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**Report on
Workshop on Technology for Pollution
Assessment in Marine Sensitive Ecosystems
of the Gulf of Thailand**

**12 - 14 December 1994
Bangkok, Thailand**

**Organized by : National Center for Genetic Engineering and Biotechnology
National Science and Technology Development Agency
Bangkok, Thailand**

Sponsored by : United Nations Industrial Development Organization (UNIDO)

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**Report on "Workshop on Technology for Pollution
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I. Introduction

The Gulf of Thailand may be considered a classical example where a fast industrial development should have a very negative impact on highly sensitive coastal ecosystems such as the natural mangrove ecosystem and the artificial ones related to fisheries and aquaculture. Industrial component of development should be aware of its impact and should contribute to develop systems for monitoring and controlling pollution. The workshop is addressed to personnel working in laboratory for monitoring and controlling industrial pollution.

The aim of the workshop is to review the technologies applied to monitoring industrial pollution (heavy metals and different kind of hydrocarbons) in sensitive ecosystem. Sampling techniques of water, suspended materials, sediments and living organisms will be analysed and compared. The utilization of different biological matrices will be discussed at the light of ecological food webs of sensitive ecosystems of the Gulf of Thailand. The levels of toxicity pollutants will be discussed and the links between monitoring techniques and ecotoxicology will be analysed.

The regional participant in this workshop were invited from neighbouring countries in Asia - Pacific region. They were representative for government of private sector that play active role in marine pollution studies in Indonesia, Malaysia, Philippines, Vietnam and Cambodia. There were 25 participant from Thailand : 20 from government section and 5 from private sectors. (list of participants appears in Annex II)

In the workshop, the regional participants have presented the paper on present status and trend in marine pollution and the development of monitoring technology in their countries.

Dr. Malee Suwana-adth, as international resource person from UNIDO/ICS, has expressed the interest of international organizations in promoting cooperation in environmental pollution management marine pollution. The UNIDO/ICS has started and supported regional cooperative issue in various regions.

II. Objective

The Workshop will define the state of the environment of the Gulf of Thailand and will constitute a forum for information exchange and learning interactions on new technologies in the acquisition and processing of chemical data related to industrial pollution.

To gather information that can be used to encourage industries to develop and produce monitoring equipment as well as tools for data transmission.

To develop the regional cooperation for enhancement of the institutional capacities in reducing the environmental degradation by improving their monitoring techniques and instrumentation.

III. Date and Venue.

The Workshop was held during December 12-14, 1994 at 4th floor Sasapatasala Building, Soi Chulalongkorn 12 (2), Phyathai Road. Bangkok 10330, Thailand.

IV. Opening

The opening ceremony was chaired by Ms. Chodchoi Eiumpong, Deputy Permanent Secretary, Ministry of Science Technology and Environment (MOSTE) Thailand. Dr. Morakot Tanticharoen Deputy Directory of NCGEB gave the welcome address and report on the background and objectives of the workshop. Dr. Malee Suwana-adth, UNIDO/ICS gave the welcome address and background of ICS objective in this pollution assessment technology promotion. After that, Ms. Chodchoi Eiumpong, Deputy Permanent Secretary, MOSTE gave an opening address.

V. Programme

The Workshop comprised of presentation of country reports of regional participants : Indonesia, Malaysia, Philippines, Vietnam, Cambodia and Thailand. Representative from leading organization which involves in marine pollution control in Thailand were invited to present their current activities. The group discussion were organized to conclude and make the recommendation at the end of the workshop.

The programme appears in Annex. I

VI. Conclusions

The meeting identified four major areas of technologies for monitoring and assessing pollution of marine sensitive ecosystems: (i) Monitoring technology for persistent chemicals; (ii) Monitoring technology for degradable organic matters; (iii) Monitoring technology for toxic and anoxic producing, including pathogenic organisms; (iv) Biotesting technology at the laboratory and field levels. In addition, the meeting indicated a strong interest in the (v) Potential application of biotechnology for control and abatement of marine pollution.

Participants recognized the need for closer cooperation in developing technologies for the five areas identified. It was agreed that the workshop organized was a timely one as all countries in the region are facing increasingly serious marine pollution affecting the region's sensitive marine ecosystems. The workshop's emphasis on the technological aspects highlighted the fact that many of the technologies to be adopted must be appropriate and effective under local conditions. Consequently, it was felt that cooperative research and development within the region and between the region and international organizations such as ICS would be very beneficial and desirable especially in relation of standardization of methodologies.

VII. Recommendation

7.1 General Recommendation

7.1.1 Monitoring technology on persistent chemicals such as heavy metals organochlorines and hydrocarbons

Focus should be placed on the analytical techniques with special attention to the quality control of methodologies, intercalibration exercise among national and regional laboratories. Application of biotechnological methods, such as biosensor for detecting levels of contaminants is strongly recommended. The improvement of existing biosensors to be capable of detecting the level of organometallic complexes and other related contaminants should be a priority. Workshops or training on laboratory intercalibration for the biosensor technology can be of great benefit to the region in combating marine pollution.

Among the participating countries, the Philippines has started working on the development of biosensors, others, such as Malaysia, Indonesia, Vietnam and Thailand, are currently involved mostly in conventional methods.

7.1.2 Monitoring technology on degradable organic substances

The development and improvement of suitable probes for a continuous measurement of degradable organic substance in the marine environment have been proposed. The focus of the probes are on the measurement of BOD and nutrients in the water. The results from the probes can be calibrated with results by conventional analytical methods. Indonesia suggested the probe to gases which

are product of the anaerobic processes instead of oxygen and the product of the aerobic process. The representative from Malaysia proposed the use of field kit to reduce the number of samples to be sent to established laboratory. The representative from Thailand said that Singapore has worked on a probe to detect degradable organics, along with a group of Chulalongkorn scientists, but the performance is still limited. Vietnam is not yet directly involved in this field, but in the coming near future through the collaboration with a Swedish group in the Mekong Secretariat, the country can have a water quality laboratory (near the delta using probe techniques.) However, the chairman also emphasized on the development of the state of the art in continuously recording sensors for these substances.

7.1.3 Monitoring technology on toxic and anoxic producing and pathogenic organisms.

More high-tech approaches to study the toxins and toxic organisms, such as red tide plankton, have been introduced. Sensitive probes/sensors and monoclonal antibody techniques are among the suggested rapid diagnostic measures for the marine system. However, most of the participating countries accepted that this approach are still far from implementation. In the Philippines, where researchers are working on shellfish poisoning relevant to regular occurrences of toxic red tide is more aware of the problem. Unsuccessful attempts have been made to develop a probe to detect the saxitoxin as part of the warning and banning issues of the outbreak of the toxic organisms. No report on the work in Malaysia regarding the use of probes or sensors to trace the toxin or toxic organisms in the water, but surveillance for the red tide outbreak have been conducted. Even though the red tide phenomena in Indonesian waters have been recorded in several places, the probe/sensor to rapidly detect the toxin has still not been attempted. Vietnam has very few incidences of red tide and there is no obvious relationship with shrimp mass mortality which is suspected to be caused by sudden floods along the coast.

7.1.4 Biotesting technology both in laboratory and in the field.

There are numerous reports on toxicity testing. The problem is how the tests have been performed. The need is a standard protocol for biotesting both for acute and chronic effects of a substance. Test organisms should be designed, based on the availability in each country. The protocols for biotesting developed by the ASEAN Marine Environmental Quality Criteria (AMEQC) Working Group, is considered to be acceptable for the time being, even though a workshop on this particular topic is proposed in the future. The Philippines has a UNESCO funded programme to test natural products, while Malaysia has a more established approach for biotesting using both static and flowthrough techniques. Indonesia and Vietnam have attempted some toxicity testings, using endemic species as the test organisms. There is no established or certified testing agencies in Thailand in this aspect, but there are a number of governmental agencies, as well as academic institutions that are capable of routinely doing this. Bioindicator marker which involve tissue examination has been proposed to be used in the biotesting protocol.

7.1.5 Application of biotechnology for control and abatement of marine pollution such as biological treatment of industrial effluents

A consortium of microorganisms has been used to reduce the effluent load, especially organic matter before entering natural water bodies. Isolation and collection of identified species that are capable of degrading a certain type of material in the effluent have to be established. Justification on the use depends on an individual incidence, such as oil spill, water effluent from industries or shrimp farms.

The Philippines imported seeding bacteria from the United States, but, a controversy arose on investigation and utilizing locally endemic species. Thailand has gone to the step of implementing bacterial species to combat various types of crude oil used in industries or oilspills. The situation is similar to what has occurred in Malaysia. Indonesia has attempted to cooperate with CORD to utilize the oleophilic nutrients capable of stimulating oil degrading bacteria to combat the oil in the water.

7.2 Specific Recommendations to ICS

7.2.1 That UNIDO/ICS monitors technological development in the above areas and disseminates information to countries in the region. Areas of immediate interest include biosensors technology for pollution monitoring and intercalibration technology.

7.2.2 Training workshops on laboratory intercalibration relating to detection of low level of organo-metallic complexes are strongly recommended. Furthermore, ICS assistance is needed in facilitating access to standard materials for testing of low level organo-metallic substances.

7.2.3 That ICS takes initiative in promoting the development of microbial remediation technology through training workshops and collaborative research and development with the ASEAN-Indochina region in order to benefit from the various ecosystems of the region.

7.3 Recommendation for ASEAN/Indochina

The meeting recommended that in the ASEAN region the following activities should be conducted:

- A) Inventory list of equipments for pollution monitoring and improving manpower capabilities, including biosensor research capabilities of each country.
- B) A regional responsible laboratory should be assigned to provide and produce inter-lab standards such as waters, sediment and biological samples. These samples will be used in the intercalibration in this region.

Annex I Workshop Programme

12 December 1994

- 8.30- 9.00 Registration
- 9.00- 9.15 Opening Session
Report by Dr. Morakot Tantichareon, Deputy Director, NCGEB
Opening Address by Ms. Chodchoi Eiumpong,
Deputy Permanent Secretary, Ministry of Science
Technology and Environment
- 9.15- 9.45 Keynote Address by Dr. Malee Suwana-adth ,UNIDO/ICS
- 9.45-10.15 Break
- 10.15-10.45 Remote Sensing Programme. By Dr. Darasri Dowreng, NRC
- 10.45-11.00 Presentation of country report: Cambodia
- 11.00-11.15 Presentation of country report : Indonesia
- 11.15-11.30 Presentation of country report : Malaysia
- 11.30-12.00 Discussion
- 12.00-13.00 Lunch
- 13.00-13.30 Present Monitoring Technology for Marine Pollution in
Thailand. By Dr. Monthip Sriratana Tabucanon
- 13.30-14.00 Present Status of Coastal Resources and Marine Pollution.
By Dr. Pornsook Chongprasith, Pollution Control Dept.
- 14.00-14.30 Discussion
- 14.30-14.45 Presentation of country report : Malaysia
- 14.45-15.00 Presentation of country report : Philippines
- 15.00-15.30 Break
- 15.30-15.45 Presentation of country report : Vietnam
- 15.45-16.00 Presentation of country report : Thailand
- 16.00-16.30 Discussion

- 18.00-20.00 Reception at Thai Pavillion

13 December 1994

- 9.00-10.00 Discussion
- 10.00-10.30 Break
- 10.30-12.00 Discussion
- 12.00-13.00 Lunch
- 13.00-14.00 Conclusion and Recommendation
- 14.00-14.15 Closing

14 December 1994

- 6.30-17.30 Field trip
Visit Eastern Seaboard Industrial Estate and Marine Biotechnology
Research Laboratory in Chonburi Province.

Annex II List of Participant

Resource person

UNIDO/ICS

Dr. Malee Suwana-adth

Chief, Biotechnology Management Service
Technology Management Services, Investment and Technology
Promotion Division, UNIDO
Vienna International Center, P.O. Box 300
A-1400, Vienna, Austria
Tel. 43-1-21131 Fax 43-1-2307355

Regional participants

Indonesia

Dr. Deddy Setiapermana

Head, Marine environmental
Research and Development Division
JI Pasir Putih 1, Ancol Timur,
P.O.Box.4801 JKTF, Jakarta 11048, Indonesia
Tel. 021-683850 Fax 62-21-681948

Philippines

Dr. Marco Nemesio E. Montano

Marine Science Institute,
College of Science, P.O.Box 1,
University of the Philippines,
Diliman, Quezon City 1101, Philippines
Tel. 63-2-982471 to 79
Fax 63-2-982693, 63-2-9223959

Malaysia.

Dr. Wang Chee Woon

Department of Biochemisry,
Faculty of Medicine,
University of Malaya,
59100 Kuala Lumpur, Malaysia
Tel. 603-7568841 Fax 603-7557740, 603-7568841

Malaysia

Dr. Abdul Rani bin Abdullah

Department of Chemistry,

Faculty of Science,

University of Malaya

59100 Kuala Lumpur, Malaysia

Tel. 603-7594240 Fax 603-7566343

Vietnam

Dr. Dao Manh Son

Deputy Director,

Department of Fisheries Resources, Institute of Marine Product

170 Le Lai Street, Ngo Quyen, Haiphong, Vietnam

Fax 84-31-45153

Cambodia

Mr. Touch Seang Tana

Fishery Advisor, Department of Fisheries,

Ministry of Agriculture, Forestry and Fisheries,

Phnom Penh, Cambodia.

Fax. 855-23-60127

Thai participants

Government Sector

Dr. Sakarindr Bhumiratana

National Center for Genetic Engineering and Biotechnology

National Science and Technology Development Agency

Ministry of Science Technology and Environment Bldg., 5th fl.,

Rama VI Road, Bangkok 10400

Tel. 662-2452498 to 9 Fax 662-2464850

Dr. Morakot Tantichareon

National Center for Genetic Engineering and Biotechnology

National Science and Technology Development Agency

Ministry of Science Technology and Environment Bldg., 5th fl.,

Rama VI Road, Rajavithi, Bangkok 10400

Tel. 662-2452498 to 9 Fax 662-2464850

Dr. Sutat Sriwatanapongse

National Center for Genetic Engineering and Biotechnology

National Science and Technology Development Agency

Ministry of Science Technology and Environment Bldg., 5th fl.,

Rama VI Road, Rajavithi, Bangkok 10400

Tel. 662-2452498 to 9 Fax 662-2464850

Prof. Dr. Plamsak Menasveta

Chief, Marine Biotechnology Research Institute
Chulalongkorn University, Bangkok 10330
Tel. 662-2188160 to 62 Fax 662-2544259

Mrs. Wallapa Choochuang

Transport Technical Officer 8
Office of The Maritime Promotion Commission
19 Thanon Phra Athit, Bangkok 10200
Tel. 662-2819367 Fax 662-2800563

Mrs. Kasemsri Homchean

Director, Environmental and Safety Control Division
Industrial Estate Authority of Thailand
618 Nikom Makkasan Road, Rajthevi District,
Bangkok 10400
Tel. 662-2530561 Ext. 300 Fax. 662-2529273

Dr. Pornsook Chongprasith

Environmental Scientist,
Water Quality Management Division,
Pollution Control Department
539/2 Metropolitan Bldg. Fl. 17
Sri-Ayudhya Rd. , Bangkok 10400
Tel. 662-6425251-65 Ext. 110 Fax 662-6425026

Dr. Monthip Sriratana Tabucanon

Director, Environmental Research and Training Centre
Techno Tanee, Khlong V , Prathumtanee Province 12120
Tel. 662-5771140, 5771136 to 7 Fax 662-5771138

Dr. Darasri Dowreng

Senior Scientist
The National Research Council of Thailand (NRCT)
196 Phahonyotin Road, Chatuchak, Bangkok 10900
Tel. 662-5620427 Fax 662-5620429, 5613035

Mr. Chalpat Rajanavipat

Fishery Biologist, Fishery Environment Division,
Department of Fishery (inside Kasertsart University)
Bangkok 10900
Tel. 662-5620495 Fax 662-5520494

Dr. Pichan Sawangwong

Head, Department of Aquatic Science,
Faculty of Science, Burapha University,
Chonburi 20131

Tel. 66-038-390354, 390060, 390560

Fax 66-038-390354, 390047

Dr. Narong Na Chlangmal

Department of Community Medicine
Faculty of Medicine

Prince of Songkhla University

Hat yai, Songkhla 90112

Tel. 662-212070 Ext 1167

Fax 662-212903

Miss Waewtaa Thongra-ar

Research scientist

Institute of Marine Science, Burapha University,
Bangsaen, Chon Buri 20131

Tel. 66-038-391671-3

Fax 66-038-391674

Dr. Sirirat Rengplap

Department of Microbiology, Faculty of Science
Chulalongkorn University, Bangkok 10330

Tel. 662-2185044, 2185070

Fax 662-2185000

Miss Preeda Phakplan

Natural Resources Planning and Management,
Asian Institute of Technology (AIT)

G.O.P. Box 2754

Bangkok 10501

Tel. 662-5245599 Fax 662-5245597

Dr. Sirintornthep Towprayoon

Division of Environmental Technology

School of Energy and Materials

King Mongkut's Institute of Technology Thonburi

Bangmod, Rusburana, Bangkok 10140

Tel. 662-4270037 Ext. 7301 Fax 662-4279062

Mrs. Praopan Tongsom

Natural Resources and Environmental Management Division,

Office of Environmental Policy & Planning

Rama VI, Bangkok 10400

Tel. 662-2799182 Fax 662-2798088

Dr. Jiraporn Sukhumavasi

Senior Scientist

Biotechnology Department,

Thailand Institute of Scientific and Technological Research

(TISTR) 196 Phahonyotin Road, Chatuchak, Bangkok 10900

Tel. 662-5795515, 5790160

Mr. Soopphaporn Pukasemvarangkoon

Environmentalist, Technical Division,

Harbour Department,

Thanon Yotha, Bangkok 10100

Tel. 662-2331311 Ext. 332 Fax 662-2343832

Dr. Sirlpong Premjit

Department of Biotechnology, Faculty of Science,

Burapha University, Chonburi 20131

Tel. 66-038-390354, 390060, 390560

Fax 66-038-390354, 390047

Private Sector

Mr. Boonchal Kurdpanyawatana

Environmental Coordinator

Esso Standard Thailand Limited

3195/17-29 Rama IV Road, Bangkok 10110

Tel. 662-2624000 Ext. 4785 Fax 662-2624814

Mr. Pullop Manggornchal

Engineer

Safety & Environment Division, Petroleum Authority of Thailand,

2 Ard-Narong Rd., Phrakanong, Bangkok 10250

Tel. 662-2490021-9, 2494515 Ext. 7211, 7121

Fax 662-2494515

Mrs. Oranuch Meechukethu

Assistant to Managing Director,

Chemstar Laboratories Ltd.

61/1 Soi. Saensabai, Sukhumvit 36

Bangkok 10110

Tel. 662-2585823 Fax 662-2582627

Dr. Sompong Hirunmasuwan

Manager, R&D Division, Goshu Kohsan Co.,Ltd.

70 Moo 5 Kingkaew Rd., Bangphli,

Samutprakarn 10540

Tel. 662-3124159, 3124165-7, 3124171-5

Fax 662-3124162

Miss Darika Lathapipat

Assistant to the president

Thailand Environment Institute

210 Sukumvit 64 Bangchak Refinery Building 4

Prakanong, Bangkok 10400

Tel. 662-3310060, 3310047 Ext. 264

Fax 662-3324873

Annex III
The Title of Country Report

- 1. Malaysia** : Hydrocarbons in Seawater and Sediments from Malaysian Coastal Waters
Wang C.W. and A.R. Abdullah
Department of Biochemistry, Faculty of Medicine,
University of Malaysia, Malaysia
- : Pesticide Residues in the Malaysian Aquatic Environment : Trends, Impacts and Future Consideration
Abdul Rani Abdullah and Choo Poh Sze
Department of Chemistry, Faculty of Science,
University of Malaysia, Malaysia.
- 2. Indonesia** : Assessment Techniques for Marine Pollution : Toxicity Testing and Mesocosm Experiment
Deddy Setiapermana
Marine Environmental Research and Development Division,
Jakarta, Indonesia.
- 3. Vietnam** : Technology for Pollution Assessment in Marine Sensitive Ecosystems of the South-West Sea Waters of South Vietnam
Dao Manh Son - Bui Dinh Chung
Department of Fisheries, Forestry and Fisheries,
Phnom Penh, Cambodia.
- 4. Philippines** : Status of Marine Pollution Assessment Capabilities in the Philippines
Marco Nemesio E. Montano
Marine Science Institute, College of Science,
University of the Philippines, Philippines.
- 5. Thailand** : The Most Critical Problem of the Inner Gulf of Thailand
Piamsak Menasveta
Marine Biotechnology research Institute,
Chulalongkorn University,
Bangkok, Thailand.