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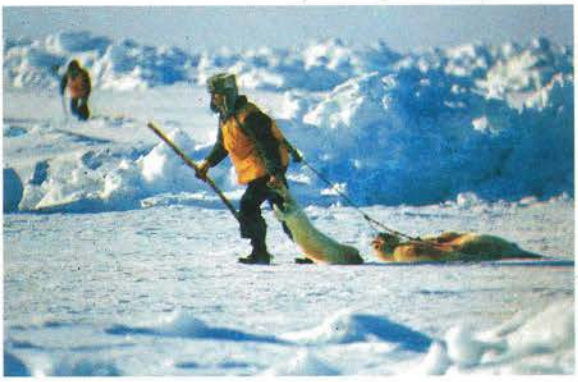
15 Years of making a difference

Exchange of Environmental Experience Series - No. 4



UNEP

United Nations Environment Programme
Nairobi, December 1992

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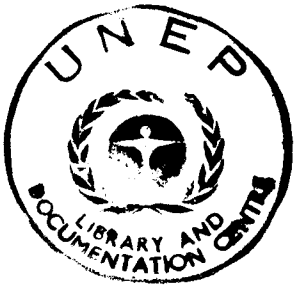

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Preface

Dr. Mostafa K. Tolba
Executive Director
United Nations Environment Programme

"Knowledge is power". This age-old proverb still can guide us when seeking to control the environmental destruction going on around the globe. I am particularly pleased to address the readers of this publication commemorating the 15th anniversary of the operation of UNEP INFOTERRA network. INFOTERRA, the international environmental information system, is dedicated to coordinating the exchange of information about the state of the world environment, about technologies to meet environmental challenges, and most importantly, about sources where the world's best environmental knowledge can be tapped to serve all countries in their efforts to make the Earth a more comfortable place for all.

The information services provided by INFOTERRA has empowered a number of countries to gain access to the needed knowledge and hence the power to come to grips with environmental challenges, even calamities, as some of the success stories in this publication so eloquently depict. It is understandable that the countries which most often turn to INFOTERRA for help are developing countries, as most developed countries already have their own research institutes, think-tanks and computerized data bases.

Developing countries very seldom can afford such information "luxuries". On the other hand, developing countries have unique and important environmental information needed by the rest of the world. All countries need a basic environmental data system to be able to make informed decisions regarding their investment, economic and commercial policies.

Recognizing this information disparity, INFOTERRA has become a catalyst in building national capacity for environment information collection, processing, and exchange.

Looking ahead, we can see INFOTERRA adapting to its new role in the information-intensive global village, where ever increasing byte blocks are transmitted in smaller and smaller fractions of time. But that "village" is still very unequal and gigantic efforts are needed to bring developing country information networks and centres fully able to handle the multiplicity of data which the global environmental management desperately needs. INFOTERRA is working to bridge the information gap, to bring the knowledge of the North and South together for effective global planning.

Foreword

Woyen Lee
Director
INFOTERRA Programme Activity Centre
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When the United Nations Conference on the Human Environment recommended in 1972 the creation of a mechanism to facilitate the exchange of environmental experiences and information among nations and within a nation, the tasks seemed almost impossible to fulfill. Successive sessions of the UNEP Governing Council had established INFOTERRA as a system to provide environmental information pathways to answer questions and to exchange experiences on the environment. This has been achieved through the establishment of an international network of national focal points, of environmental information sources, of special sectoral sources and of regional service centres.

INFOTERRA has matured. Today INFOTERRA has 155 National Focal Points covering countries with 99 % of the world's population. INFOTERRA's International Directory of Sources lists over 6,000 institutional information sources and is extensively indexed. INFOTERRA has developed into one of the largest international environmental information supply systems in the world, handling over 24,000 queries annually. During the years, the focus of information transmitted has shifted to the broader cross-sectoral management and policy issues, instead of isolated specifics. Thus, INFOTERRA has increasingly contributed to informed decision-making at national and international level.

The guiding philosophy of INFOTERRA has been and continues to be that sustainable development depends on a thorough knowledge of the resources available to the world, and the limitations placed on these resources. Environmental problems are the product of inter-relationships among a wide range of factors. Simple and apparently direct solutions do not always

produce the expected results. Solutions, therefore, must also involve a wide range of elements. The key to the research for alternative solutions is relevant and timely information.

The series, entitled *Exchange of Environmental Experience*, grew out of a recognition that a great deal of valuable experience on the environment was being shared through the INFOTERRA network, and perhaps much of this information warranted a wider audience. The substantive information given to one user upon request might be of interest to others.

This volume of the EEE series *"INFOTERRA - 15 Years of Making a Difference* " aims to convey to the public a number of success stories of the INFOTERRA network and its impact on sustainable development.The success stories related here have been submitted by the involved INFOTERRA national focal points and researched by the staff of the INFOTERRA Programme Activity Centre as completely as resources have permitted.

It is important to remember that most of the successful application of information provided by INFOTERRA network is not necessarily known to the PAC and therefore not included in this volume. What is presented here serves only as examples. With these limited number of examples published in this book, I invite you to join the concerned world of INFOTERRA users.

I

TERRESTRIAL ECOSYSTEM MANAGEMENT

BIOLOGICAL DIVERSITY AND PROTECTED AREAS

"Iwi, Last of Hawaii's Sickle-Billed Hoeycreepers", by Jack Jeffrey, USA

The stories in this section address the struggles in many parts of the world to prevent the rapid destruction of diverse ecosystems and the consequent loss of species. It is recognized that such species loss undermines sustainable development which depends on highly diverse natural ecosystems to maintain hydrological cycles, regulate climate, create soils and absorb and break down pollutants.

To highlight a few examples from the stories which follow, INFOTERRA information has played a key role in solving problems of tourist pressure in Kenya's national parks, hippopotami intrusion in the Gambian rice fields, protection of the Giant Water Bug in Vietnam and attempts to save Rico Mountain in Bolivia.

Kenya seeks environmental strategy for national parks

The Masai Mara of Kenya borders the Serengeti plains of Tanzania, together they form an ecosystem which incorporates one of the greatest concentrations of large animals found anywhere on Earth. In 1989 the Narok District Development Committee, which administers the Masai Mara, asked INFOTERRA to provide information on models of multiple-use national park management plans which would enable the Committee to integrate environmental management and wildlife conservation into other land-use practices at the district level. As a result of the information received, the Narok District Development Committee instituted a two-tiered reserve system. In the inner reserve, no intrusion of human settlement was allowed, while in the outer reserve the traditional cattle herding of local Masai pastoralists was permitted. This effective policy has been instrumental in maintaining the Masai Mara as Kenya's number one tourist attraction.

In 1992 Kenyan parks were again in need of INFOTERRA information. The Kenya Wildlife Service (KWS) sought advise in controlling the problem of dust emission on the roads in game parks. The dust emission from unpaved road when game-viewing vehicles pass through chokes plants on the side of the road and detracts from the game viewing experience for tourists. The United Kingdom Transport Research Laboratory (TRL) provided examples of different methods for solving dust problems and references to Kenyan standards. Most importantly, they advised that the TRL had research staff based in Kenya working on a joint research project with the Kenyan Ministry of Public Works on dust emissions from unpaved roads. They also noted that the International Labor Organization also had technical advisors in Kenya doing research on a road programme with conservation of the environment as one of its important components. Thus INFOTERRA was able to build bridges at the national level between projects at different ministries unaware of each others research. While KWS consulted with the experts resident in Kenya to help find the most suitable method of dust control, INFOTERRA was able to place in their hands additional useful information.

The National Park Service of the United States Department of Interior, sent the USA Park Road Standards and noted that the impact of park roads on park resources could be significantly reduced through careful planning, design, and construction practices. They advised that roads located on natural flat to rolling landforms that avoided side hills and steep terrain caused the least physical impact on the park. Also separate narrow one-way wildlife viewing roads have the least impact on the flora and fauna of the park while providing the tourist with viewing experiences unobstructed by other vehicles.

The USA also provided Kenya with information on a commercial product "Road Oyl" which was advertised as the only organic soil stabilization and dust control product on the USA market. Road Oyl, if applied under wet conditions to an aggregate base with good subsurface drainage, promised to create a hard surface able to shed surface water and provide a smooth travelling surface.

The Gambia rice fields damaged by hippopotami

In July 1986, INFOTERRA received a telex from the Gambia saying: "Hippopotami intrusion into rice fields along river Gambia. Urgently require information on projects or research dealing with anti-hippopotami barriers".

INFOTERRA had earlier provided environmental information to the Gambia, when the government considered plans for a rice plantation scheme along the river. Now the rice fields were growing, but the hippopotami, which used to graze at the shores of the rivers, went into the rice fields. Although the hippopotami is a protected animal, the rice farmers had already reduced the hippopotami population in the area to around only 40 animals. Something had to be done to protect the remaining hippopotami. A solution had to be found to secure the necessary grazing area for the survival of the remaining hippopotami.

The query was referred to organizations involved in wildlife conservation and management, but it was found that very little work was done with hippopotami containment, mainly because of the relatively few conflicts between hippopotami and land owners.

Experts concluded that the most adequate method of keeping the hippopotami away from rice fields was to erect a fence using hardwood tree branches, with fence posts dug in and joined in an X shape to prevent hippopotami from crossing the fence, while allowing smaller animals to go through to their grazing, or drinking locations. The fence was built so that enough space was left between the fence and the river for grass to be grazed by the hippopotami. This kind of fence had been successful in Kenya.

Vietnam protects the Giant Water Bug

The Ca Cuong (Lethocerus Indicus) commonly known as the Giant Water Bug, has become endangered in Vietnam as a result of modernized agriculture techniques. Modern irrigation systems have destroyed old hydrological patterns. The loss of small field cultivation has meant the loss of the bug's habitat; the use of pesticides and chemical fertilizers has created a toxic environment. The protracted Vietnam War with its chemical weaponry had a devastating impact on the bug, as well as most other aquatic species. As a result, the giant water bug is listed in the Vietnamese Red Book of 1989-1991 as endangered.

The National Pedagogic University No. 1 was interested in learning more about the bug in order to conduct a programme for its protection, propagation and to study its export value as a food item and its potential as a biological control vector. The Vietnam INFOTERRA national focal point requested information about the Giant Water Bug from the INFOTERRA network.

The International Centre of Insect Physiology and Ecology (ICIPE) responded with valuable information about the insect and its breeding behavior. They also included two abstracts which contained information about the use of the bug as human food. In both Thailand and Laos the bug is used to make bug-paste condiments such as "nam prik mangda" and other commercial preparations.

As a result of the information received, the Faculty of Agro-Biology at the Hanoi National Pedagogic University has begun its research programme. It is in the process of rehabilitating the use of the bug in Vietnamese cooking and is starting commercial breeding for export. Some research has been done on the use of the bug in the biological control of certain snails which are vectors of diseases that attack both humans and livestocks. Currently, the University is in search of grant funding to continue its research efforts.

Bolivia tries to protect a mountain

Non-governmental environmental action organizations with small budgets for research are also users of the INFOTERRA services. In 1988 the Civic Committee of Potosi urgently requested information from INFOTERRA to be used in its efforts to save both an historic town and a mountain from industrial exploitation.

The town, Potosi, located high in the Andes at 3,976 metres, is one of the highest towns in the world. Potosi was founded in 1545 after the discovery of silver in the region. Some 30,000 tons of silver were mined until the 17th century when silver market tumbled. Potosi's rich architecture and the beauty of the surrounding landscape have earned it a place on UNESCO World Heritage list. With the rise of silver prices in the 19th century, the city revived and became the home of the prosperous Mining Corporation of Bolivia.

The mountain, Rico Mountain, rises behind the town to a height of 4,790 metres above sea level. Rico is an extinct volcano containing some of the richest mineral deposits in the world. In May 1988, a private mining company started mining operations there. They constructed a hydrometallurgical plant in Potosi and envisioned processing 700 tons of minerals daily. According to the company's estimate, the mountain had about 400 million tons of exploitable minerals including lead, zinc, antimony, copper, bismuth, gold and tungsten. Unfortunately, the extraction and processing of this quantity of minerals is a pollution nightmare. The result

would also mean the destruction of the mountain and loss of habitat. In addition, projections indicated that the razing of the mountain would create a new weather pattern for the town including fierce winds, and clouds of dust. Some experts even felt that the town could become inhabitable.

Another burning issue for the citizens of Potosi was that the proceeds from the mining operation would not benefit the citizens. Most of the workers were imported and the company was not locally based.

In this climate, the Civic Committee of Potosi was formed and it wrote to INFOTERRA requesting models of legislation which would help it to protect the city and the mountain. Within days, substantive information on existing legislation for the protection of mountain ecosystems was supplied by several countries. The Committee held public debates attended by NGOs, mining interests, environmental experts. These debates received attention throughout Bolivia. The mining interests focused attention on ways to pass economic benefits on to the community, while NGOs focused on conserving the environment.

Not all stories have a happy environmental ending. The magnificent conic form of the mountain is gone. Both private and state mining companies are hauling the mountain away. And the town? It is still fighting and is struggling to have Rico Mountain declared a national monument so that the mining operation will stop.

St. Lucia investigates the impact of sand mining

Small island countries dependent on tourism are necessarily concerned with erosion of beaches. In St. Lucia it was determined that the beach erosion was not only from natural causes, but the result of badly planned rock and sand mining. To avoid further damage, the government decided to encourage the construction industry to turn inland and mine the pumice deposits. However, there were no environmental guidelines or regulations governing inland sand and rock mining on the island. St. Lucia turned to INFOTERRA for assistance.

Substantive information arrived from many sources. The USA national focal point provided a customized bibliography on the environmental impact of sand mining and rock quarries and a contact address for expert assistance available from the National Stone Association. UNEP's Industry and Environment Programme Activity Centre provided management guidelines for sand and gravel extraction and an environmental checklist for mining projects. The Inter-American Development Bank sent a computer-generated bibliography on pollution control in quarry operations. The United Kingdom national focal point provided official guidance notes from the Department of Transport, Minerals and Land Reclamation Division. The University of the West Indies provided references which could be obtained through inter-library loan.

With this information in hand, St. Lucia was in a position to develop proper guidelines and regulations to ensure that the environment would be protected in the conduct of the inland sand and rock mining operation.

MICROBIAL RESOURCES AND BIOTECHNOLOGIES

Biotechnology has moved from the research phase and become a fast growing new industry and a controversial one. While many scientists have recommended genetic engineering as a safe shortcut in evolution, others have warned that it may erode genetic diversity and distort natural ecological processes. Issues concerning biotechnology were brought to the world's attention at the United Nations Conference on Environment and Development (UNCED) during the debates on the Convention on Biological Diversity.

Stories in this section highlight the controversies in this rapidly growing scientific field. We will see the Swedish debate over the use of artificial snow, the development of regulations to govern this new subject in the former USSR and international cooperation in germplasm research.

Sweden investigates artificial snow

Marketing artificial snow to Sweden may sound like selling refrigerators to Eskimos, but artificial snow has some interesting uses beyond the provision of powder at ski resorts. Compacted artificial snow is a foundation material for building construction in tundra areas. The artificial snow freezes at a higher temperature than normal and will stay frozen during the usual spring thaw providing a firm foundation for building construction.

Artificial snow is created by the presence of the bacteria *Pseudomonas Syringae* which acts as a kernel for the crystallization of water into snow flakes at a faster speed and at higher temperature than naturally produced snow. The bacterium is a known plant pathogen, only dead bacterium are needed for snow production. One concern is that tests have shown that in any given sample of artificial snow "seed", there are some living bacterium.

When the USA biotechnology firm approached the Swedish government about importation of their product to Sweden some concerns surfaced and the Swedish government queried INFOTERRA national focal points in countries where artificial snow had been used.

In many countries no testing of the product had been done. In Switzerland the testing was not yet completed, and another product was currently used for making artificial snow. In USA the United States Department of the Office of Animal and Plant Health had reviewed the product to determine if it was potentially harmful to plant life, and obtained negative results. In addition, USA INFOTERRA national focal point provided several contact addresses and the results of the computer search on the product. It was found that field testings had been carried on for several years by the Oakland

based biotechnology company who pioneered the product. It was also revealed that a Swedish company provided a cash infusion to the US company in the early years before the product was even launched on the market.

In Canada, a great number of reviews had been done by scientists in the federal departments of the Environment, Health and Welfare, Fisheries and Oceans, and the Canadian Wildlife Service, and the Canadian Forestry Service. Canadians had been especially concerned because the product was used for the Winter Olympics at Calgary. Canada stated that although a number of other strains of the bacteria *Pseudomonas syringae* were known to be plant pathogens, the particular strain used to produce the artificial snow, Ps 31, did not appear to be a plant pathogen. It was not known to be pathogenic in birds or mammals, and the bacterium was not expected to be harmful to fish or other aquatic organisms. However, in order to give an extra degree of protection to the environment, the federal government required that supplies of the product used in Canada should not contain any viable bacteria nor viable bacterial pathogens. At the request of the Department of Health and Welfare the producer agreed to carry out several mammalian toxicity tests, and also some field monitoring during the ski season to see if the product was as innocuous as it claimed. Canada also noted that in the USA a certain number of viable *Pseudomonas syringae* cells are permitted in the product.

In addition, a detailed analysis of the possible negative effects of the bacteria was received from Germany, where longer term testing was recommended. The product is now under continuous testing in Sweden.

USSR formulates biotechnology regulations

In 1990 the former USSR queried INFOTERRA seeking assistance in drafting legislation on the release of genetically engineered organisms. Unfortunately, there were few models to pattern. Genetically modified organisms and their release into the environment was a recent phenomenon. Consequently, the legislation on the subject was still at the preparatory stage in most countries in the world.

Fortunately, Austria was in the process of preparing a comprehensive law on the entire field of biotechnology. It had convened a working group of academic and industrial experts to carry out an inventory 200 pieces of national legislation seeking any relevance to biotechnology. The comprehensive biotechnology law was in the drafting stage and it contained a section on the release of genetically engineered organisms. Austrians shared this draft with the USSR.

The USSR was also given a draft compilation of regulations worldwide related to genetically engineered organisms by United Nations Industrial Development Organization UNIDO. The USA, Ireland, Australia and Indian INFOTERRA national focal points provided scientific and technical documentation related to genetically engineered organism release.

British Researcher receives seeds

Sometimes responses from the INFOTERRA network exceed expectations. An interesting case of substantive information delivery took place in 1987 when a enquirer from England needed information on cytogenetics and breeding systems of leguminous species and asked the INFOTERRA network for assistance.

Among the replies which were sent was a letter from China giving the name of a leading expert in crop germplasm research and a complete list of the leguminous species currently being investigated at the Chinese Academy of Agricultural Sciences. The replies from Kenya and Sudan contained several types of actual seeds together with a promise of further seeds once they had been collected. A list of specialized institutions engaged in plant research was also enclosed. Responses from Chad and Ghana also offered to send seeds to the enquirer.

This example of substantive information delivery goes beyond the usual expectations of users.

AGRICULTURAL LANDS AND AGROCHEMICALS

Requests concerning the use and misuse of pesticides has always been a major subject of INFOTERRA requests. And no wonder, there are currently about 1,000 chemical pesticides in common use and the market is growing. It is expected that consumption will increase at an average rate of 7 to 9 per cent up to the year 2000. Governments are becoming more aware of the danger to human health and the environment that result from abuse and misuse of chemical pesticides. At the same time, agriculturalists are experimenting with alternatives to chemical pesticides such as integrated pest management techniques and organic farming. In such a rapidly evolving field, there are many questions for farmers and governments alike that need answers.

INFOTERRA becomes an important source of reliable information to assist in the agricultural management process. These stories will address problems of aerial spraying, disposal of milk contaminated with pesticides, experiments in integrated pest management and non-pesticide related agricultural issues such as the composting and recycling of agricultural waste.

Malaysia investigates aerial spraying

The aerial spraying of pesticides always raises some concern. In 1986 the Malaysia INFOTERRA national focal point queried the INFOTERRA network to discover the facts about this method of pesticide application.

Malaysia asked about existing studies regarding the bio-efficiency of aerial spraying of pesticides, guidelines on aerial spraying in general and the

environmental impact of 35 different chemical substances. The query was transmitted to special sectorial sources and to a number of NFPs.

Malaysia received advice from Harwell's laboratory in U.K. which emphasized that careless handling and application of pesticides had aroused widespread concern internationally and "there had been many accidents reported particularly in developing countries". As an example, the pesticide application to cotton in Nicaragua during 1969-1970 was mentioned. This spraying led to 300 deaths and over 3,000 cases of poisoning. Harwell also reported that in the U.K. aerial spraying has been found to be particularly advantageous on pest control in forests, but in spraying fruit orchards there is the danger of killing bees that pollinate the flowers.

From the Netherlands, Malaysia learned that many of pesticides they were planning to use could not be used for aerial spraying in that country. The Netherlands also pointed out that it is difficult to find the right criteria for assessing the risk. Small mistakes can have greater consequences in aerial spraying because of the high wind velocities which carry the toxics great distances. The most important advantage of aerial spraying, according to the Dutch source, was that an aeroplane does not leave tracks in the field which could cause production loss. Thus in some cases, aerial spraying compensated for the higher cost of application. Plots treated aerially must, however, have a minimum size to avoid side-effects.

With this information, Malaysia was able to make an informed decision.

Algeria disposes of contaminated milk

In 1987 Algerian authorities safely destroyed 18 tons of the toxic chemical, carbon sulphide, based on information supplied by INFOTERRA sources. The chemical had been stored in an industrial premises and was posing a health and security risk. The Algerian INFOTERRA NFP reported that the destruction was a great relief to district authorities.

In 1988 -1989 Algeria sought and received technical information on re-use, storage and destruction of empty containers of anti-locust organo-phosphorous compounds. Also Algeria enquired how to handle 25 tons of powdered milk which had been contaminated by a pesticide called metaldehyde. In the case of the 25 ton consignment of powdered milk the authorities were unsure how to dispose the milk safely. INFOTERRA contacted Harwell laboratory and the source suggested four alternative methods of disposal.

The first suggestion was that the milk powder be mixed with sea water and tested to see if the pesticide remained suspended in solution or whether it would cause problems by floating to the surface. The pesticide was toxic to fish, Harwell pointed out, but diluted sufficiently over a wide area it would not be harmful to marine life. If the solution was found to be satisfactory, then it was suggested that it should be loaded on a tanker and disposed of in the

Atlantic Ocean. The second alternative suggested that the milk powder could be pumped directly into the Mediterranean Sea from the coast. However, with little tidal movement, the source had reservations about this method.The third suggestion was that the milk powder could be mixed with fresh water and discharged into a sewage works in a carefully controlled manner. Finally, Harwell said the powder could be incinerated or disposed of in a landfill, so long as stringent precautions were taken to ensure that water supplies were not contaminated.

All of Harwell's alternatives had severe environmental implications. But based on these suggestions, Algeria was able to made an informed decision.

Morocco revives honey production

In 1990-1991 Morocco fell victim of invading locusts. Dark clouds of hungry insects 120 km by 25 km destroyed crops as they passed. With aid from the Food and Agriculture Organization (FAO), aerial spraying of Carbaryl and Lindane was able to keep the swarms under control and preserved crops. Ultimately, the locusts were eliminated, but so were the bees.

Moroccan honey production collapsed. The government requested INFOTERRA assistance. Fortunately, from the information they received they learned of another chemical which if sprayed over the same territory would neutralize the impact of the first pesticide applied. After this was done, they were able to reintroduce honey bees with great success.

Zambia explores biological control

Zambia´s INFOTERRA NFP requested information in 1988 concerning a non-chemical control of tsetse flies. INFOTERRA was able to make available to the Zambians details about a highly efficient and cheap trap for tsetse flies developed by the International Centre for Insect Physiology and Ecology (ICIPE), based in Kenya. The ICIPE trap NG2B proved that the occurrence of tsetse flies, and consequently sleeping sickness, could be drastically reduced (up to 99% in the test area Kajiado District in Kenya) without expensive and harmful pesticides. The trap contains locally available materials and is baited with either acetone, cow or buffalo urine to attract the flies which die rapidly from heat in a polyethene bag cage. ICIPE is now running an entire programme in Zambia on biological pest control techniques.

Zambia also asked, in 1990, advice on biological control of an introduced aquatic plant *Salvinia molesta* which was choking local rivers and ponds by forming thick mats of vegetation. The NFP in Austria answered within a few weeks and provided extensive information of methods applied in a number countries all over the world.

A small bug, salvinia weevil, had been tested in Australia, and introduced from there to India to control successfully Salvinia growth in

Bangalore and Kerala. Tests in Papua New Guinea had shown, that the weevil could thrive only if urea fertilizer was simultaneously applied. In Brazil, two other bugs had been identified as control vectors. Additional bugs had been successfully tested in New Zealand. The information and the contacts provided helped Zambia to start its own biological control programme.

Peru composts agricultural waste

In 1986, a Peruvian researcher wrote to INFOTERRA describing her work in composting maize, banana leaves and coffee bean husks for use as fertilizer. She was interested in learning additional methods used in other parts of the world.

The Food and Agricultural Organization (FAO) provided several research reports on the topic. Centro de Estudios Mesoamericano Sobre Tecnologia Apropiada (CEMAT), based in Guatemala was able to send information on several coffee composting projects. The Chinese INFOTERRA national focal point provided information on an interesting intercropping scheme. First, maize is sown and harvested. The ears are chopped into pieces and plowed back into the soil. Wheat seed is then sown. When it is ripe it is harvested leaving 20 cm long straws. Then corn is sown as an intercrop. Another method was to chop the wheat straws and turn them into the soil as a fertilizer before sowing the maize.

The information gathered from the INFOTERRA network provided a rich source of alternative ideas for the Peruvian researcher.

FORESTS AND OTHER ECOSYSTEMS

Worldwide, forests continue to be degraded and destroyed. No precise figures are available to assess the state of all forests on the global level. However, provisional figures indicate an annual loss of 11 million hectares in tropical countries alone. The situation in temperate forests is yet to be assessed. Forest loss is not only from logging. Destruction is also due to acid rain, insect and disease attack, uncontrolled fires, air pollution and climate change. All these issues are subjects of INFOTERRA queries. In this section we will learn how Kenya is addressing the problem of of Cypress Aphid destruction, how agroforestry techniques have been used in India and how the love of music can lead to environmental activism.

Kenya hit by Cypress Aphid

In the autumn of 1990, INFOTERRA was approached by the Nairobi based Nature Conservation Society of Africa with a request for information on Cypress Aphid (*Cinara cupressi*), its ecology, life cycle, economic importance, historical background, etc. The forest aphids were destroying

forests throughout Southern and Eastern Africa. All the information on research related to the pest was urgently needed.

INFOTERRA passed the query to a number of national focal points and special sectorial sources. Bundesforschungsanstalt für Forst-und Holzwirtschaft in Germany provided 33 computer printouts and references to 23 publications. The Commonwealth Agricultural Bureau International (C.A.B.I.) sent 15 records.The Forest Resources Development Branch of FAO was especially interested to know about the current status of the insect infestation in Kenya and an exchange of information was established. Materials were received also from the national focal points in the U.K. and Canada. One of the reports received from Canada related information on biological control of forest aphid pests in Africa.

The invasion of the Cypress Aphid is seen by Kenya as one of the potentially most devastating threat to its ecology. In spite of the government's extensive campaign to meet the challenge, the infestation continues.

India cultivates multipurpose tree

An Indian development agency was interested in initiating a major tree plantation development project which would become an integrated energy/economic system. One of the trees considered for the plantation was ipil-ipil (Leucaena leucocephalia). This species had been successfully used in reclamation of wetlands. However, in this integrated scheme it was essential that the tree be usable for many different purposes. The development biologists were aware that a considerable amount of work had been done in Central and Southern America on the use of Leucaena seeds, pods and bark to extract various dyes. But were there any other uses? The INFOTERRA network was asked to find the answer.

The query was sent to Argentina, Chile, Bolivia, Brazil, Costa Rica, the United Kingdom, Sweden and to the special sectoral source, the International Council in Research of Agroforestry (ICRAF). Many reports and research findings were forwarded to the development project, including 158 references from Chile alone. ICRAF sent an interesting study indicating that the species had potential to improve soils by fixing nitrogen and as fuelwood.

US musician seeks protection of African Ebony

There are many roads to the establishment of environmental sensitivities. In this case a Florida clarinetist became worried about the availability of African Ebony for the manufacture of musical instruments and asked INFOTERRA to provide information about the tree.

INFOTERRA informed him that, traditionally, the African Ebony grew in abundance in the low altitudes savannah and the woodland of Eastern African from Sudan to Mozambique. It was considered of great economic

importance in the ancient Egyptian kingdoms. Today it is utilized in the manufacture of instruments, furniture, and for the artistic creations of the Makonde and Kamba carvers. Unfortunately, the tree takes decades to mature and the species has become increasingly scarce. INFOTERRA also advised the musician of several campaigns he could join to save the tree.

After several months, the musician wrote back to say, " I hope that the ebony plantation programme is successful, not only for the interest of those wishing to use the wood, but more importantly for the sake of the species."

CLEANER PRODUCTION

The UNEP's Cleaner Production programme was established in 1989 to increase awareness of cleaner products, technologies and production techniques, and to help industry and government develop cleaner production programmes. The programme which is operated by UNEP's Industry and Environment Programme Activity Centre, networks with experts worldwide, transfers information, holds training sessions, publishes technical reports and supports demonstration projects.

The Cleaner Production programme's computer-based information exchange, the International Cleaner Production Information Clearinghouse (ICPIC), is continuously updated. ICPIC publishes the *Cleaner Production Newsletter* in English and French.

II

ENERGY, INDUSTRY AND TRANSPORTATION

INDUSTRY, TRANSPORTATION AND ENVIRONMENT

"Mt. Fuji is weeping", by Shunzo Amma, Japan

Industrial expansion is an important part of most national development plans, but such expansion, if accompanied by uncontrolled industrial pollution, is a severe threat to both national well-being and the global environment. The high cost of remedial action has made all sectors more conscious of the need to avoid pollution through clean technologies and forward-looking policies. The formulation of such policies calls for access to reliable technical and legal information.

Queries processed by INFOTERRA highlighted in this section address the issues of hazardous waste disposal and recycling, conversion to clean technologies and the defeat of attempts to site a polluting industry in the developing world in the countries of Western Samoa, Belize, Saudi Arabia, Swaziland, Kenya, Angola, Peru and Oman.

Western Samoa and Belize refuse oil recycling plant

As the dangers of hazardous waste processing are made known in the industrial countries and the activities are regulated or severely restricted, some unscrupulous companies attempt to relocate their activities in countries in the developing world which do not have restrictive regulations. Western Samoa and Belize encountered this problem.

In 1986 a foreign corporation proposed to ship 50,000 tons of used motor oil into Western Samoa each month to be stored, processed and recycled. The intention was to recover the sulphur from the used oil and to use the residual product as furnace fuel. The company requested permission to import a catalytic cracking plant and projected that it would begin production two months after the approval had been granted.

Western Samoa looks to its marine resources for economic survival and was concerned about any damage that might result from the new plant. The company indicated that the used oil included automotive lubricant and industrial oils and that it would be shipped to Western Samoa in bulk tankers. Samoa immediately queried INFOTERRA. In case of an oil spill at sea what would be the immediate and long-term effects on marine life? Would the recycling process, itself, create residues or gas emission that would have negative effects on the ecosystem?

Within a few weeks, INFOTERRA was able to forward the critical information to the government. The special sectoral sources who processed the query: UNEP's Industry and Environment Programme Activity Centre, Harwell Environmental Safety Centre, and the UN Industrial Development Organization were all concerned that the company had not adequately defined the processes to be used in the recycling or the composition of the recycled oil.

The sources warned that "automotive lubricants and industrial oils" are meaningless terms. Western Samoa needed to find out the exact composition of the used oil. Some such used oils contain no hydrocarbons, some contain additives such as halogenated hydrocarbons, organometallic materials, organo-phosphorous compounds, sulphate surfactants and worn metal fibers. The quality of the input oil would determine its pollution potential. The sources also warned that it would be important to know how the company would dispose of oil unsuitable for the recycling process, and whether they intend to construct a local disposal facility.

In addition, the company had not sufficiently detailed what processes it would use to recycle the oil. Many processes could be used and each produced different kinds of wastes and pollutants. It was also important to know how the sulphur was to be extracted and in what form. If sulphur was to be extracted in a solid form, it could be difficult to handle.

The sources indicated that Western Samoa should indeed be concerned about oil spills. Used oils pose difficult clean-up problems because they contain so many additives, impurities, and contaminants that are toxic and difficult to neutralize. In particular, PCB contamination could be expected.

The sources concurred that the liabilities could be great and Western Samoa should employ an expert consultant with knowledge and experience in used oil recycling technology to review the project before proceeding. The plant was rejected.

However, two months later INFOTERRA received another query from Western Samoa concerning yet another proposal to site a used oil recycling plant in the country. This proposed plant would treat 75,000 tons of used oil each week.

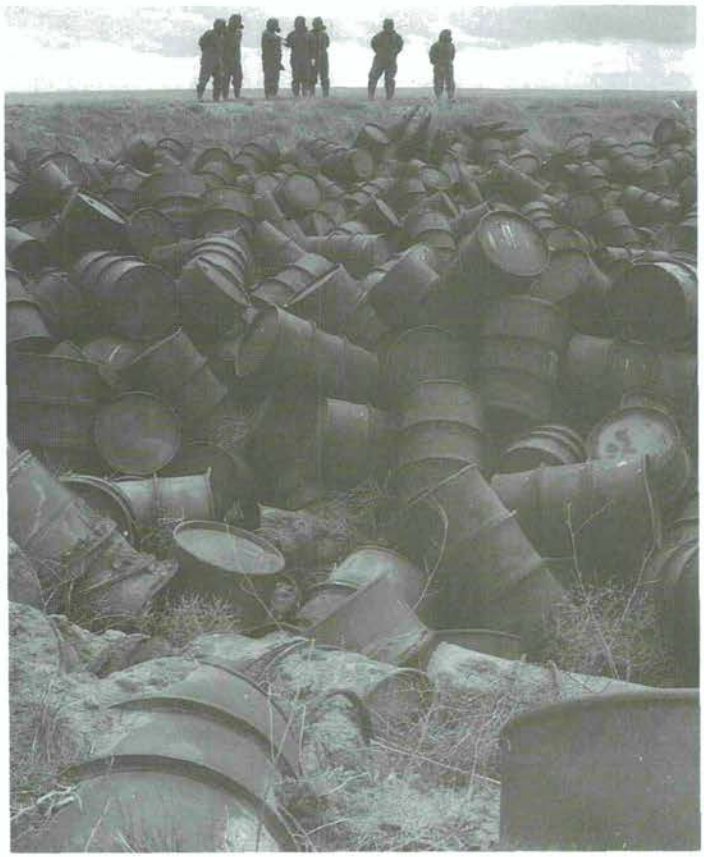
In this instance, Western Samoa sought a legal approach and asked that INFOTERRA provide copies of treaties of conventions governing the dumping and destruction of toxic waste, USA legislation on the topic, information concerning the United States Environmental Protection Agency and its role in approving international shipments of toxic and hazardous materials, a list of consultants in the area, and a check list of questions to evaluate such proposals.

INFOTERRA research uncovered the startling news that the company seeking to establish a plant in Western Samoa had undertaken a similar business venture in Mexico in 1981-82 where it had disappeared after building and filling the storage tanks with the toxic waste without recycling the waste as it had proposed. INFOTERRA was able to confirm the Mexican incident and to determine that the company had used the same scam in other countries. Upon receipt of the information, Western Samoan officials acted quickly deporting company officials in the country and revoking all entry permits issued to company official outside the country. The government expressed thanks to INFOTERRA for the information which averted a crisis situation.

But the story is not finished. The Mexican INFOTERRA national focal point received a query from Belize asking about a proposal by a company to site a oil recycling plant in that country. The Mexican INFOTERRA NFP referred the request to the UNEP Industry and Environment Programme Activity Centre (IE/PAC) who had provided assistance on the Samoan request. IE/PAC alerted the INFOTERRA Programme Activity Centre in Nairobi which was able to send the information that had been forwarded to Western Samoa. Thus, Belize was well informed and able to act for its own best interests.

Swaziland refuses waste

Developing countries are often tempted by promises of monetary gain to consider proposals to site hazardous waste plants in their countries even though they lack the ability to impose the necessary controls. Swaziland faced that temptation in 1987 when a British company requested a permit to import, store, and treat a maximum of 150,000 metric tons of industrial waste in the country per year. The list of the substances involved included solid residues from the cleaning of machinery in industrial plants, ashes and salts from treatment plants, chlorinated and non-chlorinated solvents, asbestos sheets, etc.



"What Have We Done?", by Paul Van Peenem, Canada

In its query to INFOTERRA Swaziland expressed its concerns, "We view the handling of such a massive amount of industrial waste as a very serious matter involving risks. At the moment Swaziland neither has the administrative machinery nor the legal provisions that relate to such an

undertaking. The processing of such an application requires expert knowledge of these chemicals and of the subsequent risks involved both to man and the environment".

INFOTERRA asked the NFP in U.K. and the Harwell Environmental Safety Centre to provide Swaziland with copies of relevant regulations. In this excerpt of the answer by Harwell one can already trace the impact of the international negotiations on the matter:

> As you are aware the question surrounding the import-export of hazardous waste (and I judge most of the material listed in your query to be "hazardous" to a degree) from one country to another has caused a great deal of recent activity in individual countries and international organizations. One cause of this concern, particularly within international organizations has been the possible effect of the increasing difficulty that developed countries are finding of managing their own hazardous waste within their own frontiers. This has led to the idea that it may be possible for the developed world to solve its problem by exporting its hazardous waste to developing countries. With respect to the specific transaction referred to in your enquiry, there are a few points that are worth making, and I invite you to consider them.
>
> Almost all the wastes listed in your enquiry seem to be subject to the European Communities' Directive on the transfrontier shipment of hazardous waste. That the transaction is organized by a U.K.company doesn't indicate that the waste has a UK origin. It might be mixed with waste from other generators. This potential loss of identity for specific waste can have implications for enforcement, insurance and liability.
>
> Were these wastes to be treated and disposed of within the European Community, Switzerland, Norway, Sweden, Austria, Finland, USA or Canada, this would be done by a series of quite advanced techniques and methods, such as:
>
> - high temperature incineration;
> - chemical treatment;
> - solidification;
> - controlled landfill at a very carefully selected site.
>
> There seems, to me, no obvious reason why less effective methods should be used in Swaziland.

In conclusion the Harwell expert stated: "Because the need for control on this trade has only recently been identified, fully effective procedures are not yet uniformly in place, and are not yet of proven effect. To this extent the

present situation could be said to be unsatisfactory, but I am enclosing copies of the EEC Directive, and the OECD Resolution for your consideration."

In addition, the Director of UNEP/ International Register for Potentially Toxic Chemicals expressed in his letter serious doubts about the soundness of the proposal from the company. On the basis of so little information, no assessment, not even a preliminary one, of the potential effects of the project on the health of people, the environment or the economy of the country could be made. He had also serious doubts whether Swaziland had the technical and administrative capabilities to operate and control the proposed project. With the absence of adequate legislative authority, there could even be serious implications related to insurance, liability and compensation in case of mishaps arising from the management of the hazardous wastes. He also strongly advised that the company proposing the plan be requested to submit a detailed Environmental Impact Assessment (EIA) study on the project.

Based on the advice received, the Government of Swaziland decided not to accept the proposed offer.

Kenya treats electroplating waste

Electroplating is an industry which produces very toxic substances that must be carefully handled in order to prevent contamination of either humans or the environment. In 1991 Kenya queried the INFOTERRA network on methods of neutralizing electroplating waste generated by its airline industry. The actual waste mixture contained potassium cyanide, sodium cyanide, hydroxide, chromic acid, silver, chrome, lead, copper zinc and sludge from organic solvents. The industry generated 4,000 liters of waste liquid each year and 400 litres of sludge.

The INFOTERRA network was able to provide the technical information and some important advice. UNEP's Industry and Environment Programme Activity Centre (IE/PAC) sent a technical guide to the environmental aspects of the metal finishing industry. More importantly, a search of the IE/PAC's International Cleaner Production Information Clearinghouse (ICPIC) database provided case studies of waste reduction through the utilization of cleaner production processes. Harwell Laboratory gave a detailed description on how to handle the cyanide and chromate wastes. It stated that cyanides are oxidized at carefully controlled alkaline levels by a hypochlorite ion. Sodium hypochlorite was considered most convenient to use but the calcium compound also worked well. Using the calcium compound would, however, need a test reaction on the small scale in order to establish the ratio of quantities. A description of the method used for disposal of both cyanide and chromates in Europe was given, along with guidelines of essential requirements needed in case the disposal was to be contemplated locally in Kenya.

Harwell stressed the importance of suitable equipment, good protection gear and respirators to protect the operators, experienced and qualified

personnel and an environmentally acceptable place or means for disposal of the reacted solutions. It advised that if proper facilities are not available in Kenya the chemical reactions should not be attempted because the cyanides are very toxic and quick acting, needing antidotes immediately, and the chromates/acid mixture can give long-lasting, poorly-healing wounds if spilled on the skin. Chromates have carcinogenic potential as well. The alternative would be to make arrangements to ship the load away to a European disposal company specializing in reactions of this sort. Two company names, one in Denmark and one in U.K., were given. Because the solids/solutions would need to be packed very securely in drums of correct specifications, it was suggested that detailed advice of the disposal company should be taken.

This serious advise was weighed carefully as Kenya made its decision.

Kenya recycles castor oil residues

In 1992 a Kenyan company had initiated a commercial castor oil project which included all the phases of production from growing through the crushing and refining processes. The government was concerned about the location of the crushing and processing plant because of problems envisaged with waste disposal. It was known that the waste had certain toxic properties. On the other hand, the company was interested in using the waste as an organic fertilizer without any treatment, and needed information on technical processes and experiences gained elsewhere.

The query was referred widely to both special sectorial sources and to national focal points and a wealth of information was received. A detailed response from UNEP's Industry and Environment Programme Activity Centre provided three different reports concerning land application of castor oil residue as fertilizer or organic amendment. Reports stated that no adverse effect on crops were discovered. However, apart from the toxic characteristics, other factors needed to be considered in order to achieve proper application, such as natural soil fertility, precipitation patterns, crop needs, quantity of needed nutrients and factors in the residues that may inhibit crop growth. Also proper storage and transportation were important to prevent odors and leaching.

Very useful information and addresses were received from the United Nations Industrial Development Organization (UNIDO). According to UNIDO, the wastes released after extraction of castor oil can be used as foodstuff, after removing toxins and an allergen. There are various methods for the detoxification of castor cake and destruction or inactivation of the allergenic property. These include processes like autoclaving; boiling or cooking with water, or water and lime; steaming; or treatment with solution of salt, ammonium sulfate, sodium sulfate and bisulfate hydrochloric acid, formaldehyde or dilute alkali. Castor cake can also be used as an organic fertilizer without any treatment. However, wastes should not contain more

than 1 or 2% of oil, as a higher oil content impairs the decomposition of wastes in the soil. Tanzania is a leading producer of castor oil in Africa, and UNIDO advised the company to contact the Tanzanian manufacturers to learn of their experience with technological processes and utilization of wastes.

The most thorough answer was received from an Indian source. In India the castor cake is used as fertilizer. It is rich in nitrogen and minerals, and has been found to be a suitable fertilizer for rice paddies, sugarcane and tobacco fields etc. It has been used successfully in combination with other manures, to grow cotton, chillies and groundnuts. Castor cake, though high in protein content, is unsuitable for feeding purposes since the toxic components of the seed remain after the extraction of oil. In India, castor cakes are also being used for biogas production. Recently, a study had been done to explore the effect of particle size, temperature, loading rate and stirring on biogas production from castor cake.

Angola seeks low-cost waste water treatment plant

In September 1991, the Resident Representative of UNDP in Angola approached UNEP in order to receive preparatory assistance for the installation of a pilot-plant for treatment of effluent from the only existing yeast factory in Angola. The plant was being rehabilitated and was projected to produce 8 tons of baker's yeast per day, along with 210 m^3 of highly polluted process water, which according to international regulations should be treated before rejection.

Since the plant was located in the centre of Luanda and would pollute the rich fishing waters in the Luanda Bay, the UNDP Representative felt that it was important to assist the authorities in installing a water treatment facility. Since no water treatment facilities existed in Angola, he also felt that this project could serve as an excellent example for the whole agro-based industrial sector. Substantive comments and pertinent information were requested. INFOTERRA was asked to provide information on similar projects elsewhere in the world. INFOTERRA referred the request to relevant UNEP sources and its INFOTERRA network.

Through the Swedish INFOTERRA NFP, Angola received information on waste water treatment at a similar type of yeast factory in Sweden. The answer gave various alternatives. One alternative was targeted for Angolan use because it is easy to control and cost-efficient. The method is as follows:

> The processed waste water is pumped several kilometres from the production facility to the waste water treatment plant, which is an ordinary municipal facility. Since the load from the plant is relatively high as compared to that of the ordinary household waste water, it is collected at the plant site and then passed on to the waste water treatment in accordance with the time profile that will provide a more constant load for the waste

works. This system is used in Sweden for a factory which produces twenty times more waste water than the factory in Angola.

In addition, bibliographical references were received also from Harwell Laboratory, United Nations Industrial Development Organization's (UNIDO), Industrial and Technological Information Bank (INTIB). The Polish INFOTERRA NFP referred Angola to a similar factory in Poland, which had solved its waste water problem.

After analyzing the information and experiences in other countries Angola was able to make an environmentally sound decision.

Peru finds clean technologies for fish meal

Peru has a large fish processing industry that is able to export a considerable amount of fish meal and bring into the country badly needed foreign currency. Peru also has beautiful beaches which attract tourists from around the world. Unfortunately, these important industries were in conflict. The fish processing industry lacked the technology to properly treat its waste products and was dumping them untreated directly into the sea. Beach communities complained. Bad odors and unpleasant substances washed ashore creating a health hazard and driving tourists away from the beaches.

In an effort to resolve the problem, the Peruvian Ambassador in Kenya contacted INFOTERRA. Was there a low-cost technology that would enable the fish processing industry to treat its waste so that the beaches of Peru would not be destroyed?.

INFOTERRA produced results. Canada provided several guidance documents for effluent from fish processing operations. The USA INFOTERRA NFP sent government guidelines and technical reports relating alternative technologies. Sweden and Thailand replied with similar materials. The FAO/Fisheries Branch Library provided an extensive bibliography on the topic. The UN Industrial Development Organization was able to refer Peru to a company in Sweden which manufactured low-cost equipment appropriate for the purpose. UNEP's Industry and Environment Programme Activity Centre was able to provide several clean technology alternatives complete with a listing of experts to contact for further advice. Peru had the information it needed to solve its problem.

Oman rejects hazardous waste disposal

A 1986 inspection of a large paint factory in the Sultanate of Oman revealed that a large amount of waste solvent which was produced from the cleaning of vessels and reactors had been accumulated and stored in drums. The company had originally intended to export it to a sister company which had the means and facilities to recycle it, or to produce, as a by-product, a low quality grade

paint. However, this plan was cancelled after it was revealed that it was not economically feasible.

A few days after the inspection, the company official approached the Water and Waste Pollution Section at the Ministry of Environment and requested advice on the proper methods of disposal of the solvent. The factory was manufacturing all kinds of paints and produced an average of 400-800 litres of waste solvents every month. The dominate chemical used was Xylene.

Although the Ministry had some guidelines on how to deal with various toxic wastes such as solvents, a cross check on the methods used by other countries was sought through the Oman INFOTERRA national focal point. The national focal point immediately telexed the request to INFOTERRA PAC and also directly to the International Register of Potentially Toxic Chemicals (IRPTC) requesting information on disposal methods for the chemicals. INFOTERRA PAC referred the request to several national focal points.

The first response was received from the Kuwait INFOTERRA national focal point. It suggested that Xylene may be recycled by the paint industry as a thinner. Alternatively, it could be incinerated as a boiler fuel, evaporated, or released into sewer drains in diluted form to allow biological degradation in a sewage treatment plant. The latter method had been recommended to Kuwait earlier by IRPTC. Oman obtained information from several other sources; including a document received from the Canadian national focal point entitled *Xylenes: Envirotips,* Published by Environment Canada, which was very useful.

After all the information was received, it was decided to re-extract the solvent and reuse it, while the sludge was disposed of at a special toxic waste disposal site. Later on the company was able to treat the waste by using the distillation equipment at a branch factory.

Several years later in 1991, the INFOTERRA NFP of Oman asked for information concerning Material Safety Data Sheets and environmental impact on transformer oil (BS 148) with special reference to disposal methods of both the oil waste and the containers. They also enquired about the environmental acceptability of this type of oil-cooled transformers.

Useful materials were received from Canada and Ireland. Canada sent four publications on the subject and Ireland sent computer searches and technical reports. One source stated that electrical equipment, contaminated with PCBs should be cleaned and the oils and residues should be transported to approved incinerators. To minimize costs, distillation should be used to recover flushing solvents for recycling. Another source described how a PCB waste management firm withdrew the PCB fluid with the transformers remaining in place and replaced the PCB with an alternative coolant. The risks of potential PCB spills or fires were thus be removed and the transformers' useful life extended.

Many of the references on environmental impact of transformer fluids were about PCB risks, especially in fires and related several fire accidents in transformers containing PCBs. One of these accidents happened in New York in 1981, and one source discussed a medical surveillance programme concerning individuals who were potentially exposed to PCBs, dibenzo-p-dioxins and dibenzofurans on that occasion.

The responses to both these requests enabled Oman to deal effectively with the disposal of hazardous wastes within the country.

ENERGY AND ENVIRONMENT

The World Energy Conference in September 1989 forecast that worldwide energy consumption would rise by 50 to 75 per cent between 1985 and 2020, and that developing countries would account for up to 75 percent of the growth in that period. The environmental costs of conventional energy sources must be weighed carefully as countries industrialize. Reliable scientific and technical information concerning alternatives will be a critical guide in decision-making.

Many queries processed by INFOTERRA in the past which related to energy addressed the controversies surrounding nuclear power. This section has several examples of those queries but also shows environmental concerns surrounding a large hydroelectric dam project in Lesotho and a biogas production project in Bulgaria.

Oman looks at risk of nuclear ships

The concern about nuclear power extends beyond the large power plants to the smaller units in ships and submarines, especially if these vessels are calling at a country's port facilities. In 1991 the Ministry of the Environment of Oman expressed this concern in a query to INFOTERRA. It wanted to know what risks there were to the environment from nuclear powered ships under normal operating conditions.

INFOTERRA was able to provide information from several sources. The International Atomic Energy Agency was able to provide a detailed listing of source materials available on request. The Swedish INFOTERRA national focal point provided a study from the Swedish Defence Research Establishment which estimated that an accident on board a nuclear ship would cause 1/10 of the damage of similar nuclear power plant accident. The study noted that to date there has been no incident on a nuclear powered ship which caused damage to either humans or to the environment. Countering the optimistic tone of the Swedish study, the INFOTERRA network also provided Oman with the Greenpeace "Neptune Papers". The USA INFOTERRA national focal point provided eleven documents on the topic, including information on military and merchant nuclear powered vessels and

an article containing a report of the damage caused by the release of radioactivity into the sea from the Soviet "Mike" submarine.

With the rich variety of opinions, scientific and technical reports, Oman was able to better evaluate the safety of nuclear powered vessels in its harbour.

Lesotho investigates the impact of a dam project

Lesotho is a country of rare and wild beauty. It is a mountainous highland, an alpine Africa, a rare ecosystem. The plentiful water resources of this tiny kingdom have long been coveted by farmers of the surrounding dry South African plain. In 1988 the Kingdom of Lesotho and South Africa agreed to cooperate in a massive hydroelectric development project. A series of five dams would be constructed in Lesotho. The water would be sent through a series of tunnels to South Africa. The hydroelectric power produced would be the exclusive property of Lesotho. The project raised many environmental questions. What would the impact be on the rare flora and fauna?. How could roads be cut into the construction areas without creating massive soil erosion? The Lesotho Highlands Development Authority, responsible for the dams, contacted INFOTERRA.

In evaluating the massive amount of material received, the Lesotho Highland Development Authority decided to take several steps to mitigate environmental damage. It has proposed and is now assessing the creation of a protected conservation area in an effort to preserve the rich biological diversity of the alpine region. It has also begun a programme of environmental education and awareness building. The construction project itself is being continuously monitored for environmental impacts. The environmental and socioeconomic impacts of the project remain highly controversial.

Argentina explores risks of plutonium

Plutonium is considered as one of the most toxic substances on earth. It has a half-life of over 20,000 years.

In 1989 the construction of a plutonium reprocessing laboratory in Ezeiza, the province of Buenos Aires, ended with a strong controversy. The provincial Federation of Physicians launched a warning campaign backed by its 25,000 professional members. Others involved in the fight against the reprocessing laboratory included congress members, citizens and ecologists. Against this background, a researcher and journalist who ran two radio programmes for non-profit stations in Buenos Aires wrote to INFOTERRA asking for information on the potential risks of plutonium, its toxicity, current regulations and other pertinent data.

INFOTERRA referred the query to International Atomic Energy Agency (IAEA) which provided detailed information on the topic which was very

useful. From other sources a bibliography of 37 sources was sent to the enquirer.

Bulgaria experiments with biogas

One of INFOTERRA's greatest services is to put people who have the knowledge and the experience in touch with people who are asking the questions. In 1981 the Research Centre of the Bulgaria Committee on Environmental Protection was interested in developing biogas as an energy source. They hoped to turn vegetable and farm wastes into an asset and an energy source, but had no experience with that technology. INFOTERRA put the Bulgarians in touch with an expert on the subject from India.

The Indian source immediately realized that the Bulgarians need to acquire more data. What exactly were their raw materials and in what quantity could they be made available? What were the average monthly temperatures where the experiment would take place? With these and other specific details in hand, he was able to design a plan for the biogas conversion project. He later agreed to come to Bulgaria and assist Bulgarian engineers on several village biogas development projects.

Thus India with its long agricultural tradition and skills was able to provide appropriate technological assistance to another country.

III

HUMAN SETTLEMENT AND ENVIRONMENT

"Survival"' by Danilo Oliveros Garcia, Colombia

Population growth, rising standards of living and changes in consumption patterns have resulted in the discharge of increased quantities of waste from urban households. The total amount of municipal solid waste generated from the developed countries increased about 25 per cent from 1970 to 1990. While for the same period in developing countries, the output doubled.

In both developed and developing countries there is an increasing awareness that something has to be done to organize efficient municipal waste

disposal and recycling systems. The queries processed by INFOTERRA in this section which reflect that concern include the story of the attempt to dispose of the Philadelphia municipal incinerator ash and alternative municipal waste disposal processes adopted in Sweden and Iran. Away from the theme of municipal waste, but still related to human settlements, is a story on the planning of an environmentally-friendly Asian Games.

Guinea rejects Philadelphia municipal incinerator ash

A serious problem for most large cities in the developed world is how to safely dispose of their municipal waste. As landfills are closed in the USA, more and more municipalities are turning to large incinerators. Incineration substantially reduces the bulk of the waste material, but it too has environmental problems. The ash produced contains the residues of all toxins that were burned.

Unable to find an affordable disposal site for the ash in the United States, Philadelphia contracted with a Norwegian shipping company to dispose of the waste. The Norwegian ship M/V Bark loaded the cargo and sold it to a local company in Guinea. The ash was sold as a new product from Norway, a cement-like construction material which could be used for making bricks, as road fill, in railroad beds, etc.

The Norwegian ship dumped 15,000 tones of the Philadelphia incinerator ash to the small island of Kassa, just ten kilometers from Conakry. The island's 5,000 inhabitants make a poor living from agriculture and fishing. It was hoped that this new miracle product would bring jobs and prosperity. The shipment was unloaded into a bauxite quarry only forty kilometres from the sea, 3 metres above sea level.

Three days after the ash was unloaded it became evident that surrounding vegetation was dying. Guinean authorities were deeply concerned and ordered an immediate inquiry. It was revealed that the material was legally imported and that it was, in fact, Philadelphia municipal incinerator ash. The Guinea INFOTERRA then contacted the network for further information.

INFOTERRA put out an urgent request for information and within a few day replies were received from Harwell Environmental Safety Centre, the US Environmental Protection Agency, Greenpeace, and the INFOTERRA national focal points in Canada, Ireland, and Sweden. Greenpeace indicated that the ash contained toxic metals and dioxin at levels high enough to threaten anyone in direct contact with the material. The US government indicated that protective clothing should be worn by anyone handling the ash. The tests on the municipal incinerator ash from the Philadelphia shipment revealed 600 part per trillion of the most toxic form of dioxin - 2,3,7,8, TCDD and large concentrations of heavy metals.

The Guinean authorities realized that, the quarry had cracks which made leaching a possibility and the ash could be carried by wind and contaminate marine life and the nearby fields. The population was also at risk. An immediate ban was place on the brick making venture. The ash was kept wet to prevent it from being carried by wind, barriers were erected around it. The Guinean authorities quickly conducted their own chemical analysis of the material. After the results were analyzed, the government ordered the Norwegian company to remove the ash. This was carried out a couple months later.

Unfortunately, this was not the only shipment of Philadelphia ash. Some 250,000 tons of the ash were rejected by Panama. A sister ship to the Bark, the Khian Sea, spent much of 1987-1988 criss-crossing oceans searching for a place to off-load 13,500 tones of the same cargo. It was refused entry in six countries. It succeeded in depositing 3,000 tons in Haiti. The Haitian authorities contacted INFOTERRA, the International Register for Potentially Toxic Chemicals and Harwell Environmental Safety Centre for advice. Ultimately, the shipping company was again ordered to remove the unwanted cargo.

Mexico interested in recycling plastics

In 1988 INFOTERRA received a query from Mexico asking about various aspects of regulations concerning the manufacture, recycling and disposal of plastics. The Environmental Safety Centre at Harwell Laboratory advised the enquirer that the word of plastics covers hundreds, maybe thousands, of different materials, each of which have a different composition, with different physical, chemical, and ecological properties. Because of this diversity, the wastes produced will also vary. In waste management, Harwell distinguished four classes of "plastic wastes".

(i) waste from the production of raw materials used in the formation of plastics;

(ii) waste from the production of plastic resins;

(iii) waste from the production of marketable products from the plastics resins;

(iv) waste produced by disposal of the product.

In examining the first category, Harwell noted that since many of the potential raw materials for plastics production are also used for other production, it did not make much sense to distinguish between the waste generated from plastics production and wastes generated from non-plastics production. The wastes in the second category seem best covered by general waste management laws designed to protect health and the environment, since these wastes are dependent on the specific formulation used, and the specific methods used to make the resin. The third category of waste are simplest to manage, but with special attention to thermoplastics, which have to be

recycled with care. These plastics decompose when heated in other ways than the simple regenerations of monomer, e.g. PVC begins to lose hydrogen chloride when heated to temperatures higher than 100°C. The last category of wastes is most difficult to recycle since these plastics need careful separation of the waste stream at the source. The general experience in the developed countries has been that the costs of producing a well-classified group of 'plastics' fractions from mixed waste exceeds the value of the products that can be produced from these materials.

When it comes to disposal of plastics the reply is that most plastics are bio-degradable only at a very slow rate and contribute therefore to the litter problem and to the unsightliness of many waste disposal landfills. The 'toxic' effect on the environment in which they are present is mostly very low. Among the substances that could cause adverse environmental effects when released by plastics discarded as waste are vinyl chloride from PVC; phthalates (much used as plasticizers); organo-chlorine compounds (also used as plasticizers and 'extenders'); various heavy metals whose compounds are used as pigments; lubricants; anti-oxidants in resin formation; and chlorofluorocarbons used as 'blowing agents' in plastic foams. Environmental damage is caused when plastics are incinerated, by emissions from plastics in landfill, and from potential ground-water pollution from landfill disposals.

Understanding the technical complexities of the plastics issue enabled Mexico to deal with regulatory issues more effectively.

Sweden looks at alternative waste water treatment

Many countries are looking at ways to turn waste into a usable resource. In 1990 Sweden began to investigate more natural systems for its waste water treatment processes. Many of the Swedish water treatment plants were old and would soon need replacement or up grading. As the Swedish Environmental Protection Agency developed its long-term plan, it wanted to include low-technology alternative options.

INFOTERRA national focal points in the United Kingdom, Netherlands, Canada and the German Federal Republic responded with a wealth of information including natural processes which separate treatment of gray and black water from toilets, alternatives to water toilets, marsh filtration systems, and resource recovery systems.

The wide range of possible technologies enabled Sweden to develop a more comprehensive replacement plan.

Iran solves municipal waste problem

In 1991 Iran´s capital Teheran was struggling with its waste problem and contacted INFOTERRA. Iran needed information about collection and utilization of municipal wastes.

INFOTERRA responded with information received both from special sectoral sources and from national focal points. UNEP/Industry and Environment Programme Activity Centre sent materials on the collection, treatment, reclamation and recycling of household refuse from France and Japan, as well as several contact addresses to organizations dealing with municipal waste management. The USA national focal point provided 13 documents on municipal solid waste management and the Swedish national focal point sent useful material including two documents on how energy can be recovered from incineration. The Canadian NFP sent the results of an on-line literature search and a list of organizations dealing with the subject. Also India sent a paper entitled*"City garbage recycled to produce rich manure for fields & its effect on soil structure, yield etc".*

The information received enabled Iran to plan more effectively.

China hosts environmentally sensitive All Asian Games

When China developed its plan to stage the All Asian Games in 1990 it wanted to be sure that the event was organized and managed in an environmentally sensitive fashion. It asked INFOTERRA for help in defining the environmental standards that should be in place for the big event.

INFOTERRA felt that the Organizing Committee would benefit from the experiences learned by the Seoul Olympic Organizing Committee when Korea hosted the All Asian Games in 1986. The Korean national focal point was able to provide the Chinese Organizing Committee with detailed information on air and water quality standards, the environmental protection measures adopted and practical solutions to problems encountered. During the Games, the Koreans had implemented strict traffic control measures, adjusted the working hours of major industrial plants, strengthened emission standards, constructed new sewage treatment plants and reinforced refuse disposal systems.

The information received enabled the Chinese to incorporate practical environmental planning into their organizational strategies.

IV

HEALTH AND HUMAN WELFARE

INFOTERRA is not an emergency response or disaster preparedness information network. However, INFOTERRA is often called on to provide the scientific and technical information needed to conduct the clean up or remedial work after an environmental emergency has abated.

The stories in this section relate INFOTERRA's role in providing information after the eruption of Mount Pinatubo, the Yangtze floods, the ecological damage of the Gulf War and the Exxon Valdez oil spill.

The Philippines cleans up after Mt. Pinatubo's eruption

When Mount Pinatubo erupted on 12 June, 1991, it was one of this century's most violent and destructive volcanic explosions. The major episodes lasted until 16 June declining gradually after that. Within the provinces of Zambales, Tarlac, Bataan and Pampanga vast areas of agricultural lands and fishponds were affected by ash and mudflows. Irrigation systems, water service facilities, power lines, roads, bridges were damaged and houses and public buildings collapsed from the weight of accumulated ash and related earthquakes. Rivers and nearshore areas were severely silted by ashfall, mudflows and other sediments. Over 700 persons died and about 200 injured.

On 28 June, the Asian Disaster Preparedness Center (ADPC) at the Asian Institute of Technology approached INFOTERRA urgently requesting information on how to deal with volcanic debris, flood control due to silting, construction of low-cost housing, and rehabilitation of the infrastructure including telecommunication systems and agriculture. The center was asked to send the information directly to the UNDP Resident Representative in the Philippines.

The query was referred to the national focal points in countries known to have experience in volcanic disasters in order to receive material on rehabilitation problems. Outprint from databases in the field, publications, addresses of specialized consultants were received. Information received from

the USA national focal point indicated that representatives from the United States Foreign Disaster Assistance Office were currently stationed in the Philippines to assist with clean-up operations. According to the director of the Mount Pinatubo team, experts in all of the topics requested were participating in the team. Instructions on how to reach the team director were supplied.

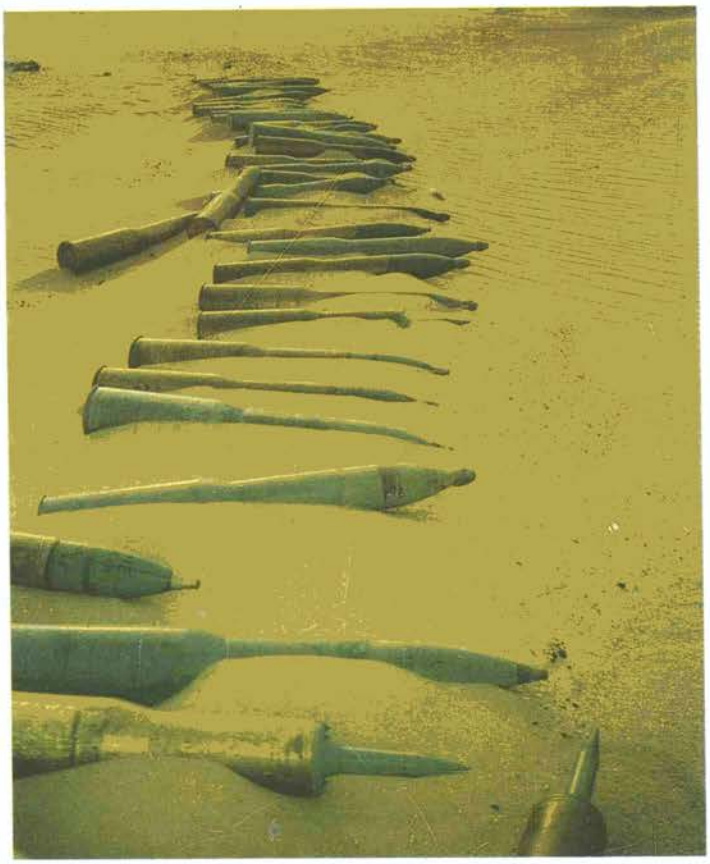
China seeks assistance after Yangtze flood

In the summer of 1991 much of China was swept by a flood disaster. When the Yangtze River spilled into the plain, many provinces were covered by water. The damage was serious and action was needed to take preventive measures in order to control the sanitation and health situation.

Two months after the flood, the Chinese Academy of Preventive Medical Sciences requested, through the Chinese INFOTERRA national focal point, information on ways and means to prevent epidemics and methods for rehabilitation of the environment after the widespread flooding.

INFOTERRA was able to respond. China received information from more than 10 countries and several international organizations. The United Nations Disaster Relief Organization (UNDRO) provided nine very valuable documents concerning floods and their impact, including reports on China and Asian countries. The World Health Organization's Division of Environmental Health provided relevant material including the publications *Surface Water Drainage for Low Income Communities* and *The Guide to Sanitation in Natural Disasters*. The World Health Organization also recommended and sent selected pages from a bibliography on *Environmental Health Management in Natural Disasters and other types of Emergency*. Useful information was received from national focal points in USA, former USSR , India and Canada, as well as from the Asian Institute of Technology. Decisions made on the basis of the information prevented typhoid and cholera epidemics from spreading.

Gulf War caused ecological disaster



"Lethal Pollution"' by Jehan Rajab, State of Kuwait

Fighting a war on top of an oil field is guaranteed to cause ecological damage. The oil fires, oil spill and the pictures of the waste of battle scattered across the desert are all recent memories.

After the war, a number of queries were sent to INFOTERRA from around the world asking about the ecological damage incurred and the impact on the larger global community. INFOTERRA was able to keep the public informed.

INFOTERRA was also able to transfer information to UNEP's team of scientific experts monitoring the damage in the Gulf on clean-up methods including the new biological technologies for oil slick dissipation. INFOTERRA was instrumental in restoring the collection of the Kuwait National Scientific and Technical Information Center documents dealing with the environment of Kuwait and the Gulf region.

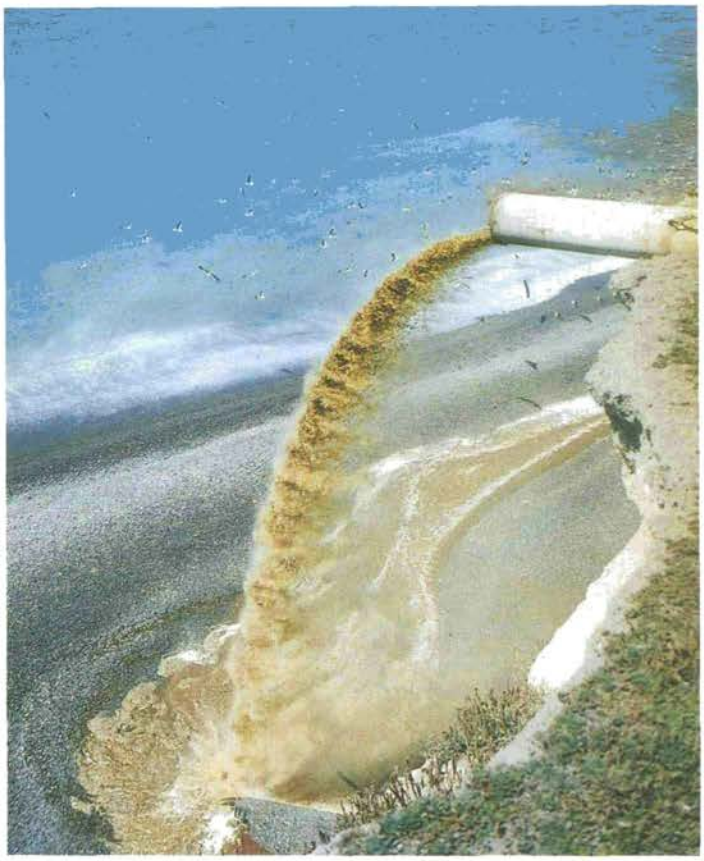
US oil spill becomes source of information

On March 24, 1989, the tanker Exxon Valdez spilled almost 11 million gallons of oil into Prince William Sound, Alaska, after striking a reef. This was the largest oil spill in U.S. history. In less than five hours the oil flooded one of the nation's most sensitive and biologically diverse ecosystems.

One of the lessons of the spill was that information is the key to quick response. One of the decisions taken after the accident was to establish The Oil Spill Public Information Center to increase the ability to respond to future accidents. The reference and research collections of the Center include information in numerous disciplines of the natural and social sciences, economics and law, as well as scientific and technical reports and research on clean-up technologies. Through INFOTERRA, the new center received important information. In return, INFOTERRA has been able to use the center as a source for valuable information on oil spills making the results of the cleanup methods used in the Alaska oil spill available worldwide.

V

OCEANS AND COASTAL AREAS



Abuse of Our Oceans by Kurt Adams, New Zealand

The world's oceans play a key role in regulating climate, producing food and energy, etc. Coastal areas in particular are the focus of the largest human settlement and are rich breeding grounds for marine life. Unfortunately,

oceans and coastal areas have also become a depository of much of the waste generated by the human population.

Oceans and coastal areas are a frequent subject of INFOTERRA queries. In this section we have related several stories involving the protection of the mangrove ecosystem, the problem of "red tides" and the impact of gill nets.

New Zealand and Bahrain conserve mangroves

Destruction of mangrove forests is a great problem in many costal areas. Mangroves are critical ecosystems in coastal and estuary areas. They provide natural protection against turbulent seas, reduce typhoon and storm damages, bind and build sand and soil. Mangroves are spawning and nursery grounds for many species of fish, shrimp, clams, oysters, crabs and crocodiles. They also provide breeding and nesting grounds for many seabirds and other wildlife. Mangrove species produce heavy wood that is highly prized as building materials and firewood. Charcoal made out of mangrove wood has exceptional qualities, burning with intense heat without sparking. Many people directly or indirectly draw a livelihood from the mangroves. Therefore, the depletion of mangrove forests due to over-cropping, salt pans and oil spills have alerted governments to take measures for their protection. INFOTERRA has received a number of queries on how to save these endangered forests. Some of them follow.

The Nature Conservation Council, an independent advisory agency responsible for matters concerning nature conservation in New Zealand, in 1987 established an advisory committee on mangroves to advise it on technical and scientific aspects of mangrove management and conservation and to increase public awareness of the value of mangroves. As part of the task for formulating a national conservation strategy for mangroves, the committee had to identify threats to the ecosystem and to offer means of rehabilitation. Specifically, the committee was charged with investigating means to prevent oil pollution and once it had occurred, finding ways of reducing the effects of oil pollution. This was a new field of research and the committee needed information. INFOTERRA provided assistance.

The Australian Institute of Marine Sciences and the Dutch Environmental Database on Wetlands Intervention (EDWIN) provided a wealth of bibliographic material. EDWIN was also able to provide contacts around the world to scientists working in the field. The UNEP and US EPA libraries were able to supply relevant documents from their organizations.

Utilizing all the information provided, the committee was able to publish the research results in a technical book entitled "Trees in the Tide". This synthesis of the research material is a valuable reference for researchers working in the field.

Less than one year after the query from New Zealand, INFOTERRA received a similar request from Bahrain to provide any information available

on the conservation and propagation of mangroves. INFOTERRA was able to provide the materials forwarded to New Zealand as well as some new studies that had been done in the field.

Guyana affected by "red tides"

"Red tides" are phenomena caused by extensive algae growth due to pollution. They occur in many parts of the world at densely populated coastal areas. The red tides cause great damage to the coral reefs. Fish living in such reefs become poisonous and unsuitable for human consumption. Red tides spell great income losses for fishermen and health hazards for the local population.

In 1982, the Guyana INFOTERRA national focal point was asked for information on the causes of "Red Tides" or "poisonous tides", their effect on fish, and the latest information on "Red tide poisoning" in humans.

INFOTERRA was able to help.The request was referred to several INFOTERRA national focal points and sources. Answers were received from 12 sources and assisted the Ministry of Fisheries in Guyana to effectively deal with the problem.

Trinidad and Tobago seek information on gill net fishing

A project implemented by the government of Trinidad and Tobago and the International Development Research Centre (IDRC) in Canada, on identifying and collecting scientific information on the impact and operations of industrial and small-scale gill-net fishing contacted INFOTERRA in September 1991. The intention was to complement an on-going investigation into local and regional gill-net fishery, by developing a bibliographical database on assessment and management of marine fisheries. Of special interest was retrieval of information on the impact of drift-net fishing on marine resources, including mammals and reptiles, and also on the local small-scale gill-net fishery. Documentation related to by-catch, legislation and policy formulation related to gill-net fisheries was especially sought.

The query was referred to several national focal points and special sectoral sources. The USA national focal point sent copies of six documents dealing with gill-net fishing and fisheries management, and the address of a contact person at the National Oceanic and Atmospheric Administration (NOAA). Materials, mainly printouts from databases on the subject, were also provided by USSR and Ireland as well as by Food and Agriculture Organization FAO, the Commonwealth Agricultural Bureau International (C.A.B.I.) and the International Center for Living Aquatic Resources Management (ICLARM) in the Philippines.

The database developed from these materials provides a ready reference for managers.

VI

ENVIRONMENTAL ASSESSMENT

Informed environmental policy requires the support of monitoring and assessment. Most countries have some sort of environmental monitoring and assessment processes. However comprehensive monitoring is unevenly done around the globe. One of the tasks of UNEP is to catalyze, coordinate and report on global environmental monitoring. These activities are lead by the Global Environmental Monitoring System (GEMS).

INFOTERRA is often asked to provide the relevant technical information to assist with national monitoring activities. The stories in this section relate these activities in China, Venezuela and Malawi.

China develops monitoring system

The city of Tianjin, which is the third biggest city in China, decided to establish a water quality monitoring system. An international tendering was done and a company from the United Kingdom with the lowest bid was selected. Before the representative of the company came to Tianjin for negotiations, the city obtained water monitoring standards through INFOTERRA. It was revealed that the standards proposed by the U.K. company were lower than the standards used in the U.K.

In the meeting with the company representative, the Chinese authority asked the contractor why he felt that the city should have lower standards than those used in the U.K. The answer was that China, being a developing country, might wish to spend less money by applying lower standards for water monitoring. This was not the case, the contract was concluded using the same standards applied in the U.K.

INFOTERRA saved city of Tianjin from applying low-quality standards in protecting the health of its citizens.

Venezuela and India introduced EIA procedures

The INFOTERRA NFP of Venezuela played a key role in the introduction of Environmental Impact Assessment in Venezuela in 1991. A query from a

national user about techniques of mineral exploitation and its environmental impacts, and the subsequent computer search, led to contacts with USA and Canadian sources. These contacts provided specialized information which was studied by Venezuelan experts. The technical reports and recommendations were discussed in national and international meetings and finally resulted in the promulgation of four laws. The first law permitted certain mining activities in a designated area. The second banned certain forms of mining in the state of Bolivar. The third provided norms for impacts on renewable natural resources resulting from exploration and extraction of minerals. The fourth was an act under the organic environment law establishing environmental impact studies.

In 1987 the Indian government was interested in developing environmental impact studies. It contacted the Centre for Environmental Management and Planning (CEMP), an INFOTERRA special sectorial source, in order to get expertise in measuring the environmental impact of a number of industries in West Bengal.

Two experts were selected for the mission to India and asked to give a course on environmental impact assessment. They contacted the U.K. INFOTERRA national focal point for international materials on the subject. Through INFOTERRA the two experts got background information which they could use for preparation of the EIA course. They later wrote that they had promoted INFOTERRA network when meeting people involved in environmental management in India.

Malawi prevents polllution

In 1985-86 several industrial development projects were planned in Malawi, but the authorities did not have information on proper environmental management of the proposed industries. Also information on pollution control was not available. Therefore, the Malawi National Committee for Environment contacted UNEP and the query was directed to INFOTERRA.

Malawi needed information on construction and operation and treatment of effluent from ethanol and tannery plants. They were interested in understanding the potential hazards and establishing environmentally sound methodologies.

As a result of the information received, the proposed industrial projects have employed clean technologies and have been monitored regularly with good result.

UNEP monitoring system needs reference materials

Monitoring requires background information to make it effective. INFOTERRA works closely with the UNEP Global Environmental Monitoring System (GEMS) to provide those reference materials.

In 1989 GEMS was interested in developing a monitoring centre on the island of Socotra. Socotra is a large island located in the Indian Ocean to the East of Cape Gardafui. The island has particular importance because it contains many plants found nowhere else in the world. The GEMS centre was to be a cooperative effort with the International Bureau of Plant Genetic Resources.

Before embarking on this endeavor, GEMS wanted to have a good understanding of the issues. It requested INFOTERRA to provide information in all environmental subject areas. Because Socotra was at the time part of the People's Democratic Republic of Yemen and had formerly been a part of the British Aden Protectorate both the national focal points for Yemen and the United Kingdom were queried.

The results provided valuable information. The British Museum Library Service sent the results of several computer searches and a priceless comprehensive 1903 study of 600 pages entitled "The natural history of Socotra and Abd-el-Kuri". GEMS felt well briefed and ready to begin their project.

OzonAction

To transfer information to developing countries on policy and technical options for the phase out of ozone depleting substances (ODS), UNEP's Industry and Environment Programme Activity Centre (IE/PAC) has established a computer-based information exchange system, the Ozone Action Information Clearinghouse (OAIC). It contains data on ODS use in relation to: aerosols, sterilants and carbon tetrachloride; foams; halons; refrigeration, air conditioning and heat pumps; solvents, coating and adhesives.

OAIC contains:

- descriptions of alternative technologies;
- a database of ODS-reduction products and services;
- national and corporate programme summaries;
- a calendar of ODS-reduction conferences, events and workshops;
- an international directory of ODS-reduction experts;
- abstracts of significant ODS-reduction documents;
- a message centre; and
- news bulletins describing the latest worldwide developments in ODS-reduction.

OAIC provides a global information exchange on ODS reduction, and is designed as a 'pointer' system that directs users to sources of more specialized information.

A quarterly newsletter, *OzonAction,* reports on the latest news, technology updates and initiatives undertaken by countries and organizations implementing the Montreal Protocol. IE/PAC will also publish technical and policy documents in response to specific information needs within industry and government.

VII

ATMOSPHERE

The unexpected discovery of a hole in the ozone layer in the stratosphere over the Antarctic in 1984 led to intensive scientific activity. Action followed quickly in 1985 with the adoption of the Vienna Convention for the Protection of the Ozone Layer. Mounting scientific research implicated chlorofluorocarbons (CFCs) and halons in the depletion of the stratospheric ozone layer. In September 1987, concerned nations signed the Montreal Protocol agreeing to reduce the production and consumption of ozone depleting substances (ODS). The Protocol was amended in London in 1990 to speed up the phasing out of ODS and to create a financing mechanism to assist developing countries in implementing measures to protect the ozone layer.

The following stories illustrate how the INFOTERRA network has been used in the dissemination of information on this rapidly emerging issue.

OzonAction Programme works with INFOTERRA

Under the framework for the implementation of the Montreal Protocol on Substances that Deplete the Ozone Layer, UNEP's Industry and Environment Programme Activity Centre (IE/PAC) was directed to collect and disseminate technical, programmatic, and policy information on the phase-out of ODSs. Once collected, the documents were to be catalogued, abstracted, assigned keywords, and eventually made available to the public through the UNEP/IE OzonAction Information Clearinghouse, which operates a 24-hour information system accessible worldwide by anyone with a computer and a modem.

But the IE/PAC needed assistance in aquiring the most important documentation and in organizing their collection so that they could quickly become operational and provide responses to user requests. The USA INFOTERRA national focal point had many documents dealing with ODSs, the IE/PAC asked for assistance in developing their technical library. The focal point for USA provided a list of the keywords used to index documents; bibliographic citations for USA ozone documents, ordering processes for USA monographs, reports, journals, and newsletters.

The IE/PAC OzonAction Clearinghouse became the most valuable source of information for the many INFOTERRA queries related to this rapidly developing subject area. In addition, the OzonAction Newsletter is distributed quartely to all INFOTERRA national focal points keeping them advised of the latest ozone publications and information sources.

ICAO seeks link between civil aviation and ozone

In 1991, the Regional Office of International Civil Aviation Organization (ICAO) in Nairobi asked INFOTERRA PAC for documentation on the impact of civil aviation on the ozone layer.

The INFOTERRA national focal points in the USA, UK, Canada and Sweden provided computer printouts, documents and useful addresses on the topic. The USA INFOTERRA NFP provided a copy of the executive summary of a UNEP/World Meteorological Organization (WMO) report *Scientific Assessment of Stratospheric Ozone-1991*, and referred ICAO to WMO in Geneva as the foremost source of information on ozone depletion.

The answer from the Irish INFOTERRA NFP contained full text documentation on seven items. It pointed out that airlines do considerable damage to the ozone layer by releasing halons into the atmosphere each time the fire extinguisher equipment is checked on the aircraft. The Irish Airline, Aer Lingus, has developed a user-friendly system of storing halons and re-using them again, thus avoiding damage to the ozone layer. Aer Lingus has made this technology available worldwide to other airline companies.

VIII

ENVIRONMENTAL AWARENESS

The foundation for long-term sustainable development lies in local, national, and global awareness of environmental issues and programmes for action. The first step is environmental education in the understanding, prevention and solution to environmental problems.

The stories in this section include the development of environmental science curriculum in Sri Lanka and Norway and a cooperative research programme in Sweden.

Sri Lanka develops an environmental science curriculum

When the Department of Chemistry of the University of Keleniya in Sri Lanka was planning to introduce a course in environmental science there was a need to compare how other universities had designed their under-graduate and graduate courses. The Head of the Chemistry Department of the University contacted INFOTERRA in order to receive assistance in determining the curriculum. INFOTERRA immediately sent copies of ET Worldwide a UNEP publication of the Environmental Education and Training Unit which containes a list of universities offering courses in environmental subject areas.

UNEP's Education and Training Unit also agreed to review and provide comments on any curriculum developed by Sri Lanka. With this generous technical support from UNEP, Sri Lanka was able to establish its environmental science curriculum.

Norway establishes Institute of Ecological Research

In spring 1992, the Norwegian Permanent Representative to UNEP wrote a letter to the director of GEMS asking him for assistance in replying to a request received from the University of Trondheim. The University was considering the establishment of an international institute of ecological research and wished to find out about similar international institutions.

The University of Trondheim needed information about research institutions working on mapping and/or ecological consequences of 1)

radioactivity, 2) other pollution resulting from human activity such as heavy metals, sulphur, acid rain, 3) the accumulation of pollutants in food chains and its affect on plants, animals and humans, 4) biodiversity and protection of the threatened species, 5) safety aspects related to technological and industrial activities, 6) risk assessment related to the operation of nuclear reactors.

The university was especially interested to know more about the functions and tasks of Earthwatch and also about the kind of information included in the INFOTERRA system, and how a university in Norway could get access to the information.

GEMS referred the query to INFOTERRA. Information on the INFOTERRA network was provided to the university as well as how to use the network either through the Norwegian national focal point or by contacting the Programme Activity Centre directly. The university was also given a diskette containing the reply to the queries with reference to over 700 sources of information.

Sweden compares national environmental research strategies

Early in 1992 The Commission on Environmental Research in Sweden was to carry out a comparative study on the organization of environmental research in developed countries. It was interested in the general organization of the research activities, the proportions between applied and basic research, the proportions between public and private research, the main environmental research areas and the expenditures broken down between public and private funds. The commission felt that most of the information was already compiled in the individual countries. It hoped not to have to conduct its own survey but to locate the sources of the information. In order to accomplish that task it called on the Swedish INFOTERRA national focal point. Queries were sent directly to the INFOTERRA national focal points concerned using electronic mail when possible. Useful statistics were received within a few weeks time.

Fortunately, the Netherlands INFOTERRA national focal point was able to advise the Swedish Commission that a similar study was underway in the Netherlands at the Council of Environment and Nature Research. The Swedish and Dutch researchers were able to collaborate and avoid duplication of efforts. Thus by using the INFOTERRA network both governments were able to save time and money.

IX

ENVIRONMENTAL LEGISLATION

A number of governments have contacted INFOTERRA for advice concerning the development of national environmental legislation, the creation of environmental administrative structures, and the promulgation of regulations. INFOTERRA has been able to respond through its close association with several sources including UNEP's Environmental Law and Institutions Programme Activity Centre, and the International Union for the Conservation of Nature's Environmental Law Information Centre.

In this section requests for assistance from India, Sri Lanka, Czech and Slovak Republic, Mongolia, Democratic People's Republic of Korea, Guinea and Mexico are highlighted.

India creates a department of environment

Early in 1980 the government of India was interested in establishing the governmental machinery needed to incorporate environmental concerns in its decision-making. It hoped to establish a department of environment and a suitable legislative structure. A high-level committee was convened to research the issue and make recommendations.

As India had been active in the establishment of INFOTERRA at the World Conference on the Human Environment (Stockholm, 1972), it was natural that the government would turn to INFOTERRA to supply the information needed. The committee contacted the Indian INFOTERRA national focal point requesting substantive information on environmental administrative, legal and organizational structures (both national and provincial) in all the major countries of the world. They sought model legislation and regulations, as well as information concerning the problems nations had encountered with the procedures they had established. The Indian government received 176 documents which included many copies of environmental laws enacted in the countries concerned.

The committee studied the compiled information, took into account the existing legal and institutional arrangements in India, analyzed the present and emerging environmental priorities, outlined the socioeconomic constraints and

was able to make credible, realistic recommendations for an Indian system of environmental protection. The Indian Department of Environment was established in 1981 and similar bodies were subsequently created in the different states of the Federation.

Sri Lanka develops environmental regulations

Ten years later, 1991, the INFOTERRA national focal point in Sri Lanka sent a query which was quite similar to the Indian one of ten years earlier,".kindly send us relevant literature on the following legal aspects of environmental protection existing in India, Japan, Malaysia, Bangladesh, USA, Netherlands and U.K. to help us in developing comparative legislation for Sri Lankan needs".

Sri Lanka hoped to use the information to draft the following:

(1) a General Environmental Law to lay down provisions relating to environmental management, conservation and protection of environment;

(2) special laws on: (a) air quality, (b) water quality, (c) pollution control, (d) toxic chemicals, (e) forest protection, (f) industrial pollution control;

(3) principal enactments and subsidiary legislation such as orders, regulations, and by-laws related to environment.

INFOTERRA was able to provide a great deal of useful material, but because the query was so general, it was no longer as easy to get material as it was ten years earlier when the body of environmental legislation was smaller and easier to review. However, The Environmental Law Center had established an environmental law database which enabled them to retrieve the needed information.

Governments request advice on environmental law

The establishment of environmental legislation is a growing need of governments. INFOTERRA has been active in supplying such information to developing countries, and with the break-up of the USSR, to the emerging countries in that region.

In recent years, several countries have sought assistance on this topic. The Czech and Slovak Republic received information from several national focal points to assist in the development of its environmental legal base. Mongolia sought INFOTERRA support as it developed comprehensive environmental legislation. The Democratic People's Republic of Korea requested information to assist in the drafting of its basic environmental legislation. Guinea sought model legislation from countries in West Africa to

assist in development of its environmental legislation. Mexico needed advice in drafting a laws to prevent cruelty in zoos.

Index

LIST OF ABBREVATIONS

ADPC	Asian Disaster Preparedness Centre
AIT	International Council in Research of Agroforestry
C.A.B.I.	Commonwealth Agricultural Bureau International
CEMAT	Centro de Estudios Mesoamericano Sobre Tecnologia Apropriada
CEMP	Centre for Environmental Management and Planning
CFC	Chlorofluorocarbon
EDWIN	Environmental Database on Wetlands Intervention
EIA	Environmental Impact Assessment
EPA	Environmental Protection Agency
FAO	Food and Agriculture Organization
GEMS	Global Environmental Monitoring System
IAEA	International Atomic Energy Agency
ICAO	International Civil Aviation Organization
ICIPE	International Centre of Insect Physiology and Ecology
ICPIC	International Cleaner Production Information Clearinghouse
ICLARM	International Centre for Living Aquatic Resources Management
ICRAF	International Centre for Research in Agroforestry
IDRC	International Development Research Centre
IE PAC	Industry and Environment Programme Activity Centre
INTIB	Industrial and Technological Information Bank
IRPTC	International Register of Potentially Toxic Chemicals
KWS	Kenya Wildlife Service
NFP	National Focal Point
NGO	Non-governmental Organization
NOAA	National Oceanic and Atmospheric Administration
ODS	Ozone Depleting Substances
OECD	Organization for Economic Co-operation and Development
PAC	Programme Activity Centre
PCB	Polychlorychlorinated biphenyl
PVC	Polyvinyl chloride
TRL	United Kingdom Transport Research Laboratory
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNDRO	United Nations Disaster Relief Organization
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNIDO	United Nations Industrial Development Organization
WHO	World Health Organization
WMO	World Meteorological Organization

This is the fourth book in the INFOTERRA
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Book One, entitled **Fire, Wood, Water: Reaping the Benefits**, contains the folowing articles:

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