS, industrial ecology
- GIS application and process simulation
- Industrial Ecology, Process Simulation
- Discussion
- GIS
- Guideline for integrated risk assessment and management in large industrial area, Process Simulation
- Modelling
- All lectures
- Using GIS for Environmental Management, discussion on how to assess the effect of Industrial Development to Environment
- Guideline to formulate a project for EM, DSS, GIS, ...
- GIS, Process Modelling, Draft of Project, Field trip

2. *Which part of the activity do you think should be expanded*
- GIS, DSS
- Case Studies
- Modelling
- Environmental Management Planning for Industrial Zone Development
- Industrial ecology
- Discussion
- Process Simulation
- GIS
- Process Simulation, DSS, Industrial Ecology
- Application of GIS, water quality modelling
- Case studies, discussion

3. *Which part of activity do you think should he dropped:*
Only one answered that:
Overrun of technical explanation in too details may not relevant to all students and one wanted to reduce the process modelling models to balance with the other parts.

4. *Any other suggestions for future improvements to the programme*
- Should to talk in details about GIS application
- Staff from industrial Planning Agency should be involved
- A training course instead of a workshop
- More discussion among participants
- Participants from more organization should be involved
- Improvements of working groups
- English should be spoken more in the workshop
- Content of EIA for concentrated Industrial areas

5. *Do you think that the topics/tools you studied during the course could be used by industries in your country? If so, how? If not, why not?*

- Yes, implementation of DS tools such as GIS, PS... in decision making, environment, evaluation and management
- Yes, the tools for management of industrial Technology how the industrial technology can be controlled in order to reduce the discharge of pollutants.
- DSS and PS
- Water quality models
- Yes, they could be used for integrated Environment Assessment and management in Triangle Development plan of Hanoi-Hai Phong-Quang Ninh. They models tools such as: GIS, DSS, PTS, are quite useful for pollution management and application in DOSTES
- Yes, though some cause study projects or a pilot study, especially can be applied for the Triangle Northern Economic Zone.
- Yes, the tools used in the training course are very useful for industry. Especially, process simulation and optimization should be used by industry to achieve waste minimization purpose. GIS should be used in planning of a region development plan.
- Yes because it is important for Environmental Management Plan in large industrial areas
- Yes, by applying suitable things from the workshop in industrial management in the frame work of Sustainable Development
- Yes, the modern technique will be used on the industrial area development and this development should be made in balancing will the environmental protection
- Yes, because the are a lot of new knowledge in aspects of environmental Management

6. *Can you suggest any programme and future activities which ICS could pursue in order to help with the technological and scientific advancement of your country*

- I think it way be some pilot studies for my city.
- Methodology for integrated Environmental Impact Assessment course, Transfer of hard ware and software for Industrial area development planning
- Having projects from that training courses will be implemented
- ICS could involve in specific project in order to demonstrate application of presented tools in Vietnam conditions
- ICS should conduct a programme related to Integrated coastal zone management for Vietnam
- To Develop a project for integrated assessment and Management in Triangle Development areas of Hanoi - Haiphong - Quanninh
- More workshops as this workshop but with different topics
- More detailed training course on Process Stimulation for some main Industrial processes
- Training programmes

- Formulation of project to integrate the environmental issues in planning industrial development for industrial areas or for every manufacture.

7. *Do you think you have benefited from participation in this course/workshop? if so, how ? and your institution ?*

- Yes, I have learnt a lot, especially in term of environmental management in industrial areas and DSS
- I think, I have got some benefits form participation in this course. I am very interested Regional Management
- Yes, very much.
- Yes, I have got more understanding and experiences
- Yes, during discussion I gained experiences and knowledge that could be applied in my works.
- Yes, as an officer in Environmental Management, basic knowledge of environmental science is indispensable for me as well as for my Department.
- Our Institution and myself have benefited form the participation in this workshop in improvement in future activities
- I have to use information from this workshop in my job in the future to master plan of large industrial are

8. *How do you intend to disseminate the information you have acquired during the activity once back in your own country.*

- The environmental management should be also considered within the large industrial area and it will be reflected in our research documents, report ...
- I am going to apply my knowledge to environmental Management in the Northern economic zone of Vietnam.
- By providing the workshop materials to others.
- To formulate an integrated environmental management plan for the triangle Economic zone with other participants.
- To present information gained from the workshop in DOSTE'S meeting, to write an article on the worshop.
- To handover some software, materials to my colleagues.
- By teaching
- To make copies of the materials form workshop to distribute to others, to organize the discussion or include the workshop's contest in the meetings with my colleagues.

G. Evaluation of Lectures and speakers.

1. *Course material:*

   Excellent: 6, very good 9, good: 2, fair: 0

2. *Resident lecture presentation:*

   Excellent: 6, verygood 9, good: 2, fair: 0.

3. *International Lecture presentation:*

Excellent: 10, verygood 6, good: 0, fair: 0.

4. Ability of lecturers to answer specific question.

Excellent: 2, verygood 13, good: 2.