



**CRI/ICEIT
NEWSLETTER**

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Chulabhorn Research Institute

INTERNATIONAL CENTRE FOR ENVIRONMENTAL AND INDUSTRIAL TOXICOLOGY (ICEIT)

CRI's ICEIT has been designated as a
"UNEP Centre of Excellence for Environmental and Industrial Toxicology".

Asia's Developing Countries Industrially Advancing, But Environmentally Deteriorating

Asia, where over half of the world's people live, is industrialising rapidly. Fast-rising demand for industrial goods, increased population pressure and economic competition have been the driving forces behind this transformation. In less than half a century since the end of World War II, the region's population has more than doubled, now numbering at close to 3 billion.

As many developed countries have learned, industrial expansion brings not only welcome changes but also destructive consequences. Industrialisation has, on the one hand, generally improved the quality of life of the people in the region, where the majority are poor, but, on the other hand, has had a detrimental impact on the environment. The higher the number of industries, the greater the amount of hazardous wastes discharged.

As developing Asian countries scramble to join the exclusive club of industrialised nations, few are prepared for the environmental damage that accompanies rapid industrial expansion. They are slow in learn-

ing the past mistakes of industrialised countries, and lack the resources and technological know-how to correct the situation.

Let's us look back into the past to learn what prices developed countries have had to pay for industrial expansion, especially through their reckless use of chemicals:

During the 1950s, the London smogs killed thousands, and brought the city's transport to a halt every winter. The world largest rivers such as the Rhine became severely polluted. DDT residues spread to the most remote sites, including Antarctic ice. Industrial accidents – such as chemical explosion in Flixborough, United Kingdom, which killed 23, injured 104 and caused 3,000 others to be evacuated – became increasingly frequent. In Sweden, acid rain from western Europe killed off life in thousands of the country's lakes.

These incidents, once considered isolated problems in North America and Europe, are becoming increasingly common in

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Industrial expansion brings not only welcome changes but also destructive consequences.

Following its highly successful first-time effort five years ago, the Chulabhorn Research Institute (CRI) is organising a sequential Second Princess Chulabhorn Science Congress from 2 to 6 November 1992.

The meeting, entitled "the International Congress on Environment, Science and Technology: The Challenge of the 21st Century", promises to be one of the most significant scientific events in Thailand and perhaps in this region. It will also make an important contribution to international understanding of environmental science.

It is being organised in honour of Her Majesty Queen Sirikit, who will turn 60 this year, in recognition of her outstanding efforts in development and environmental conservation.

The Congress' scientific programme, which has been very carefully put together, addresses five major issues of global concerns; environmental health, toxic chemicals, hazardous wastes, biotechnology and biodiversity. It also provides an excellent opportunity to put into effect policies to promote sustainable development and to follow up on the United Nations Conference on Environment and Development.

With its topics being timely and of global relevance, the Congress has gained the attention of the world scientific community. Most of the more than 100 of the world's leading scientists, academics, experts and technocrats from the United States, Europe, the developing countries and international organisations who are expected to take active part and make their presentations as invited speakers, have confirmed their participation. Apart from anything else, this indicates that the Congress is well recognised as a significant international scientific event.

Among those invited to present plenary lectures at the Second Congress are Dr. Mostafa Kamal Tolba of the United Nations Environment Programme, Dr. Frederick F. Becker of the University of Texas M.D. Anderson Cancer Centre and Dr. A.M. Charkrabarty of the University of Illinois College of Medicine at Chicago.

PROFILE

This is the first of a three-part series introducing the eminent scientists and academics who will give plenary lectures at the Second Princess Chulabhorn Science Congress.

DR. MOSTAFA KAMAL TOLBA

For almost two decades at the helm of the United Nations Environment Programme (UNEP), Dr. Mostafa Kamal Tolba has made significant impacts on international efforts to protect the environment. He had been instrumental to the worldwide acceptance of the concept of environmentally sound development, and had helped raise global awareness to such environmental problems as the warming of the earth and sea-level rise, a thinning ozone layer, the dumping of hazardous wastes, sewage polluted beaches, and the loss of tropical forests and species.

Dr. Tolba's negotiating and scientific skills contributed to UNEP's most widely acclaimed success, the adoption in Montreal, Canada, in 1987, of the historic international agreement to protect the ozone layer.

An Egyptian scientist specialising in plant pathology, Dr. Tolba was Professor of Microbiology at Cairo University before his current appointment as the Executive Director of UNEP, a rank equivalent to Under-Secretary-General of the United Nations. He had written extensively on plant diseases, anti-fungal substances and the physiology of micro-organisms.

DR. FREDERICK F. BECKER

Dr. Frederick F. Becker has attained national and international recognition as a unique scientist, teacher and administrator. He has brought his talents and creative ability to studies of the normal and diseased liver, the induction of cancer by chemical agents, and the biology and treatment of the resultant cancers. He is Vice President for Research, Professor of Pathology and Scientific Director of the Tumor Institute.

Dr. Becker's early research efforts proved vital in understanding the effects of chemical agents in inducing cancer including his early findings that led to an understanding of the heterogeneity of the alterations that resulted, modulating factors such as diet, and the sequential phases that are required to occur before cancers appear.

Dr. Becker developed and edited a six-volume work entitled *Cancer, a Comprehensive Treatise*. It has been acclaimed a vital source in the field and has served as a model for recent cancer literature.

Among his honours was the Achievement Medal of the National

DR. A.M. CHARKRABARTY

Dr. A.M. Charkrabarty is Professor of Microbiology and Immunology at the University of Illinois College of Medicine at Chicago. His work has contributed to the discovery of microbes which can degrade xenobiotic compounds. His research has resulted in elucidation of genetics and biochemistry of highly complex biodegradative pathways in many microbes. Dr. Charkrabarty's other contributions to medical science include cystic fibrosis and *pseudomonas* infection.

Cancer Institute of Japan, and the Solomon A. Berson Medical Alumni Achievement Award. Dr. Becker also received the signal honour of being elected to the *Royal Academy of Arts and Sciences of Spain*. In 1990 President George Bush appointed Dr. Becker as a member of the National Cancer Advisory Board. In 1991 the University of Texas awarded him the Hubert L. and Oliver Stringer Chair for Basic Research, the first endowed Chair to be awarded to a holder of an administrative title.

SUBMISSION OF ABSTRACTS REQUIRED BEFORE END OF JULY

All participants to the Second Princess Chulabhorn Science Congress are invited to submit abstracts of their presentation before **31 July 1992**.

The Scientific Programme consists of plenary and invited lectures, symposia, workshops, panel discussions, contributed paper and poster sessions on: Environmental Health, Toxic Chemicals, Hazardous Wastes, Biotechnology, Biodiversity, and Policies and Issues in Environment, Science and Technology.

For more information please write to:

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Chulabhorn Research Institute
c/o Faculty of Science, Mahidol University
Rama 6 Road, Bangkok 10400

SCIENTIFIC PROGRAMME

PLENARY LECTURES AND EMINENT SCIENTISTS AND ACADEMICS

- Environmental Science and Technology for 21st Century
M.K. Tolba (United Nations Environment Programme)
- Capacity Building for Environmental Science and Technology
Nay Htun (United Nations Conference on Environment and Development)
 - Overview of Environmental Health
D.W. Moeller (U.S.A.)
 - Recent Developments in Chemical Carcinogenesis
F.F. Becker (U.S.A.)
 - Hazardous Waste Contaminated Groundwater and Bioremediation
P.L. McCarty (U.S.A.)
- Bioremediation: Biotechnological Approaches to Problems of Environmental Pollution
A.M. Chakrabarty (U.S.A.)
- Plant Biotechnology and Sustainable Agriculture
J. Schell (Germany)
- Science of Biodiversity
O.T. Solbrig (U.S.A.)
- Toxicity of Chemicals
Speaker: To be announced

PARTIAL LIST OF TOPICS FOR SYMPOSIA, PANEL DISCUSSIONS, SEMINARS AND WORKSHOPS

- I. SCIENCE AND POLICY**
Integrating Science and Policy
International Cooperating Systems
- II. ENVIRONMENTAL HEALTH**
Environmental Carcinogenesis and Occupational Cancer
The Economics of Health Care
Habitat Modification and Environmental Health
- III. TOXIC CHEMICALS**
Biological Indicators for Monitoring Testing and Good Laboratory Practices
Risk Assessment Procedures
DNA Repair and Mutagenesis
Factors Influencing Toxicity
Information Systems for Managing Chemicals
- IV. HAZARDOUS WASTES**
New Technologies and Management Practices for Cleaner Production
Planning and Management of Hazardous Wastes
- V. BIOTECHNOLOGY**
Environmental Stress Responses
Biodegradation
New Developments and Technologies
Biosensors for Environmental Monitoring
Plant Biotechnology and Sustainable Agriculture
Assessment and Management of Risks and Safety
- VI. BIODIVERSITY**
Discovery of Biological and Medicinal Agents from Natural Sources in the 21st Century
Conservation and Tissue Culture
Assessment and Monitoring Techniques
Ecoregions Conservation
International Conventions on Biodiversity
- VII. TRADITIONAL METHODS FOR MANAGING NATURAL RESOURCES**
Alternative Approaches to Agriculture
Problems of Water Resource Management
Permaculture:- Integrated Designed for Social Development
Effects of Environmental Problems on Cultural Changes
- VIII. COMMUNITY-BASED ENVIRONMENTAL PROTECTION**
Poverty *versus* Environmental Protection?
The Role of Non-Governmental Organisations in the Protection of Natural Resources
Active Citizenship and Community Participation:- A Key to Success in Environmental Protection
Enhancement of Women's Participation in Agriculture for Food Production

"THE BENEFIT OF HAVING A POOL OF WELL-TRAINED HUMAN RESOURCES CANNOT BE MEASURED IN MONETARY TERMS"



The first-ever "Earth Summit" – the United Nations Conference on Environment and Development (UNCED) – is scheduled to take place in Rio de Janeiro, Brazil, on 1-12 June 1992. One of the most elaborate and largest international conferences, involving virtually every country on this planet, UNCED will address global environmental problems with a view to making the earth a better place to live. Heads of state or government will discuss issues ranging from the protection of the upper atmosphere to the conservation of all deep-sea life forms. The Summit's main goal is sustainable development; this included, for example, the promotion of industrial progress that does not abuse the environment.

*As one of the most rapidly developing economies in the world, Thailand will benefit a great deal from UNCED. *Agenda 21, to be adopted at the Conference, is expected to contain a masterplan for action in all major areas affecting the relationship between the environment and the economy. This document will provide a guideline to help the Thai Government chart its policy towards environmentally sound development.*

Her Royal Highness Princess Chulabhorn will lead the Thai delegation to UNCED.

Professor M.R. Jisnuson Svasti, an Editorial Board member of the CRI/ICEIT newsletter, talks to Dr. Nay Htun on some of the main issues to be taken up at the Rio Conference.

Dr. Htun is UNCED's Director of Programmes and Special Advisor. His responsibilities include maintaining liaison with industry and supervising UNCED's work in the field of biodiversity, biotechnology, hazardous wastes and toxic chemicals.

PROF. M.R. JISNUSON: Please give as a brief information on UNCED, its scope and goals.

DR. HTUN: UNCED is an inter-governmental conference to be attended by Heads of State or Government. The media has called it the Earth Summit. The Conference will address issues related to the environment and development, and adopt environmentally-sound development policy guidelines for national implementation. As you know, the Conference will be held in Rio de Janeiro, from 1-12 June 1992. The Head of the Thai delegation will be Her Royal Highness Princess Chulabhorn.

So far there have been three

meetings of the Preparatory Committee for UNCED, and the fourth has been scheduled for March and April this year. At those meetings, governments, together with non-governmental organisations, reviewed a wide range of topics on the environment and development, such as poverty, trade, and the flow of resources from developed to developing countries and *vice versa*. We have looked into a whole cluster of socio-economic issues. Issues that are closely related to natural resources and the environment, such as the atmosphere, soil, forests, biodiversity, biotechnology, ocean, fresh water, toxic chemicals and hazardous wastes, have been thoroughly discussed by the Preparatory Committee.

Also discussed is how to integrate the environment and development. There are many ways of doing this; through financial means, technology transfer, education, training and information.

So these are the whole cluster of issues that will be dealt with at UNCED. They are also the main component of what is called Agenda 21, a comprehensive programme of action for the 21st century.

There is another set of topics that have been discussed at the Preparatory Committee. They are the basic principles of individuals' as well as countries' rights and responsibilities on the environment and develop-

ment. These principles, if and when adopted, will be incorporated into a document, which will be known as the "Earth Charter" (see below). Some have already compared this document to the Magna Carta. We hope that when it is adopted by the Conference, the Earth Charter will provide an important ethical and moral framework to guide our behaviour, thinking and action.

As for the environment and natural resources, the core issues are toxic chemicals, hazardous wastes and biotechnology. I specifically mention these topics because they have special significance. Let's look at toxic chemicals. Chemicals are essential for almost all aspects of human welfare and development. It is inconceivable to think that civilisation and the world community can exist and progress without chemicals. We just have to look around us to be convinced of the importance of chemicals. Unmistakably, they play an important role, for example, in agriculture, horticulture and transportation; and in almost every aspect of human activities. However, when chemicals are mistreated or over-used, they pose a great danger to the environment and human health. Our main concern here is to choose the best strategies for managing chemicals to ensure that they not only enhance development but also protect human health and the environment. One such strategy, for example, is to promote greater inter-governmental coordination for testing the toxicological properties of chemicals. At the moment, the existing mechanisms are not efficient enough; we have to find better mechanisms. Proper labelling is another method of managing chemicals. It can provide consumers with relevant and useful information on how to handle and safely store the dangerous products. Currently, there is not a single standardised international system for chemical labelling; each country has its own standard of labelling. This is why education, training and research are often seen as important steps in building up the national capacity for managing chemicals. Before I say something about education, training and information, I should like to talk first about biotechnology.

Like chemicals, biotechnology plays an important, bridging role in helping to accelerate all forms of development, be it agriculture, horticulture,

protection of human health, food production, to name a few. Biotechnology requires genetic and biological resources, which are mostly available in the developing countries. With the help of biotechnology, developing countries can speed up their development process. UNCED's main concern, therefore, is to ensure that these countries make the best use of biotechnology without endangering human health and the environment.

We need information to assist us in formulating policies. Education and training are important because they contribute to the development of human resources and help build up the national capacity for managing chemicals and biotechnology. This issue of national-capacity build up is one of the key elements of UNCED's programmes and activities.

I grant you that it is costly to provide good education and training; but we must also think of the benefit. The benefit of having a pool of well-trained human resources cannot be measured in monetary terms. Nevertheless, the cost can be optimised by establishing a network and strengthening cooperation among universities and institutions at the national as well as regional level. This will eliminate a fair amount of duplications. For example, if CRI produces a package of training curriculum, training modules, audio-visual programmes and course notes, on toxicology or biotechnology, these materials can also be used, with very little modifications, by other organisations in different countries of the region. In effect, this will save time and effort of other institutions from having to produce similar packages.

PROF. M.R. JISNUSON: *Where do you envisage the funding for national capacity building to come from?*

Dr. HTUN: Funding must start at the national level. The government must indicate its willingness and commitment to improve its education, training and research programmes before any external funding can be expected.

PROF. M.R. JISNUSON: *In developing countries, there is often communication gap among scientists, policy makers and the general public. What can we do to minimise this gap?*

Dr. HTUN: There are many ways to do it. First of all, scientists and policy makers must hold regular dialogue.

Scientists must not shy away from what they have to say.

Second, scientists are generally reluctant to present their ideas until they are certain of their findings. From a scientific point of view, this is correct; it's understandable. But on many important issues we just cannot wait.

Society cannot wait until we are one hundred per cent right. The time element is crucial. If we have to wait until we are one hundred per cent certain, it may already be too late. Scientists must be willing to communicate.

Third, scientists should also improve their ability to communicate in a language easy to understand by everyone. Scientists are comfortable using scientific and technological terms that can only be understood by scientists themselves, but not by politicians, decision makers and others.

Finally, there is a need to raise people's awareness of the influence of science on everyone's daily life. Without science, there will be no progress, and the quality of life will not improve. Without doubt, scientists have an important role to play in increasing public awareness. Decision makers and politicians will listen more to the people and be more responsive to their needs, when there is greater public awareness. These are some of the ways, I believe, to bring policy makers and scientists closer together

**See the main article on Agenda 21 on Page 6.*

The Earth Charter is a statement of principles setting out rights and obligations of all nations in relation to the environment. An example of one such principle is the undertaking not to pollute a river upstream of where others must take drinking water downstream, a concept that has particular significance where waterways flow through several countries. The Charter would be morally but not legally binding.

(Source: Earth Summit in Focus, Number 1, the United Nations Department of Public Information [DPI/1160 - September 1991 - 7m])

Agenda 21 to Promote Safe Management of Toxic Chemicals and Hazardous Wastes

The United Nations Conference on Environment and Development (UNCED) is expected to adopt a comprehensive programme of action called Agenda 21, when it meets in Rio de Janeiro, Brazil, on 1-12 June 1992. The Agenda will provide a blueprint for action in all areas, based on the principles of sustainable development, for now and the 21st century. Agenda 21 will not be legally binding, but it is expected that governments adopting it will be highly committed to its implementation.

Among the measures in the Agenda 21's programme of action are the safe use of toxic chemicals and the reduction and control of hazardous wastes. Here are some of the proposed measures and their cost estimates to be considered at the Conference.

Toxic Chemicals

– Thousands of chemicals are used in construction, industry, food production and agriculture; their improper use severely damages the environment and endangers human health and future generations.

– The safe management of chemicals requires action by governments, private industry and international organisations, including assessing the dangers of hundreds of chemicals; sharing information about dangers internationally; establishing a consistent system of labelling substances; and promoting safer alternatives to harmful chemical use.

– Safety is an important consideration at all stages of the chemical cycle, including manufacture, trade, storage, use and disposal. Awareness of the hazards of chemicals is necessary for safe use. Communities have a right to know the risks of particular substances and processes.

– Government policies should support research and practices to replace toxic chemicals with less hazardous substances and alternative clean technologies. In agriculture, reliance on pesticides can be reduced by promoting biological methods of insect control.

– Preventing accidents and developing emergency responses are important in locations where chemicals are used or stored. Procedures to clean up and restore damaged areas should be set out. National centres should be es-

tablished to diagnose and treat poison victims.

– The production and use of internationally prohibited chemicals including asbestos and certain halogen compounds should be restricted and phased out.

– Transnational corporations which export chemicals should adopt the same safety standards that apply in the countries in which they are based. The exporting of chemicals whose use is banned in the country of origin should be prohibited.

– To regulate the use of dangerous chemicals and determine whether they should be imported, countries need to know about health and environmental risks. Governments and industries in exporting countries should provide that information; international organisations should help disseminate it.

– Data is often insufficient to determine the risk associated with particular chemicals. Assessments should be completed by the year 2000 on 500 of the most widely used chemicals, including all major pollutants. Guidelines, including exposure limits, should be issued. More than 100,000 chemicals are in use but only 1,500 are used in 95 per cent of all industrial and agricultural productions.

– The cause-effect relationship between chemical exposure and certain diseases should be studied. Research methods that reduce the use of animal testing should be developed.

– Uniform international standards are needed for classifying the safety of chemicals used in the workplace or home. International organisations should develop an appropriate labelling system but should not create unjustified trade barriers.

– The annual cost of regulating toxic chemicals worldwide is estimated at US\$500-600 million. Developing countries will need US\$100-150 million in international financing. International efforts to assess chemical risks, develop a labelling system and support the exchange of information will require another US\$43 million.

Hazardous Wastes

– Reducing the production of dangerous industrial wastes and improving

their safe handling and proper disposal are vital if human health and the environment are to be protected. Proposals in Agenda 21 address the need to control the generation, storage, treatment, transportation and disposal of hazardous wastes; the need for international support for developing countries so they can deal with these wastes; and the elimination or reduction of transboundary waste shipments.

– Incentives are proposed to prevent or minimise the production of dangerous wastes. Cost-effective, cleaner production methods should be introduced. Biotechnology or other substitutes for hazardous substances will be encouraged.

– The production of chemicals whose use is banned or restricted should be phased out. More research should be undertaken to find alternatives.

– Techniques need to be developed for recovering useful material from waste products and using it in new ways. Recycling should be promoted. Unavoidable and dangerous industrial waste should be treated at or near its source. Treatment and disposal processes should be combined, where possible. Polluters should pay for disposal of wastes and clean-up of contaminated areas.

– Governments, with international assistance, should introduce pollution standards and controls, and create the infrastructure needed to enforce them. Surveys should determine where waste is produced. Research should be undertaken on the nature of hazardous waste materials and their impact on health, the environment and the economy. Action must be taken to protect people living near sites of dangerous waste.

– Countries should be able to dispose of their own toxic waste (assuming that such material can be disposed of in an environmentally sound manner). Movement of hazardous wastes across boundaries should be regulated under international standards and agreements.

– The export of wastes to developing countries that cannot meet treatment and disposal standards as stringent as those in the country of origin should be prohibited. Governments will

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SHORT COURSE ON ENVIRONMENTAL TOXICOLOGY

By Professor Alastair M. North

Environmental deterioration takes many forms, ranging from global issues like the "greenhouse effect" and ozone depletion to local phenomena such as pollution by domestic and industrial wastes. Consequently, as the world wakes up to the critical condition of the environment, a whole variety of professional skills and experiences are being called for to halt and then reverse the present destructive trends. Sadly, it seems that such expertise is in short supply, particularly in developing countries. Even worse, the multidisciplinary nature of environmental problems means that many "experts" with skills in only a single discipline are unable to make a meaningful contribution to the issue as a whole.

This weakness in human resources is particularly evident when it comes to the consideration of toxic wastes. The Industrial or Chemical Process Engineer understands only the factory and plant functions that generate such wastes; the Sanitation Engineer knows how to treat conventional domestic and similar effluent, but has no understanding of esoteric chemical pollutants; the Chemist can analyse almost anything, but is not well equipped to design large scale treatment plants or predict the medical consequences of the chemicals involved; the Medical Graduate has concentrated his attention on clinical medicine and surgery rather than the perils of the environment, particularly if these become evi-

be urged to pass laws that impose severe punishment for persons engaged in illegal waste traffic.

— Programmes to minimise the production of dangerous wastes and their disposal will cost an estimated US\$18.5 billion per year. About US\$1.2 billion from international sources is needed annually to help developing countries build safe waste-management capacity.

Sources for this article are from: *Earth Summit in Focus*, Number 1, the United Nations Department of Public Information (DPI/1160 – September 1991 – 7M); *Press Summary of Agenda 21*, Fourth Session of the Preparatory Committee for the United Nations Conference on Environment and Development, New York, 2 March to 3 April 1992.

dent only after long periods of minimal exposure. This tripartite separation of engineering, chemical and medicine results, of course, from the classical subject-oriented faculty and department structures of the world's universities; and those in this region are no exception.

The problem in developing countries is compounded because limitations in human resources are accompanied by deficiencies in legislation and enforcement that permit (or even encourage) maximisation of short-term profit for minimum capital investment. The latter is often achieved by minimising waste treatment or pollution control measures, because legislative training, likewise, is separated from scientific and technological awareness.

These issues are clearly apparent from the perspectives of the Chulabhorn Research Institute (CRI) and the Asian Institute of Technology (AIT) both of which have been created to conduct high-level teaching and research in science and engineering, unhindered by inter-disciplinary boundaries. It so happens that in consideration of toxic wastes, each Institute can bring a partial interdisciplinary approach to the subject, but there is also a very significant complementarity between the parts. The CRI can provide the expertise and awareness of medical pharma-

cology and toxicology, while AIT can provide input of applied science and engineering knowledge in waste and pollution generation and treatment. Together these parts provide the interdisciplinary subject area we call "Environmental Toxicology".

While the long-term objective of both Institutions is to jointly provide formal educational qualifications and research in this subject area, the first collaborative venture was a postgraduate short course training programme. This was designed to give an intensive introduction to the medical or technological components lacking in the experience of professional persons involved in toxic waste pollution. The programme, consisting of a toxicological and technological component, was conducted in Bangkok during November and December 1991. This volume contains the material of the programme. We hope that it sets a direction in this vitally important interdisciplinary field, improving regional environmental protection, as well as providing a milestone in inter-institutional and international cooperation.

Professor Alastair M. North is President of the Asian Institute of Technology. He has had a distinguished academic career, teaching at some of the world's most renowned universities. He is an expert on physical and industrial chemistry.

LOCAL SUPPLIER OF REFRIGERANTS IN SWITCH TO NON-CFC SUBSTITUTES

A major Thai trading firm has made a big step forward in helping to protect the earth's ozone layer. A spokesman for Berli Jucker announced in March this year that the company had imported "Suva" chlorofluorocarbon-free refrigerants from Du Pont, replacing the ozone-depletion gases "Freon".

The company's decision was motivated by the growing awareness of the adverse environmental effects of CFCs and by the need to provide ecologically sound alternatives, the spokesman said.

"Freon" refrigerants, also produced by Du Pont and locally distributed by Berli Jucker, had long been used by car makers, refrigeration and air-conditioning equipment manufacturers, department stores and real estate companies. The substances contain CFCs which are harmful to the earth's upper atmosphere.

"Suva" products are safer alternative refrigerants developed by Du Pont after the Montreal Protocol on Substances that Deplete the Ozone Layer to regulate the use of CFCs came into effect in 1989.

Asia's Developing Countries Industrially Advancing, But Environmentally Deteriorating

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the industrially-booming Asia. The only difference is that the situation is much more acute here.

Consider these cases:

In Southeast Asia, toxic wastes released by industrial plants have been responsible for a large number of deaths and disabilities. In Taiwan and Hong Kong, contamination of coastal waters by industrial toxic wastes is widespread, poisoning seafood supplies. Manila's five main rivers are classified as "biologically dead". In major cities of South Korea, China, India and Southeast Asian countries, where energy consumption has risen sharply in the last decade or so, contamination of water resources by acid rain has reached a critical stage.

In developing countries of Asia, more than anywhere else, industrial pollution is a sign of prosperity. The more wealth a country has acquired, the more industrial pollution it will suffer.

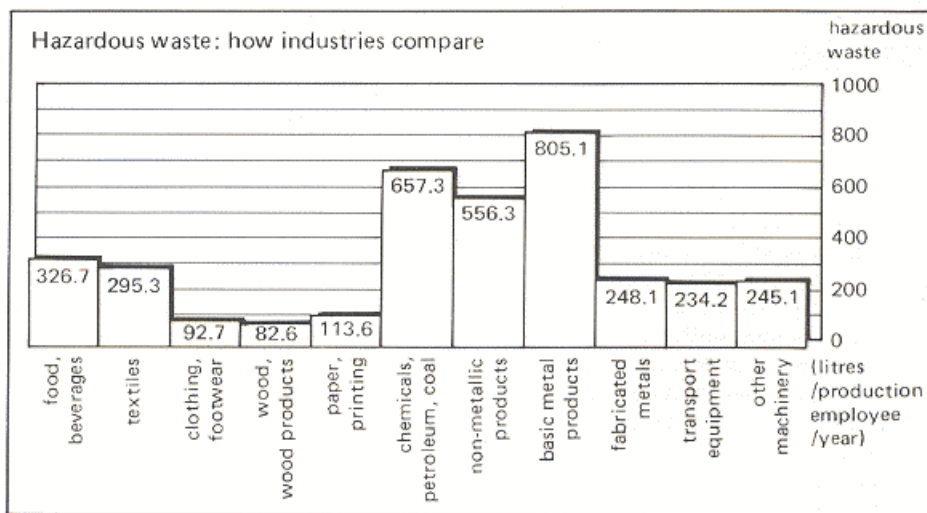
The use of fossil fuels in the region has increased so much that the air quality in Asia's urban centres is harmful to health. Sulfur dioxide emissions from commercial energy use are dangerously high. Industrial emissions of carbon dioxide (the main contributor to global warming) have jumped more than ten fold, from 94 million tons in 1950 to well over one billion tons in the last few years.

Industrial expansion has increased the use of chemicals. Chemical by-products are then discharged into the air, ground and water, destroying much of the environment. In Asia, pesti-

U.S. INDUSTRY TO BE REWARDED FOR EARLY REDUCTIONS OF TOXIC EMISSIONS

United States industrial companies are given incentives to make accelerated and voluntary cuts in toxic emissions.

According to *Chemical & Industry* (17 June 1991), the U.S. Environmental Protection Agency (EPA) has recently come up with a programme that will allow American companies a grace period of up to six years to comply with new technology specifications, if they can achieve the required emission reduction ahead of time.



Source: "Industry and the Environment," *UNEP Environment Brief No. 7*.

cides and other hazardous chemicals are found more often and in increasing concentrations in human beings.

In North America and Europe, efforts to provide protection to the environment, which began more than two decades ago, have brought satisfactory results. In many industrialised countries where there is zero population growth, industrial pollution levels have reduced. Progress is due partly to action by government and industry, and partly to the growth of service and information industries. The number of heavy manufacturing industries has also declined.

To cope with their problems, Asia's developing countries have to learn from the experiences of the industrially advanced nations. They need to adopt sustainable forms of industrial development that will make maximum possible use of recycling techniques, produce minimum pollution and reduce risks to the lowest possible level.

Authorities must realise that it pays to prevent pollution rather than clean it up, and that concern for the environment leads to financial savings and

increased competitiveness. Early attempts to deal with the problem through government regulations and "add-on" technology to clean up industrial waste have not proved to be successful.

Sources: "Industry and the Environment," *UNEP Environment Brief No. 7*; "Acid Rain Likely to Fall on Asia," *Depthnews* (DNSS #3-90); and *Depthnews Radio* (Code No. 1811291/12).

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