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INTERNATIONAL PROGRAMME ON CHEMICAL SAFETY

UNITAR

Key Elements of a National Programme for Chemicals Management and Safety

IOMC

INTER-ORGANIZATION PROGRAMME FOR THE SOUND MANAGEMENT OF CHEMICALS

A cooperative agreement among UNEP, ILO, FAO, WHO, UNIDO, UNITAR and OECD

This document has been prepared, under the framework of the IOMC, as part of a series of complementary documents designed to help strengthen national capacities and capabilities for chemicals management. Other documents in the series include:

- ***Preparing a National Profile to Assess the National Infrastructure for Management of Chemicals: A Guidance Document*** (UNITAR/IOMC, 1996). This document provides guidance to countries on the preparation of a National Profile through a process involving all parties of interest. A National Profile is a comprehensive assessment of the existing institutional, administrative, technical and legal infrastructure for national chemicals management and safety.

- ***Organizing a National Workshop on Chemicals Management and Safety: A Guidance Document*** (UNITAR/IOMC, 1997). This document is intended primarily to assist countries in organising a national priority setting workshop on chemicals management and safety, following the preparation of a National Profile, but is also of relevance for the organisation of other national workshops addressing chemicals issues. Guidance is provided on effective workshop planning, implementation, and follow-up, and possible workshop methodologies are introduced.

- ***Planning and Implementing a National Action Programme for Integrated Chemicals Management: A Guidance Document*** (UNITAR/IOMC, 1997). This document is intended to assist countries in planning and implementing a National Action Programme for integrated chemicals management, in order to systematically address priority issues of national chemicals management as identified through the National Profile process. The document provides a procedural framework designed to help countries work through all aspects of National Action Programme planning, development and implementation.

Through collaboration among IOMC organizations and interested organizations and governments, additional documents in the series are under development in the context of the UNITAR/IOMC *Pilot Programme to Assist Countries in Implementing National Action Programmes for Integrated Chemicals Management*, in which Argentina, Ghana, Indonesia and Slovenia are participating as pilot countries. Funding for this pilot initiative, and the associated materials development, is provided by the Swiss Agency for Co-operation and Development (SDC).

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PREFACE

The initial preparation of this guidance document on the Key Elements of a National Programme for Chemicals Management and Safety took place following a recommendation of the Programme Advisory Committee of the International Programme on Chemical Safety (IPCS) that Guidelines for Strengthening National Chemical Safety Programmes be developed to provide guidance for all countries on the infrastructure and activities required for chemicals management at the country level.

The original draft material prepared by IPCS has been revised and finalized through collaboration between IPCS and the United Nations Institute for Training and Research (UNITAR) in the context of the UNITAR/IOMC *Pilot Programme to Assist Countries in Implementing National Action Programmes for Integrated Chemicals Management*. One of the objectives of this pilot programme is the further development of a document series aimed to assist countries in strengthening national chemicals management, an effort which is underway through collaboration among UNITAR, the IOMC participating organizations, the pilot countries and other interested organisations and governments. This resource document forms a core part of this series.

Special acknowledgment and appreciation are extended to Dr R. Lönngren (Sweden) and Dr K Bentley (Australia) for their active role in preparing initial draft versions of the document. Others who contributed to the further development, revision and editing of the draft material, and who are also gratefully recognized, include Ms F. Schulberg (UNITAR Consultant and WHO Temporary Advisor), Ms E. Phipps (UNITAR), and Mrs S. Kirsner (Australia). Dr J.A. Haines co-ordinated the work for the IPCS; Mr A. Halpaap co-ordinated the work for UNITAR.

A number of individuals reviewed and provided comments on various versions of the draft document. Comments on an early draft were kindly provided by colleagues from ILO, UNIDO, OECD, the Swedish Chemicals Inspectorate (KEMI), Health and Welfare Canada, and the UK Department of Health. The final draft was reviewed at a working group jointly convened by IPCS and UNITAR in Geneva, 20_21 January 1997, which involved the following participants: Ms F. Al_Tawalbeh (Jordan), Dr K. Bentley (Australia), Dr N. Besbelli (Turkey), Mr Do Thanh Bai (Vietnam), Ms D. Bostjancic (Slovenia), Dr B. Hirsch (USA), Mr J.W. Huismans (Netherlands), Dr L. Mortimer (New Zealand), Dr H.R. Rathor (WHO Regional Office for the Eastern Mediterranean, Egypt), Ms F. Schulberg (USA), Mr A. Strawson (UK), Dr C.J. van Leeuwen (Netherlands), Dr B. Wagner (Germany), Mr P. Whylie (Jamaica). The members of the UNITAR/IOMC Project Task Force for the pilot programme, which is comprised of representatives from all IOMC organizations, also took part in the review of recent drafts.

The financial support of the Norwegian Ministry of Foreign Affairs and the Swedish International Development Assistance Agency to the IPCS and the Swiss Agency for Development and Co_operation to UNITAR provided the resources for the joint IPCS/UNITAR Working Group. Resources provided by the Australian Department of Family Services and Health allowed for the editing of an early version of the document. Funding provided by the Swiss Agency for Development and Co_operation in the context of the

UNITAR/IOMC *Pilot Programme to Assist Countries in Implementing National Action Programmes for Integrated Chemicals Management* enabled the final revision, editing and publication of the document. These contributions are hereby gratefully acknowledged.

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INTRODUCTION

Chemicals have provided enormous benefits to the world community, and are an indispensable part of daily life. Fertilizers and pesticides, for example, have dramatically increased agricultural productivity and industrial and consumer chemicals have contributed to improvements in quality of life, while other chemicals have led to improvements in disease control and protection of environmental quality. Best practice demonstrates that chemicals can be used widely, cost-effectively, and with a high degree of safety. Best practice, however, is very often not followed, and the enormous increase in chemical usage over recent decades has led to significant health and environmental problems.

With chemicals being used in all parts of the world, in rural as well as urban communities, their effects are being felt in even the most remote regions. It is therefore critical for every country to undertake efforts to promote safe management and use of chemicals, for industrial, agricultural, public health and consumer uses, in order to avoid damage to health and the environment and to help ensure sustainable development.

There are a number of additional benefits associated with the adoption and implementation of chemicals management programmes. First, there are enormous costs associated with the health and environmental impacts of chemicals including, for example, increased incidence of cancer and other diseases, the need to improve water treatment to ensure adequate supplies of clean water, and the costs associated with response to accidents. Furthermore, application of chemicals management programmes in a manner consistent with potential trade partners can reduce barriers to trade.

Ideally, to meet the challenge of promoting safe management and use of chemicals, countries should seek to develop and implement a comprehensive, fully integrated national chemical safety programme, with sound chemicals management integrated into national health and environmental goals, policies, and implementation strategies. The most promising approach to chemicals management involves an integrated, inter-sectoral approach with consideration of chemicals throughout their life cycle.

In reality, very few countries, if any, have such a comprehensive programme. This is due in part to the fact that, in many countries, management of chemicals has tended to develop in a piecemeal fashion, with controls being introduced for specific toxic chemicals in specific areas as problems have emerged. The initial focus was on occupational and public health, and more recently, the environment. Furthermore, implementation of comprehensive programmes requires significant resources, including skilled personnel. Given the limited resources available to most countries, there is a need to focus attention on priority areas.

Overview of the Document

This document describes the key elements of a national programme for chemicals management and safety, thereby setting out a framework for a comprehensive approach. It is provided as a resource for countries to be used in their efforts to establish, update or implement national programmes and policies related to chemicals management. Each country should adapt the framework and guidance to its national needs and circumstances, taking into account national priorities and availability of resources, as well as the local legal, cultural, social and political situation. While the long-term objective should be to achieve a comprehensive approach consistent with national needs, it is recognized that this will likely be accomplished in a step-wise fashion over time.

Information contained in this document is intended to be of use to all parties interested in the sound management of chemicals, recognizing that chemicals management should involve a variety of public authorities as well as the private sector, academic institutions, other non-governmental organisations and the public. However, the primary audience for this document is likely to be those responsible for establishing, updating and/or implementing national chemicals management policies and programmes.

This document is intended to complement other international activities and publications which provide more detailed guidance on specific areas of chemicals management or which aim to assist countries in setting priorities and developing strategies to strengthen national chemicals management. For example, in 1996 UNITAR/IOMC published a guidance document on *Preparing a National Profile to Assess the National Infrastructure for Management of Chemicals*. Countries which have prepared such profiles have found them to be an effective first step in the establishment or updating of national chemicals management schemes. Another example is the 1995 UNEP publication entitled *Legislating Chemicals: An Overview* which is the first in a series of publications being prepared to provide guidance on chemicals legislation. The ILO has initiated an Action Programme on Safety in the Use of Chemicals at Work which seeks to assist a selected number of developing countries in the design and implementation of national programmes for the environmentally sound management of hazardous chemicals and waste at work, and includes a number of outputs such as chemical safety guidelines on priority chemicals, guidelines on chemical risk assessment in small and medium-sized enterprises, and the design and implementation of chemical safety workshops at the national level.

Part I of this document provides an overview of the aims, principles and essential elements of sound chemicals management.

Part II discusses in greater detail each of the key elements of national chemicals management and safety in order to assist countries in establishing and strengthening national policies and programmes.

- Section 2.1 addresses national intersectoral co-ordination, and includes an overview of the range of interested governmental and non-governmental parties.
- Section 2.2 deals with human and other resources needed for chemicals management programmes.

- Section 2.3 discusses information on chemicals, including needs and access to relevant information.

- Section 2.4 covers the issues associated with identifying and assessing chemical risks.

- Section 2.5 addresses management of chemical risks including legislation and non-regulatory approaches, monitoring and enforcement, and management of chemical accidents.

- Section 2.6 considers a range of issues involved with risk communication and public awareness.

Part III outlines sources of information and assistance for those countries seeking to establish, update and implement chemicals management policies and programmes.

- Sections 3.1 - 3.3 discuss activities which can be undertaken at the national, regional and global levels, respectively, to strengthen chemicals management capacities and capabilities.

- Section 3.4 provides an overview of various sources of information and assistance, including international organisations, countries with more advanced chemicals management programmes, industry, other non-governmental organisations, and electronically available information.

Eight annexes contain supporting information including a glossary of key terms, a selected bibliography, a list of major international organisations involved in chemicals management activities, and a listing of international agreements related to chemicals. Additional annexes contain information related to the outcome of the UN Conference on Environment and Development (UNCED) as well as information on the Inter-Organization Programme for the Sound Management of Chemicals (IOMC) and the Intergovernmental Forum on Chemical Safety (IFCS).

A key word **index** is included to facilitate use of this document.

BACKGROUND:
The International Context

International Efforts to Improve Chemicals Management and Safety

Since the 1960s there has been growing international concern about the adverse effects of chemicals, particularly in relation to chemicals at the workplace and as pollutants in the human environment. As a consequence, the international community has addressed the issue of health and environmental effects of chemicals in a number of fora. A variety of inter-governmental organisations and initiatives have been established to provide assistance to countries with respect to the establishment and implementation of chemicals management schemes and to facilitate international co-operation. This background note highlights certain major international developments in the area of chemicals management and safety. A more comprehensive picture can be found in *International Approaches to Chemicals Control: A Historical Overview* by R. Lönngren.

1972 Conference on the Human Environment

The United Nations Conference on the Human Environment, which convened in 1972 in Stockholm, provided a major impetus for international organisations and governments to start developing chemicals management and safety programmes. One important outcome of the Conference was the establishment of the United Nations Environment Programme (UNEP) which received the mandate to catalyze and co-ordinate the work of the United Nations in the field of the environment. As far as chemicals management is concerned, the Stockholm Conference highlighted the need and importance of assessing the potential risks of chemicals to human health and the environment and recommended that programmes, to be guided by the World Health Organization (WHO), should be undertaken for early warning and prevention of the harmful effects of environmental contaminants. In the wake of the Conference, the WHO accelerated its Environmental Health Criteria programme and the newly created International Agency for Research on Cancer (IARC) launched its monograph programme on the evaluation of carcinogenic risks of chemicals in humans.

The Stockholm Conference also highlighted the need for availability of information on chemicals in a form useful to policy makers at the national level. As a consequence the International Register of Potentially Toxic Chemicals of UNEP (IRPTC) was established. IRPTC[1] is the focus for activities undertaken by UNEP to ensure the global sound management of hazardous chemicals. At its inception, IRPTC was requested by governments to facilitate access to existing data on production, distribution, release, disposal and adverse effects of chemicals, as well as to provide information about relevant national, regional, and global policies, controls and recommendations.

In 1977 the World Health Assembly decided that long-term strategies to control and limit the impact of chemicals should be addressed at the international level. In order to address challenges related to chemical risks in a more comprehensive way, the International Programme on Chemical Safety (IPCS) was established jointly by UNEP, the International Labour Organisation (ILO) and WHO in 1980. IPCS was set up to provide international assessments of the risks of chemicals to health and the environment and to strengthen capabilities and capacities in countries for sound management of chemicals. The majority of

[1] now called UNEP Chemicals

IPCS activities are implemented through a Central Unit, the WHO Programme for the Promotion of Chemical Safety, which is located at WHO Headquarters. In the late 1980s, the IPCS recognized the need to develop guidelines related to comprehensive national policies for sound management of chemicals. This led to the 1991 government experts meeting in London, which emphasized the need for national co-ordinating mechanisms as a prerequisite for sound chemical risk assessment and management and called for an intergovernmental mechanism on chemical risk assessment and management.

In 1978, the Swedish Government hosted an "International Meeting on the Control of Toxic Substances with special regard to Environmental Chemicals" (Hasselby Castle meeting) to bring together representatives of countries which have more advanced chemicals management schemes and an interest in international co-operation, as well as concerned international organisations. The meeting identified a few priority areas where work needed to be completed as soon as possible, including the development of consistent data requirements, testing methods and good laboratory practice standards. It was agreed that the Organisation for Economic Co-operation and Development (OECD) was well positioned to carry out many of these tasks, which led to the substantial expansion of the OECD work on chemicals testing, assessment and management.

1992 Conference on Environment and Development and Adoption of Agenda 21

In 1992, the United Nations Conference on Environment and Development (UNCED or the "Earth Summit") marked an important event towards the goal of achieving sustainable economic development which meets the needs of the present without compromising the needs of future generations. Heads of State or Government from more than 150 member countries of the United Nations adopted *Agenda 21*, a comprehensive document outlining responsibilities of States towards the achievement of sustainable development. Agenda 21 recognized the responsibility of different sectors of society to contribute towards the goal of sustainable development, including governments, industry and the commercial sector, public interest groups, professional bodies, unions, academia, and communities. When the recommendations of the Earth Summit were adopted by the UN General Assembly, a UN Commission on Sustainable Development (CSD) was established to monitor the implementation of Agenda 21. In 1997, a Special Session of the UN General Assembly on the implementation of Agenda 21 was held.

Chapter 19 of Agenda 21 is entitled "Environmentally Sound Management of Toxic Chemicals, including Prevention of Illegal International Traffic in Toxic and Dangerous Products". It recognises the need for chemicals to meet the social and economic goals of the world community and, at the same time, calls for a significant strengthening of both national and international efforts to improve chemical safety. Through Chapter 19 of Agenda 21, all countries present at the "Earth Summit" agreed on the goal of achieving the sound management of chemicals by the year 2000. Chapter 19 also called upon the international organisations cooperating in the IPCS to organize an intergovernmental meeting to further enhance co-ordination and strengthening of international work on environmentally sound management of chemicals, with the collaboration on chemical safety between UNEP, ILO and WHO in the IPCS as the nucleus.

Chapter 19 of Agenda 21 includes six programme areas, one of which, Programme Area E, addresses "strengthening of national capabilities and capacities for management of chemicals". Specific elements of national programmes for the sound management of chemicals mentioned in Programme Area E include: adequate legislation; information gathering and dissemination; capacity for risk assessment and interpretation; establishment of risk management policy; capacity for implementation and enforcement; capacity for rehabilitation of contaminated sites and poisoned persons; effective education programmes; and capacity to respond to emergencies. Excerpts from Chapter 19 are included as Annex V.

Establishment of the Intergovernmental Forum on Chemical Safety (IFCS)

The next major step was the organisation of the International Conference on Chemical Safety (ICCS), held in Stockholm in April 1994. ICCS established the Intergovernmental Forum on Chemical Safety (IFCS), through which countries regularly discuss their activities and priorities for the sound management of chemicals. To carry out its work between sessions, the IFCS established an Intersessional Group (ISG), which met in Bruges, Belgium, in March 1995 and in Canberra, Australia in March 1996. The second meeting of the IFCS (Forum II) took place in Ottawa, Canada in February 1997.

The 1994 Stockholm Conference, as the first meeting of the IFCS, adopted a "Priorities for Action" plan to implement the recommendations of Chapter 19 of Agenda 21. The IFCS priorities for action were endorsed in May 1994 by the UN Commission on Sustainable Development. (Annex IV contains an overview of the IFCS and the "Priorities for Action").

Establishment of the Inter-Organisation Programme for the Sound Management of Chemicals (IOMC)

At the level of international organisations, FAO, ILO, UNEP, UNIDO, WHO and OECD established in 1995 the Inter-Organization Programme for the Sound Management of Chemicals (IOMC), a co-operative agreement to co-ordinate activities of international organisations in the area of chemicals management. UNITAR joined the IOMC as a Participating Organisation in 1998. Taking into consideration guidance provided through the IFCS, international organisations will increasingly co-operate towards co-ordinating their programmes in the area of chemicals management and safety. Strengthening of national capabilities and capacities for the sound management of chemicals is one of the priority areas addressed through the IOMC. (See Annex VI for a description of the IOMC and Annex VIII for a list of the major international organisations involved in chemicals management).

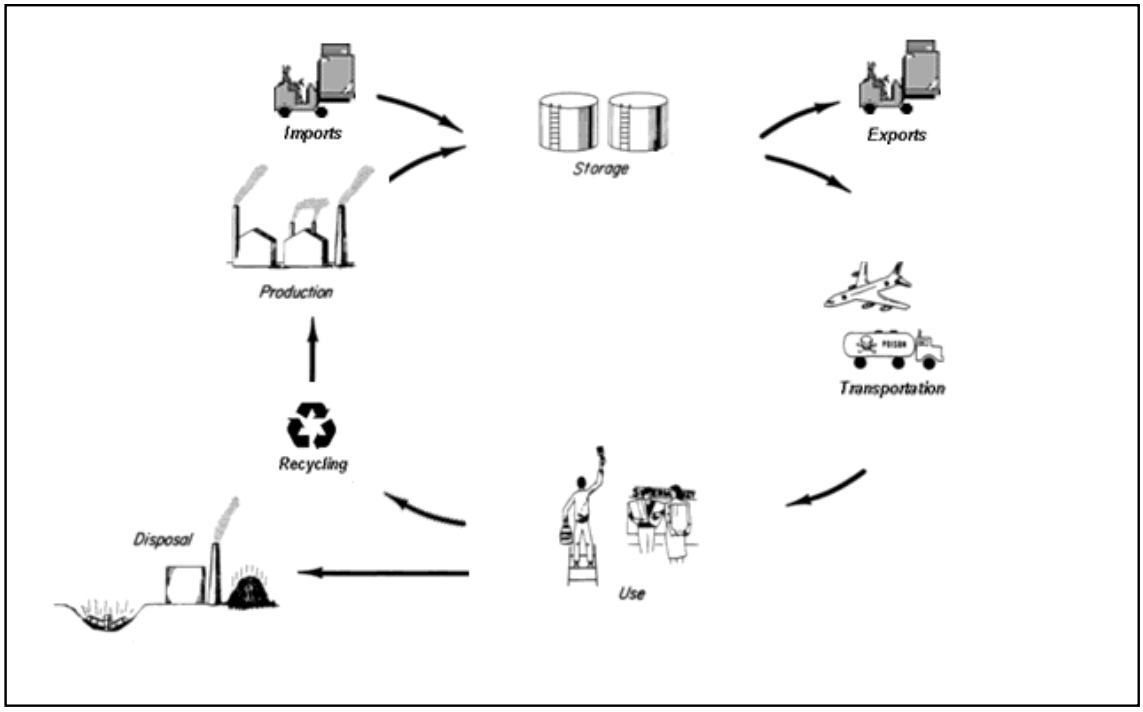
PART I

SOUND MANAGEMENT OF CHEMICALS:

An Overview of the Aims, Principles and Essential Elements

Introduction

Countries around the world have recognized, through their endorsement of Agenda 21's Chapter 19 and in the context of various international fora, the importance of the sound management of chemicals as a key component of sustainable development. Achieving sound chemicals management entails a comprehensive approach aimed at reducing risks and preventing adverse impacts throughout all stages of the chemical life cycle, from production or import through processing, storage, transportation, distribution, use and disposal (see Figure 1). With chemicals touching nearly every aspect of our lives, achieving the sound management of chemicals is a process which must involve a wide range of actors including government, industry, the agricultural sector, workers, research institutes and academia, public interest groups and individual citizens.



1.1 AIMS

Sound management of chemicals aims to protect human health and avoid adverse impacts on the environment. This can be accomplished through:

- **awareness** within all sectors of society of the risks associated with chemicals;
- **prevention,** i.e., taking steps to avoid or minimize chemical pollution, contamination, accidents, and poisonings; and

- **control and management** of chemicals which present risks to health and the environment resulting from extraction, manufacture, use, handling, transport, storage and disposal of chemicals. This includes **emergency preparedness and response** capabilities in the event of an accident.

A more detailed list of possible aims of a national programme for chemicals management and safety is provided in Box 1.

All countries should strive to develop and implement policies and programmes for the sound management of chemicals. To be successful, such policies and programmes should be developed by governments in consultation with all sectors, including industry and workers, academia, other non-governmental organisations and the public. There should be clear support for the policies and programmes from the highest levels of relevant government ministries and agencies, and other interested organisations. As a general rule, national chemicals policies and programmes should be based on best available data and scientific risk assessments, taking into account local economic, legal, cultural, social and political factors.

Hazard vs. Risk

In reading this document, it is important to understand the relationship between hazard and risk. For purposes of this document, these terms can be defined as follows:

hazard: the inherent property of a substance which makes it capable of causing adverse effects to people or the environment under conditions of exposure.

risk: the probability of occurrence of an adverse effect from a substance on people or the environment combined with the magnitude of the consequence of that adverse effect.

Chemicals management, and in fact environmental and health management policies more generally, should not be considered in isolation from other major national policies such as those dealing with economic development, trade, social affairs, agricultural production and public health. In fact, sound management of chemicals is critical to sustained economic, agricultural and social development in any country.

Experience has shown that sound management of chemicals should reflect a broad-based precautionary approach philosophy, applied in a manner which is economically feasible within the national context. In order to prevent or mitigate the risks which have been identified, chemicals management policies and programmes should seek to address the entire life cycle of chemicals. This includes: extraction, importation, manufacture, processing, handling, transport, storage, usage, and disposal. These policies and programmes should deal with both chemicals which are imported and those which are domestically manufactured, as well as naturally occurring chemicals. They should take into account individual chemicals and their products, as well as hazardous processes involving chemicals.

Box 1
Possible Aims of a National Programme for Chemicals Management and Safety

Some important aims of sound management of chemicals may include:

- **to promote understanding** of chemical risks and of safe chemical manufacture, use, transport and disposal practices to ensure that chemicals are handled responsibly. Information should be provided to public authorities, industry, workers, and the public in an appropriate manner and in an appropriate level of detail.

- **to contain hazardous processes and limit the release of hazardous substances and products** during extraction (especially mining), manufacture, processing, distribution/ transport, packaging, use, storage and disposal.

- **to promote the substitution of safer processes and substances** in lieu of more hazardous ones, where reasonable, to reduce overall risk. This would include non-chemical means for controlling pests and disease vectors (e.g., through integrated pest management). In this regard, it is vital to ensure that the substitute does not have more harmful effects than that which it replaces.

- **to minimize, and then optimize containment of, point-source discharges and fugitive releases** of chemicals and hazardous wastes.

- **to control, and if necessary restrict or ban**, the importation, manufacture, specified use, or disposal of particular hazardous substances and products.

- **to prevent chemical accidents** and, if they occur, contain their effects and rehabilitate the site and any poisoned persons.

- **to limit to acceptable levels** the concentration of hazardous chemical contaminants and residues in food, drinking water, consumer products, and environmental media.

- **to clean up polluted areas** resulting from past misuse of chemicals.

- **to restore the health** of those adversely affected from exposure to chemicals.

- **to minimize the production of hazardous wastes, and to minimize human and environmental exposure to wastes which remain** through proper treatment and containment.

It is recognized that countries have limited resources to address environmental and health problems generally and more specifically the risks associated with hazardous chemicals. Therefore, countries should set priorities based on an assessment of local risks and problems, and implement chemicals management policies and programmes in a step-wise fashion in light of these priorities. The preparation of a National Profile, which involves a systematic assessment of the existing infrastructure for chemicals management in the country and the identification of main problems and areas of concern, can provide a good starting point for this priority setting process.

Furthermore, with the increasing development of regional economic groupings, it is becoming more important for countries to co-operate with respect to chemicals management issues. Not only does regional co-operation allow countries to share the burdens associated with information gathering, testing, assessing and managing chemical risks, but it also creates opportunities for improved trade and economic development, (by, e.g., decreasing the likelihood of unnecessary barriers to trade).

1.2 PRINCIPLES

A number of basic principles underlie the sound management of chemicals, consistent with the basic aims to avoid harm to human health and adverse environmental impacts. Among the principles which should be kept in mind when designing, updating or implementing chemicals management policies and programmes are the following:

- ***The responsibility for chemical safety should be shared by all sectors of society.***

  This should be recognized and promoted through the development of a "safety culture" in which everyone understands the risks implicit in their actions and the materials they use and takes responsibility for related adverse affects, and in which care to protect the environment and the health of all is seen as a social responsibility rather than a legal requirement.

- ***Chemicals can and should be used to enhance sustainable development***.

  This involves promotion and use of cleaner technologies and less toxic and/or persistent chemicals. The manufacture and use of chemicals without appropriate regard to protection of health and the environment is inconsistent with the objective of sustainable industrial, agricultural or social development.

  Priorities should be set.

  Although chemicals management should ideally be addressed in a comprehensive manner, the reality in most countries is that limited resources constrain the extent to which programmes can be developed and implemented. Therefore, it is important to gain an understanding of the nature and extent of the risks within the country and concentrate action, in a rational order, on those chemical processes, substances, products and uses that constitute the most significant risks. The process of setting priorities should be on-going,

since priorities may change rapidly as a result of new hazards or technical solutions, or newly acquired information from hazard identification programmes.

- ***Account should be taken of all significant chemical pollutant sources and pathways, and for the full chemical life cycle.***

  In establishing chemical risk management policies, all stages of the chemical life cycle should be taken into consideration and addressed in an integrated way. In addition, the control of all industrial waste streams should be integrated so that protection of one part of the environment is not obtained at the expense of another. For example, before establishing mechanisms to control pollution of waterways by diverting hazardous wastes from waterways to land disposal, countries should consider whether this might unintentionally lead to contamination of groundwater or other problems.

- ***No country or group should endanger others through their use of, or trade in, chemicals and related technologies***.

  The protection of workers, the general public, particular population groups, and the environment should not be bought at the expense of others. In this regard, special care should be taken of vulnerable population groups and ecosystems.

- ***Prevention should be emphasized.***

  Rather than focusing solely on existing problems and "end-of-pipe" controls, pollution should be prevented or minimized at the source wherever possible. It is recognized, however, that clean-up and treatment will continue to be needed, for example, to deal with the residues of historical bad practice.

- ***A precautionary approach should be adopted.***

  In light of the limitations of existing knowledge, a precautionary approach should be applied in a manner which is economically feasible within the national context. Chemicals should be used prudently, with a bias in favour of reliable containment of potential hazards and minimizing or phasing out the use of chemicals that pose unreasonable or unmanageable risks (e.g., chemicals which, because of their toxic, persistent and/or bio-accumulative nature, cannot be adequately controlled during use) or for which there are reasonable grounds for suspecting that the chemical poses significant risks. As an example, where data is not available to undertake a complete assessment, a precautionary approach would assume a realistic worst case with regard to exposure.

- ***Costs and benefits, as well as risks, should be assessed to ensure informed decision-making.***

  Before taking a specific action, the relevant costs, benefits and potential risks should be carefully considered in order to avoid the possibility that the action will have an overall result causing greater harm than good. It is important to recognize that hazardous technologies can have important benefits, that alternative chemicals and technologies may have significant (albeit different) risks, and that the drawbacks of a new technology may

take time to emerge. For example, the use of alternative pesticides may result in unacceptable reduction in yields of particular agricultural products.

- ***The polluter-pays principle should be applied.***

  The polluter-pays principle applied in the context of chemicals management policies and programmes may include, for example, a requirement that industries responsible for creating chemical risks pay an appropriate portion of the costs of government risk management activities (e.g., by paying a registration or license fee), or that the operator of a hazardous installation should bear the cost of reasonable measures to prevent and control accidental pollution.

- ***The best available scientific information and assessments should be utilized.***

  In developing and implementing chemical safety policies and programmes, countries should strive to make use of the best available scientific information. Manufacturers, formulators, importers and traders of chemicals generally are required to provide data on their chemicals in order to support assessments and decision making.

- ***Appropriate state-of-the-art technology should be made available.***

  This may be done through technical co-operation, where possible. Chemicals management and safety policies should promote the selection of appropriate technologies and their correct use and maintenance.

- ***Information on chemical safety, the use of chemicals, and their hazards should be readily available to governments, industry, workers, and the public***.

  Chemical safety depends on the broadest possible awareness of chemical risks. Information should be easy to understand and use, and relevant to the local situation. It should cover all aspects of the health and environmental impacts of the chemicals and their safe handling. The community and particularly those working with chemicals have a right to know those risks, within the constraints of legitimate industrial confidentiality.

- ***Management of chemical risks should include contingency planning for chemical emergencies.***

  Adequate preparedness and response for emergencies requires that, e.g., information is accessible to assess risks and to respond should an accident occur; trained personnel and equipment are available at all times to mitigate the effects of the accidents and to treat victims; preparedness plans are prepared and tested in advance; and communication systems are in place.

- ***A poison control programme should be in place.***

  Toxicovigilance, prevention and response to poisoning are the key functions of a poison control programme. Such a programme should include a means for obtaining information which may be needed for response or to improve preparedness as well as a means for distributing information to facilitate prevention (such as through a dedicated poisons information centre). It should also include related clinical and analytical facilities. The programme should be linked to planning for emergency preparedness and response activities.

- ***International co-operation and co-ordination should be promoted.***

  International co-operation and co-ordination are important means to assist countries in improving chemicals management and to provide a mechanism for countries to learn from the experience of others. Such co-operation also enables countries to share the burdens associated with data gathering, testing, assessment, and management of chemicals and chemical-related risks.

1.3 ESSENTIAL ELEMENTS

Following is an overview of the essential elements of a national programme for chemicals management and safety. Each is elaborated further in Part II of the document: a reference to the corresponding section is noted below.

- ***National intersectoral co-ordination***

  A co-ordinated national approach is vital, with co-operation among the many authorities at all levels with responsibilities related to chemicals management, in consultation with authorities responsible for economic, agricultural and social development. In addition, there should be liaison with all parties involved in activities that influence chemical safety, including representatives of industrial and commercial sectors, labour and public interest groups. (see Section 2.1)

- ***Information/data on chemicals and their management***

  Information/data should be collected and, where necessary, generated. This includes generic information (e.g., that which may be internationally available), and information that is specific to the national or local situation. Nationally available databases should provide information on the amounts of chemicals imported, manufactured, and traded. Clinical, epidemiological, and environmental data are needed to support decision-making and to assess and manage chemical risks under local conditions. Many countries have established national databases on registration, emission inventories, and/or pollutant release and transfer registries (PRTRs) as a means of providing much of this information. (see section 2.3)

- ***Basic legislation and administrative infrastructure***

  Adequate legal, institutional, administrative and technical infrastructure should be in place, providing public authorities with sufficient power, trained staff and resources to implement the objectives of the legislation. This includes the capabilities and legislative authority to enforce regulatory provisions. In this regard, mechanisms should be established to ensure that resources are available to support the implementation of chemicals management programmes which may include fees to be paid by chemical manufacturers, importers, formulators and traders. (see sections 2.1 and 2.5.)

- ***Identification and assessment of risks posed by chemicals***

  These include risks to human health and to the environment. To do this, principles, guidelines and criteria for assessments are needed, along with standards and acceptable limits for chemicals in each environmental medium (including air and water) and in food and consumer goods. International organisations have numerous publications setting out internationally-agreed principles, criteria, standards and limits, as well as surveying various national approaches. It is suggested that countries should make use of internationally-recognized criteria, standards and limits to the extent available, unless national circumstances dictate otherwise. (see section 2.4)

- ***Risk management based on sound principles***

  This should cover import/export, manufacture, transportation, storage, use, and disposal of chemicals and include both regulatory and non-regulatory approaches. In countries with significant agricultural production, particular attention should be paid to pesticides. Effective mechanisms for accident prevention and emergency response are needed at the local, national, and international levels as an important component of risk management. Decisions concerning the manufacture, import and use of individual chemicals and groups of chemicals should be reassessed, both periodically on a scheduled basis and in response to the availability of significant new information. (see section 2.5)

- ***Risk communication, education and public awareness***

  All levels of the workforce should be well trained and aware of chemical safety issues. The public should have the right to be informed about chemical risks in their community and about chemical safety more generally. Furthermore, an informed and aware community is vital in achieving public co-operation and confidence in chemical safety management. (see section 2.6)

PART II

ELEMENTS OF NATIONAL CHEMICALS MANAGEMENT AND SAFETY

Introduction

This part of the document addresses in greater detail each of the key elements of a national programme for chemicals management and safety, as introduced in Part I. By providing a comprehensive overview of each core aspect of a national programme, the document aims to provide a useful frame of reference for countries that may be in the process of developing or strengthening their chemicals management policies and programmes.

2.1 NATIONAL INTERSECTORAL CO-ORDINATION

A coherent approach to chemical safety across all sectors is necessary to protect health and the environment. When a country is establishing relatively new chemical safety policies and programmes, the opportunity exists to build a co-ordinated system from the ground up, thereby avoiding the fragmentary approach that has evolved in many developed countries.

Responsibility for the control of hazardous chemicals is often distributed across many ministries, departments and agencies in central, regional and local government. This includes responsibility for various classes of chemicals (e.g., agricultural, public health, industrial and consumer chemicals, pharmaceuticals, veterinary drugs, food additives). It also cuts across the various aspects of chemicals management including, for example, collection and dissemination of data, risk assessment, risk management, response to accidents, and risk communication. In addition, it includes those responsible for monitoring of health and the environment, review of compliance, and enforcement in cases of non-compliance.

Thus, a first step in developing a national chemicals programme should involve reviewing and co-ordinating the functions of a range of interested government ministries, agencies and departments (at local, national and regional levels), as well as non-governmental organisations such as universities, research institutions, industry, trade unions and public interest groups. The range and nature of interested ministries, agencies, organisations, institutions, and other bodies will differ from country to country.

The UNITAR/IOMC Guidance Document on *Preparing a National Profile to Assess the National Infrastructure for Management of Chemicals* provides a framework, *inter alia*, to identify the bodies concerned with chemicals management. It also aims to help countries initiate a process to identify gaps in the existing legal, institutional, administrative and technical infrastructure related to chemicals management through involvement of all relevant parties. This process provides a means for improved co-ordination among all interested governmental and non-governmental organisations. Guidance is also available from the outline of the "Country Policy Paper" developed by the ILO, which highlights the importance of, and the need for, action with respect to chemical safety and the prevention of major industrial accidents at the national level. It addresses legislation, the role of public authorities, employers and workers' organisations, and co-operation among international agencies.

2.1.1 Governmental Sector

Government bodies which may be involved in chemicals management and safety include ministries, departments or agencies responsible for:

- ***environment***, generally concerned with the direct and indirect effects of releasing chemicals into the environment as emissions to air, water and land;

- ***agriculture and fisheries*****,** generally concerned with the use of agricultural chemicals for the benefit of securing food supplies. Responsibilities may include, inter alia, setting standards and controlling agricultural uses of chemicals to ensure adequate protection of users, establishing export certification schemes, and monitoring chemical residue levels in agricultural products;

- ***health*****,** generally concerned with the short- and long-term health impacts of chemicals on the general public. They may set standards for therapeutic chemicals, food, consumer goods, and public water supplies to maintain the health of consumers; and monitor food for chemical residues and microbiological safety. They may also be responsible for vector control and may provide health care facilities for environmental health surveillance and treatment of people exposed to chemicals;

- ***labour and occupational safety*****,** generally concerned with occupational health and safety issues related to the use and handling of chemicals at the workplace. They often set standards, provide training and education, and administer workplace monitoring to ensure safe working environments;

- ***transport*****,** generally concerned with the safe transportation and storage of chemicals during the distribution phase (for air, land, inland waterways and sea transport systems);

- ***trade***, generally responsible for regulating the import and export of chemical substances, and often with the authority to issue relevant trade permits;

- ***industry***, generally concerned with the production of chemicals and chemical products, and the introduction of cleaner production technologies;

- ***customs*****,** generally responsible for ensuring that chemicals do not enter or leave the country contrary to government regulations;

- ***inspectorates***, generally responsible for monitoring, review and enforcement of laws, regulations and guidance and for assisting the regulated community in meeting their obligations (sometimes linked with a specific ministry, agency or department);

- ***justice or legal affairs*****,** generally concerned with the development and enforcement of laws and regulations, and often dealing with issues concerning public access to information and the protection of confidential business information;
- ***economic affairs or planning***, generally dealing with the donation or receipt of development assistance which could include chemicals for agricultural use, technical or

financial assistance for the development of chemical industries, or technical assistance for the management of chemicals;

- ***foreign affairs*****,** generally co-ordinating all international aspects of chemicals management, such as the participation in relevant international agreements and conventions;

- ***regional and district councils*****,** generally providing planning and policy for, and administering controls on, the use of land for chemicals-related facilities, including disposal sites that receive hazardous wastes. They may also issue consents for discharges to the environment;

- ***civil defense or interior***, generally responsible for emergency services; and

- ***other departments or agencies*** might include those responsible for consumer affairs and natural resources, as well as government publications offices, local and regional government offices and governmental research institutions.

2.1.2 Non-Governmental Sectors

Non-governmental organizations, which are likely to be concerned with chemicals management and safety include:

- ***business and trade (employers) organisations*** and private institutions concerned with commercial aspects of chemicals, including manufacturing, importation, transportation and disposal;

- ***labour organisations*** and workers unions;

- ***professional organisations*** concerned with chemicals manufacture, transport, storage, use and disposal such as associations of chemical engineers;

- ***universities and research institutions***;

- ***poison information centres*** and related facilities;

- ***health care delivery systems***, both private and government-run; and

- ***public and consumer protection organisations*** which could include, for example, environmental or consumers groups, citizen action committees and/or women's organisations.

2.2 HUMAN AND OTHER RESOURCES

A critical element for a successful chemical safety programme is adequate staff, with appropriate education and training, to carry out the functions established by the programme and to monitor and enforce compliance with laws and regulations. Furthermore, the implementation of any programme requires equipment, materials and other resources. Therefore, in establishing a chemical safety programme, it is necessary to take into account the likely availability of staff, financing and other resources.

Mechanisms should be in place for the regular education and training of staff to provide them with the skills necessary to carry out their functions, and to ensure continuity as new people are hired, or staff responsibilities are changed. A critical concern of many countries is that personnel receive training (e.g., through international assistance activities), then leave their government posts without appropriate mechanisms for ensuring the training of their replacements.

With respect to the question of resources, many countries have initiated mechanisms to collect at least part of the cost of running their chemicals management programmes from the regulated community, for example through licensing fees or by charging for chemical reviews and registrations. Such an approach is consistent with the "polluter-pays principle".

2.3 INFORMATION ON CHEMICALS

2.3.1 Information Needs

Information is pivotal to a successful chemicals management programme. Ideally, the information should be comprehensive, validated and up-to-date. For purposes of chemicals management, information is needed to:

- ***identify the chemicals of concern,*** and their characteristics;
- ***identify and assess*** the chemical-related problems that are likely to occur and the sectors of the population and environment at risk, taking into account more sensitive areas and population groups (such as children and the elderly);
- ***implement*** focussed and effective risk management programmes, including standard setting;
- ***monitor and evaluate*** health and environmental risks;
- ***improve awareness,*** including education and training of those responsible for managing and handling of chemicals, and increasing community understanding of risk; and
- ***prepare for and respond*** to chemical accidents and emergencies, and to longer-term problems, to mitigate adverse health and environmental effects.

The types of information which are needed in the context of national chemicals management and safety programmes are outlined in Box 2.

In the collection, development, and dissemination of information on chemicals, it is important to consider the ultimate use, and users, of the information. For example, in addition to the information needed by national authorities to assess chemicals and take appropriate regulatory actions, information related to the assessment of risks of specific chemicals in a local community is needed by local authorities (e.g., police, fire and health authorities) to set and implement standards in order to control, prepare for and respond to accidents, by workers to understand how to safely handle chemicals, and by the public to understand the risks in the community and take appropriate action in the event of an accident and to protect their health. As a consequence, the level of detail and the technical nature of such information, as well as the nature and format of related documentation, should vary in relation to the needs of the various groups.

2.3.2 Sources of Information

National sources

Most countries rely on a variety of sources of information, both national and regional/international, in order to support decision-making concerning chemicals. For example, at the national level, many countries use mandatory notification and assessment schemes to obtain information from the manufacturing and importation sectors. This information could relate to, for example, chemicals assessment, product safety, and current distribution practices. Most countries administer national statutory schemes for pesticides registration, and many countries have schemes for other chemicals as well, such as requirements for notification, assessment and labelling of hazardous substances. When information needed for decision-making is not otherwise available, an administrating agency may request that the concerned industry undertake

efforts to generate the information, or the agency may undertake the necessary testing and assessment in its own facilities or have others do it (e.g., through universities or regional cooperative centres). Thus, an extremely important source of information on chemicals is private companies and industrial organisations. In this regard, companies should make available information on chemicals, which they manufacture, formulate, use, store or transport. They should provide material safety data sheets (MSDSs) on all chemicals which workers may be exposed to. As far as possible, this information should conform to the standardized data set for material safety data sheets contained in ILO Convention 170 and Recommendation 171 concerning safety in the use of chemicals at work.

A range of ministries and agencies may collect specific types of data on chemicals which they need to carry out their functions, and which may be useful in the context of national

Box 2
Types of Information Needed for Chemicals Management

Some specific types of information which should be available for chemicals management include:

- **the identity (names and identification numbers), nature and extent of chemicals manufactured, formulated, imported and used in the country, and the locations where chemicals and products of concern are found.** This would include the type and location of facilities which pose potential risks because of the chemicals manufactured or processed there, as well as the nature and extent of transport, storage and disposal of chemicals and products of concern.

- **the main chemical hazards which exist in the country.** This could include hazards resulting from current or past practices in the industrial, agricultural or public/domestic sectors and natural chemical hazards. Information should be available on the nature and location of chemical wastes and emissions (e.g., into air and water), as well as on potential by-products or degradation products (e.g., in the event of a fire or explosion). In this regard, consideration should be given to the use of pollutant release and transfer registers.

- **information on the behaviour, environmental fate and toxicity of chemicals** and products, and their potential health and environmental effects, including dose-response relationships. In this regard, there is validated information globally available through the scientific and technical literature, in particular relating to risk assessments. This should be complemented, as appropriate, by other information which is more specific to the local conditions and circumstances.

- **information on direct and indirect human and environmental exposures to hazardous chemicals.** With respect to human exposure, consideration should be given not only to direct exposure (e.g., through industrial or agricultural practices) but also indirect exposure through contamination of air, water, and food. The information should take into account the extent and nature of more sensitive sectors of the population and the environment.

- **experience related to chemicals safety and management** including, for example, information on particular chemicals or groups of chemicals that other countries have regulated, what relevant documents, legal instruments and institutions exist and how to get access to them, and who to contact in the event of an emergency. Some bibliographic information is available to facilitate access to such information including, for example, the UNEP/IRPTC Legal File. In addition, when developing or updating chemicals management policies and programmes, it is valuable to have information on technologies and policy instruments used successfully by other countries.

chemicals management policies and programmes. For example, authorities responsible for manufacturing, transport and minerals extraction may have relevant data. In addition, other types of data which may not be directly relevant to chemicals but which nevertheless have important applications in chemicals management decision-making are often collected at the national level. Such data might include census and demographic data, health statistics and the results of environmental monitoring and assessment.

Other national sources of information include: research institutions and universities; professional bodies; private sector import organisations; trade union organisations; and "grass roots" consumers' and environmental organisations. At the local level, information may be maintained by rescue service agencies (e.g., police and fire departments), hospitals and local planning/zoning boards. Information on toxic exposures to chemicals and on chemical incidents is collected by poison centres, which may be valuable for toxicovigilance.

Many countries find it useful to establish a central repository for information on chemicals at either a national or regional level (see Box 3). To the extent that there is more than one centre in a country, the centres should be able to share information through a network. As far as is practicable, data collection formats and terms should be harmonized within countries, as well as among different countries, in order to facilitate the appropriate exchange of information. A central repository, or networked centres, will help to facilitate access to information from different sources by different interested parties.

In deciding on the need for a chemicals information centre, or on the type of centre to be established, there are a number of issues to consider. These include: (1) how chemical safety is currently being managed (e.g.: is the emphasis on government regulation or industry self-regulation; which sectors and agencies are involved; are policies administered at the federal or regional level; how well are chemicals safety policies integrated with other nationals policies); (2) what types of information are currently available, where are they located and in what form; and (3) who will need access to specific types of data, how frequently, in what time frame (e.g. immediately) and for what purposes.

In countries where sectoral information centres already exist (for instance dealing with agrochemicals, chemicals in the workplace, chemical accidents, or trade in chemicals) or where the chemical centres are organized in regions rather than nationally, mechanisms should be established for networking and co-ordination of data collection and exchange. This will help to ensure that the data are comparable and compatible.

Box 3
Addressing Information Management Through an Information Centre

Chemicals information centres, established on a national or regional basis, can have a number of functions including some or all of the following:

- collecting and disseminating information related to the identity of chemicals and to health and environmental data on chemical products in national commerce including, e.g., toxicity criteria for formulations and acceptable exposure levels for particular human exposure routes and/or environmental compartments;
- providing a national data base on relevant registration and notification schemes for chemicals;
- promoting and facilitating exchange of information, both nationally and internationally, regarding chemicals, chemicals legislation and regulations, chemical accidents and risks, cleaner technologies, and hazard communication systems;
- providing information needed for chemicals management decision making;
- providing the information necessary for, and promoting national co-operation in, the prevention of, preparedness for, and response to chemical accidents, emergencies, and poisoning;
- raising public awareness and providing information access, as appropriate.

International Sources

Countries generally supplement data generated or collected locally with information available from international data bases and resource documents. In addition to supporting national activities, the international information provides a basis for comparing local exposures with international guidelines on methodologies, exposure limits and implementable controls.

International sources of information include scientific journals, handbooks and manuals. Furthermore, electronic communication, which is becoming an increasingly important source of information, has greatly enhanced access to data worldwide and has facilitated sharing of information and experience among countries and organisations. There are presently about 200 computerized information services on various aspects of chemicals.

A number of international organisations have global networks for exchange of information on hazardous chemicals and wastes (see Box 4). These may be available on CD ROM (such as the IPCS INCHEM), on computer via the Internet, as well as in hard copies. Among the organisations providing information are UNEP (through, e.g., INFOTERRA and UNEP Chemicals/IRPTC), ILO, WHO, IPCS, FAO, IARC and OECD. In addition, international guidance on exposure limits are available from relevant UN agencies (e.g., WHO, ILO, UNEP and FAO) which address a range of chemicals in various environmental media, the workplace, agricultural products, wastes, ecosystems, and consumer products.

To facilitate access to existing information sources, UNEP-Chemicals (IRPTC) published in 1996 a preliminary issue of *Inventory of Information Sources on Chemicals: Intergovernmental Organizations*. There is a plan to extend this effort to promote information exchange by identifying information systems on chemicals which exist in different national institutions. Many of these international sources of information will be further described in a document being prepared in the context of the UNITAR/IOMC Pilot Capacity Building Programme on the activities and resources of international and bilateral organizations to support national chemicals management and safety programmes.

Among the examples of information developed by international organisations are the internationally evaluated assessments of the risks caused by chemicals prepared by IPCS for use by countries in developing their own chemical safety measures. Different types of publications are designed for the different types of audiences: *Environmental Health Criteria* documents provide health and environmental risk evaluations of specific chemicals based on a thorough review of the scientific literature; *Concise International Chemical Assessment Documents*, based on high quality national reviews, provide a focussed assessment of the key data on effects on health and environment of chemicals; *Health and Safety Guides* give a summary of risk evaluations and provide practical advice for managers and decision-makers; *International Chemical Safety Cards* summarize essential data on substance identity, symptoms of poisoning, and safety and first aid procedures; and *Poisons Information Monographs* contain evaluated information on potentially toxic chemicals, pharmaceuticals, poisonous plants, fungi and animals and summarize the medical effects of exposure, appropriate patient management and supporting laboratory investigations. JECFA and JMPR

Box 4
Examples of International Networked Information Sources

Global Information Network for Chemicals

To support the implementation of the recommendations of the IFCS concerning chemical information exchange, a project was initiated by WHO, ILO, UNEP and OECD with the support of the Japanese National Institute for Health Sciences (NIHS Japan) to establish a "Global Information Network for Chemicals" (GINC). The project is now carried out under the auspices of the IOMC. Using existing information technologies and infrastructure, the aim of the GINC project is to foster the sharing of chemicals information between developed and developing countries for the promotion of sound chemicals management. To this end, networking arrangements are being established. Participating international organisations have set up home pages on Internet, giving the information resources that each provides. At a regional level, work has been initiated among selected countries of the Asia and Pacific region to establish chemical information exchange facilities.

Global Health and Environment Library Network

WHO, in collaboration with UNEP, has created the "Global Health and Environment Library Network" (GELNET) which aims to facilitate effective and systematic provision of scientific or technical health information. Within the framework of this network, the Health and Environment Library Modules (HELM) concept has been developed. HELM is a collection of key information on health and environmental issues, a list of bibliographic references, a computerized database and guideline documents for its installation and use in libraries. The module on Chemical Safety includes the IPCS Environmental Health Criteria documents and the IPCS Health and Safety Guides, as well as monographs from IARC.

Monographs provide an evaluation of risks to health of chemicals added to food, and toxic contaminants, pesticide and veterinary drug residues in some food commodities.

In other examples of chemical assessments available from international organisations, the OECD develops *SIDS ("screening information data sets") Information Assessment Reports* in the context of its OECD High Production Volume Chemicals Programme. These reports identify gaps and provide an initial assessment of the risks to health and the environment of a chemical. In addition, UNEP and the European Centre for Ecotoxicology and Toxicology of Chemicals (ECETOC) have jointly produced an inventory of critical reviews on chemicals. With respect to generating information on the behaviour and toxicity of chemicals, the OECD has developed *Guidelines for the Testing of Chemicals and Principles of Good Laboratory Practice* which are used widely in the world to obtain good quality data which are accepted by authorities in many countries.

International organisations which generate, collect and disseminate information also provide a framework for international co-operation and for the exchange of data, policy approaches and technology. Another important function of these organisations is that they often provide mechanisms for the two-way transfer of information between developed and developing countries.

2.3.3 Limitations of Existing Information

It is important for countries to determine the nature and scope of information which is available to support chemicals assessment and management activities and to determine how to get access to, and utilize, existing information. In this regard, countries should consider whether the information which is available is reliable. For example, with increasing access to a wide body of information through electronic media, there is a corresponding increase in information being made available which is not scientifically sound, or not validated.

In addition, while there is a large body of information on the most common chemicals which has been evaluated and validated by international organisations and is easily available to all countries, there remain large gaps in data for a number of chemicals. The majority of existing chemicals have not been completely evaluated. Furthermore, some of the data which exist have not been validated and therefore may be suspect.

In order to address the problem of data gaps, some countries utilize data estimation techniques such as quantitative structure activity relationships (QSARs). In other cases, countries apply reasonable default values in order to predict exposure and effects of chemicals. Before accepting risk assessments utilizing such techniques, it is important to consider the validity of the assessment, and the underlying data estimation techniques and default values, in the context which they are being used.

Furthermore, when applying internationally generated, or validated, risk assessments of chemicals, it is important for decision makers in all countries to take into account local cultural, climatic, and environmental conditions. These include, for example:

- variations in geographic and climatic conditions which might effect the fate and effects of chemicals and their degradation products;

- variations in sensitivities of species and ecosystems;
- specific consumption patterns and habits of local populations;
- variations in working conditions, the use of protective equipment and the maintenance of equipment; and
- the presence of sensitive groups such as pregnant women, children and the elderly.

Furthermore, there are certain characteristics of developing countries, many of which are located in tropical regions, that should be taken into account, as appropriate, in applying international assessments. These include:

- the tendency for tropical conditions to mitigate against the use of occupational safety protection equipment;
- the increased use of agricultural chemicals, particularly herbicides, in tropical countries. The chemicals are also often used at higher concentrations;
- the use of chemicals for public health purposes (e.g., for malaria control) in tropical countries;
- the use of biomass as the major energy source for domestic heating and cooking, which can lead to major indoor exposure problems; and
- the generally poorer health of people in developing countries, which may magnify the effect of toxic chemicals. Chemical concentrations that have no effect on a healthy person may prove serious to someone already suffering from malnutrition or disease, and/or who is already at higher risk (e.g. pregnant women, children, the elderly).

2.4 IDENTIFYING AND ASSESSING CHEMICAL RISKS

Risk assessment is a key element in the environmentally sound management of chemicals. The aim of risk assessment is to identify, characterize and quantify the potential adverse effects on human health or ecosystems of defined exposures to a chemical substance or mixture, or to a chemically hazardous process or situation. Risk is determined not just by how toxic a chemical is, but also by the concentration and amount to which people and ecosystems are exposed, by what route, for how long, and how often.

Generally good quality data should be used for risk assessment: the data should be generated by internationally accepted methods (e.g., the OECD Test Guidelines), and be developed according to Good Laboratory Practice (GLP) procedures. However, often there are significant data gaps and much of the data which does exist is not to such a high standard. This data can also be used, although a judgement has to be made about the validity of the results and it may be that there will be a higher level of uncertainty in the result of the assessment.

Evaluating the intrinsic hazardous properties of a chemical can be very costly, requiring complex scientific facilities and expertise. Combining this assessment of hazard with information on exposure in order to assess the risk to health and environment also requires significant effort, expertise and resources. National, even global, resource limitations dictate that not all chemicals of health and environmental concern can be subject to equally rigorous assessment and control. Therefore, priorities should be set based on:

- identifying those chemicals posing the greatest risk to health and environment within a country, taking into account available epidemiological data, as well as the specific chemicals for which there is the greatest likelihood of human and environmental exposure;

- looking at patterns of use in the community, and particularly in sensitive sub-populations (the very young, the very old, the sick), to estimate the likelihood of substantial exposure to a given chemical or combination of chemicals;

- identifying potential problems early and developing proper procedures before a hazardous chemical is widely distributed. This type of preventive approach can help avoid costly clean-up activities.

To assess the safety and efficacy of chemicals and chemical products, it is appropriate to review and evaluate data and assessments from the variety of sources described above - government, universities, industrial laboratories, and other countries as well as international organisations.

In order to adapt data and assessments obtained from outside sources to local conditions, expertise in toxicology and eco-toxicology as well as knowledge of local circumstances is needed. Often countries have limited capacity to do this. Co-operation among countries to share data and assessments, in particular among countries within a region or with similar climatic and environmental conditions, has proven to be valuable in this regard. Such co-operation allows countries to share the costs associated with the assessments, as well as the expertise and equipment needed. It also provides a broader base of experience, including epidemiological and anecdotal information, on which to base decisions including priority setting and monitoring and evaluation of risks.

A number of international efforts have been undertaken to assist countries in their efforts to assess chemical risks and take action to manage those risks. One is the Prior Informed Consent (PIC) procedure administered jointly by UNEP and FAO. The PIC principle states that the international shipment of a chemical that is banned or severely restricted for reasons related to the protection of human health and the environment should not proceed without the agreement, where agreement exists, or contrary to the decision of, the designated authority in the importing country. Thus, the PIC procedure is based on the idea that importing and exporting countries share responsibility for the safe handling and use of chemicals. However, importing countries need to take into account that the governments of exporting countries are often poorly placed to judge the suitability, efficiency, safety or fate of a chemical in a developing country where climatic, ecological, social, economic and environmental

conditions differ significantly from their own. The ultimate responsibility for assessing and managing risks under local conditions rests, therefore, with the importing country.

Another example involves the ILO Convention concerning the Safety in the Use of Chemicals at Work and its accompanying Recommendation. The purpose of the Convention is to protect workers against the risks associated with the use of chemicals at their workplace. It provides that States should adopt classification and labelling systems for all substances and introduce chemical safety data sheets and, in this respect, defines the responsibilities of suppliers and employers.

2.5 RISK MANAGEMENT

2.5.1 Options for Management

"Management" of chemicals encompasses a broad range of options designed to limit adverse effects on health and/or the environment by reducing the availability, or inherent hazards, of chemicals or by controlling the nature and extent of exposures. The range of management options include regulatory approaches (e.g., setting standards, imposing bans or other controls on certain chemicals or chemical uses, establishing reporting requirements) as well as non-regulatory approaches (e.g., economic incentives and voluntary initiatives). Education and training are also vital components of chemicals management in order to improve awareness and promote worker and public adherence to safe practices.

As a general matter, chemicals management can be improved through further research on ways of eliminating or reducing the use of hazardous materials, substituting less toxic, persistent or bioaccumulative products, and reducing the generation of hazardous waste. Such research could be encouraged through regulatory pressure, economic benefits and other incentives, and product enhancement possibilities. It could be supported by government agencies, directly or through levies, or undertaken by industry or trade associations.

Furthermore, additional efforts are needed to explore ways to ensure that all facilities and sectors achieve appropriate levels of safety. This is a particular problem with respect to small and medium-sized enterprises, which tend to be less aware of chemical risks and less likely to meet statutory or voluntary standards. (see Section 2.5.9)

Choice of Management Options

Choosing an appropriate mix of management options (regulatory and non-regulatory) requires a knowledge base, including appropriate assessments of the chemicals, products and processes which might be subject to management and a systematic assessment of each available option. Consideration should be given to the balance between costs and benefits, as well as risks, of such chemicals, products, and processes and of the various options in order to avoid the possibility of taking actions that will have an overall result causing greater harm than good. For example, while substitution of safer processes and products, including non-chemical alternatives, is a valuable approach to risk reduction, the substituted process or product could, under certain circumstances, have more harmful effects than that which it replaces. Likewise, media specific controls could, in some cases, lead to greater harm by

transferring the risk from one media to another (e.g., air pollution standards that result in companies increasing water or land disposal of hazardous materials in lieu of air emissions). In deciding among various options, it is also important to take into account local political, economic and cultural factors and the technical, social, financial, legal and institutional context of each course of action. The choice of management options should be economically viable and realistic under local circumstances, while providing for effective protection of human health and the environment. Box 5 outlines some of the economic considerations and analytical tools that can be used in selecting among options.

2.5.2 Legislation/Regulations

Legislation and associated regulations comprise an important component of national chemicals management. Overarching legislation can establish a generic legal framework for the control of chemicals and can make legally binding the basic principles of sound management of chemicals. The overall legislative framework should be integrated across all sectors and should seek to address the entire life cycle of chemicals - importation, manufacture, processing, storage, transport, use, disposal and recycling. The existence of a comprehensive, or at least well co-ordinated, legal framework can help to avoid piecemeal, overlapping, or conflicting regulations. Box 6 presents some components that are typically included in national chemicals legislation.

Generally, legislation does not regulate the management of chemicals in detail but rather gives responsibility to a ministry, department or administrative agency to develop the more detailed regulations necessary for the implementation of the legislation. A wide range of regulatory options exist, including outright bans or severe restrictions on chemicals; setting of specific standards related to quantities or formulation of chemicals; emissions controls; occupational and exposure limits; and mandatory codes of practice.

An approach which combines a broad legislative framework with targeted regulations can enable countries to more easily benefit from new information, the development of alternatives and advances in science and technology, as well as to respond to newly discovered problems, since regulations normally can be adopted more readily than legislation.

It should be recognized, however, that while legislation is critical, it will not, by itself, be sufficient to address chemicals-related problems. At a minimum, there needs to be the authority, staff and resources to effectively implement and enforce legislation and related regulations. Furthermore, it can never be possible to monitor all parties who are subject to legislation. Therefore, alternative approaches are important including, for example, economic measures and education and training programmes, in order to provide additional incentives for reducing chemical risks.

Box 5
Economic Considerations in Choosing Management Options

When regulating chemicals, governments need to balance competing priorities. The benefits from the production, importation, and use of chemicals and products can include direct and indirect economic benefits in the areas of employment, investment, and exports. However, the benefits may come with costs such as environmental degradation and increased health problems.

Economics seeks to determine the optimal allocation of scarce resources. Economic analysis thus can be a useful tool to assess both the positive and negative impacts of a proposed regulation or chemicals management option. The information gained can be used to endorse, reject, or improve regulations. Cost-benefit analysis (CBA), and variations such as cost-effective analysis, are the economic techniques commonly used to assess regulations. Wherever possible, relevant factors are valued in monetary units to allow comparison. The technique covers long-term issues and allows costs and benefits that occur over many years to be compared.

Economic analyses are rigorous and attempt to cover all relevant issues. However they are not perfect. For example, there are valuation problems particularly with non-traded items such as the environment and life. Therefore, economic analyses should be used in conjunction with other decision-making tools. (See Abelson for a full discussion on valuation methodology.)

In conjunction with economic analyses, it is common for governments to request a financial analysis that will indicate the impact of a regulation or policy on the government's finances, including any anticipated taxation revenue or required subsidies.

Box 6
Chemicals Legislation: A Typical Structure

Laws relating to chemicals generally have provisions for five major components:

- an organisational structure which indicates management policy, establishes the authority and ability to control chemicals and co-ordinates related management efforts. It should define key objectives in regard to human health and safety, protection of the environment and promotion of sustainable development;
- clear indication of the scope of the laws and definitions of key terms;
- the building of a knowledge base to collect, interpret and disseminate information used to support decisions about which chemicals are acceptable for use and under what conditions;
- the establishment of preventive and corrective measures designed to ensure the proper production, distribution and handling of chemicals; and
- a compliance scheme to monitor, enforce and promote observance of legislative provisions.
- It is important that laws make clear the effective date. Legislation should also incorporate the concept of the public's right to access to information, taking into account legitimate needs for commercial confidentiality.

Types of legislation

In the absence of, or in addition to, comprehensive "framework" legislation that addresses chemicals management in an integrative way, there are a number of specific types of legislation which may relate to the control of chemicals. These include:

- legislation on chemicals per se: their importation, manufacture, use, packaging, labelling, etc. Often such legislation is based on the intended use of the chemical, e.g., pesticides, industrial chemicals, consumer products, pharmaceuticals, cosmetics, etc.;

- general pollution statutes to control contamination of water, air, or soil. These may also prohibit or regulate ocean dumping, poisoning of fish or wildlife, and degradation of other resources;

- contaminant control directed at specific substances or classes of chemicals;

- food legislation to preserve and improve the quality of food and assure its safety;

- transportation control to promote public safety in the transport of dangerous chemicals by air, rail, road, in-land waterway or sea;

- worker health and safety legislation;

- legislation for the prevention of illegal traffic in toxic and dangerous products; and

- laws and regulations related to chemical accident prevention, preparedness and response.

With respect to the first category, legislation on chemicals per se, certain aspects of legislation tend to be similar for all classes (e.g., agricultural, industrial or consumer use chemicals). For example, most existing laws related to pesticides, pharmaceutical and industrial chemicals provide a system for screening chemicals before they enter the market (including information gathering, identification of potentially harmful chemicals, and measures for protecting health and the environment). Other aspects of such legislation may vary according to the use of chemicals. For example, laws on pharmaceuticals and pesticides in general are more concerned with standards of quality and efficacy than are laws addressing industrial chemicals; laws on industrial chemicals and pesticides place greater emphasis on environmental effects than laws related to pharmaceuticals, food additives and cosmetics. Many chemicals have multiple uses and may therefore be subject to several different laws.

Development of legislation and regulations

There are a number of procedural aspects important to developing effective chemicals legislation and regulations. First, all those who are likely to be affected should be consulted. Second, those involved in the drafting process should have knowledge of the local system and style of law, to ensure local relevance and compatibility with existing legislative arrangements. Thus, it is not sufficient to adopt directly a law which exists in another country without carefully adapting the provisions to local circumstances. Furthermore, drafting laws

and regulations is a skill which requires substantial experience in order to avoid possible ambiguities which could undermine the effectiveness of the laws/regulations.

A number of international guidance documents exist to assist in the development of legislation and regulations, some providing general information and others addressing specific types of legislation (e.g., safe use, pesticides, transport of hazardous chemicals, hazardous waste disposal). In 1995, UNEP published the first in a series of publications designed to provide guidance on chemicals legislation. Entitled *Legislating Chemicals: An Overview,* it provides a good starting point for understanding the nature and essential elements of various types of chemicals legislation and includes checklists of practical suggestions as well as listings of useful, internationally available resources and references.

Legislative/regulatory approaches

There are a number of different types of administrative controls or instruments which could be used in chemicals legislation and regulations. Countries can choose from among these, or others, to develop an overall strategy that is most appropriate to the local situation, including availability of expertise and other resources. Different combinations of such approaches are generally chosen for different types of legislation. Such approaches include:

- ***notification requirements***: Under notification schemes, manufacturers or importers of chemical products are required to notify the appropriate authority of each product and to provide information such as the product's name, quantity, active ingredients, and health and environmental toxicity. Such schemes might also include requirements for notification by the exporting country. The notifications help to support the development of national chemicals and poisons information data bases (e.g., product registers).

- ***pre-marketing review of toxicity; registration; and licensing for manufacture, possession and sale:*** These are generally required for restricted classes of chemicals, usually those of high toxicity or those having significant potential for public or occupational health exposures (e.g., food additives, pesticides).
- ***controls on importation and exportation:*** Such controls may be implemented, for example, through notification and licensing procedures for certain hazardous chemicals.

- ***controls on sale***: These may include, for example, regulating the volume permitted per package, or restricting sale to specialized outlets.

- ***controls on use***: These may include bans, withdrawals, or severe restrictions. For example, specific pesticides may be restricted to certain crops or certain times of the year, or there may be restrictions on use of certain substances in consumer products.

- ***labelling standards:*** Standards for labelling of chemicals and chemical products can be set for transportation as well as for worker and public health protection. Labelling provides the identification of the chemical, and generally includes information on its toxicity and advice on safety or first-aid. Symbols or pictograms have proven invaluable where there are minority linguistic groups, or a significant degree of illiteracy.

- ***occupational health and safety controls***: These provide for monitoring of exposures and health effects in the workplace.

- ***safety criteria:*** Examples include criteria for the quality of drinking water, air, soil, land and groundwater.

- ***controls on hazardous installations:*** These might include zoning/siting restrictions, licensing requirements, required reporting of emissions and accidental releases, and routine surveillance and monitoring.

- ***controls on transportation of hazardous goods***: These might include restrictions on routing, on driver qualifications, on placarding and emergency response needs, and on quantities and different types of chemicals in individual shipments. Such controls are needed for both international as well as domestic trade and therefore should be co-ordinated among neighboring countries.

- ***minimization and disposal of hazardous wastes:*** Measures aimed at minimization of waste streams and increased recycling would fall within this category.

- ***consent-granting processes:*** These are included in some of the above-mentioned approaches and can involve: product registrations; licenses to sell, use, store, manufacture or pack chemical substances/products; certifications of competence for workers dealing with highly hazardous chemicals; rights to release or dispose of polluted materials; and planning, zoning and similar approvals. In addition to the direct controls inherent in such consent-granting processes, they can also help to control and audit chemical use throughout the life cycle of the substance, provide data for national information centres, encourage public accountability by users of chemicals, and facilitate cost recovery through application of the polluter-pays principle.

2.5.3 Alternative Approaches to Chemicals Management

Alternative approaches to chemicals management include market-based approaches or economic incentives for controlling chemicals usage, voluntary initiatives, and education and training programmes. The last category is addressed in Section 2.6 on risk communication and public awareness. There are a number of different market based approaches or economic incentives which could be adopted by government authorities to encourage improved health, safety and environmental practices. Some examples include:

- ***taxes and fines:*** These can be in the form of license fees or charges per volume of pollution discharged. If penalties for breaches of regulations are purely financial, they may be seen as a form of taxation.

- ***compensation to reward reductions in pollution and improved management practices:*** Examples include subsidized recycling ventures, government-funded training courses to encourage safe procedures, and reward programmes for environmental/chemicals management improvements within industry.

- ***tradable pollution permits:*** Such permits allow polluters to bid for the right to discharge a given level of pollution into the environment, once an optimum level of discharge has been determined. The right can subsequently be re-sold, thus, the value of the "right" to pollute, at a given volume, is set by the market.

- ***deposit-refund systems:*** These can encourage potential polluters to take offending materials to appropriate treatment, recycling, or storage facilities.

- ***compensation for victims:*** Establishing a system whereby victims are compensated for the effects of pollution provides a strong incentive for the polluter to take steps to address the extent and/or nature of the pollution. Examples include relocation to non-polluted areas and insulation of noise-affected buildings.

- ***environmental user charges:*** These apply a charge to a hazardous substance at a level which reflects the potential impact that substance may have on health or the environment. It creates an incentive to use lower quantities of such substances or to switch to less hazardous substances.

- ***market forces:*** Large purchasers, e.g., food retailers, can be very influential in deciding how chemicals are used, often as a result of consumer pressure. As an example, some retailers set and monitor stringent standards for pesticide residues in fresh produce.

Some alternative approaches may be based in legislation while others are considered voluntary: others may be implemented through legal or voluntary means. Many of the voluntary initiatives incorporate similar controls as legislative or regulatory measures, but are not enforceable to the same extent or in the same way.

For example, taxes and fines are generally based in legislation. Tradeable permits and ecolabelling schemes can be either mandatory or voluntary. Approaches which are "voluntary" include industry initiatives and targeted agreements between government authorities and the specific sectors which are creating risks. Examples of industry initiatives include the Responsible Care™ and product stewardship programmes, which have been established through national and international chemical industries associations and which commit participating companies both independently and collaboratively to: seek improvement in performance in all aspects of safety, health and protection of the environment; educate all staff in these areas; and work with customers and communities to build closer links regarding product use and overall operation safety.

In some cases, governments are establishing environmental quality objectives, instead of establishing specific standards. This allows the regulated community to determine the best means of achieving these objectives. Another government mechanism is to establish tracking systems for particular hazardous substances to facilitate enforcement of controls.

2.5.4 Implementation of International Agreements

When establishing or improving chemicals management policies and programmes, it is important for governments to take account of international agreements which exist or are being negotiated, including conventions and voluntary agreements. If they are parties,

countries need to incorporate the provisions of such agreements into their policies and programmes. In any event, the agreements can support national activities by providing important sources of information and as a means for sharing experience among countries.

A list of the major international agreements related to chemicals management and safety is included in Annex VII. In addition to global agreements, there are also a number of multinational or regional organisations which have developed agreements establishing obligations on the part of their member countries, and which may be of interest to others. These include, for example, the European Union and the OECD. Efforts are underway in the context of the UNITAR/IOMC Pilot Capacity Building Programme to prepare materials on international and regional agreements related to chemicals management and safety, including a series of fact sheets on individual agreements as well as guidance aimed to assist countries in implementing relevant provisions in an integrated way.

2.5.5 Administrative Infrastructure

Chemicals management policies and programmes, including legislative/regulatory and economic policy instruments, should be supported by a national administrative infrastructure that is co-ordinated throughout all sectors and levels of government. As indicated in Section 2.1, this not only involves co-operation among ministries/agencies at the national level but also between national and local government, as the different levels of government frequently share responsibility for management and decision-making on many related issues (e.g., siting and land-use planning, environmental and health impact assessment, and requirements for contingency planning for accidental releases). Ensuring the availability of adequate human, financial and other resources is also crucial, as discussed in Section 2.2.

2.5.6 Monitoring, Surveillance and Enforcement

In order for chemicals management policies and programmes to be effective, the legal authority to enforce laws and regulations must exist, and monitoring and surveillance programmes must be established as a means to ensure compliance. In this respect, monitoring has two aspects: first, checking the level of pollutants in the environment, and the health of populations potentially exposed to chemicals; and second, checking compliance by those subject to chemicals laws, regulations and policies. In order to carry out monitoring, surveillance and enforcement, adequate resources need to be made available to public authorities.

Monitoring and surveillance provide a basis for ensuring that standards and objectives set out in laws and regulations are being achieved. These enforcement-related activities can also serve as a basis for interaction with the individuals and facilities which are subject to the requirements as a means to ensure that they understand the requirements and are taking appropriate actions. Monitoring results can also provide an information base on the types and levels of exposure to hazardous substances occurring within specific populations and/or environmental regions, and for reviewing, assessing, comparing and improving policies and programmes. The monitoring that is performed by facilities and industries themselves is also important in the context of environmental and chemicals management practices.

Monitoring and surveillance schemes should be developed taking into account resource availability (including the numbers and types of experts and staff) as well as consideration of priorities based on the nature and extent of risks. Frequency of monitoring should be related to the level of concern. For example, evaluation should be frequent or on-going where levels of contaminants are close to acceptable limits.

Whenever possible, standardized methods should be used for sample collection, storage, transport and analysis, and quality assurance and control programmes should be established. Ideally, monitoring and surveillance will be backed by good laboratory services, with a well equipped central reference laboratory linked to a network of peripheral laboratories. The central laboratory should provide reference standards and contain sophisticated equipment that may not be held at the smaller laboratories. Laboratory staff need to be well qualified and trained, and be able to interpret and evaluate analytical data.

It is valuable to co-operate with other countries in undertaking monitoring and analysis. For example, countries within a region might want to work together in such activities due both to the ability of pollutants to cross borders as well as to be able to share the burden of such activities. Countries with more developed laboratories and monitoring schemes could be of assistance to countries which may not have access to sophisticated equipment and supplies. Some developed countries, academic institutions and international organisations can provide internationally accepted reference standards for contaminants in media (e.g. biological tissue, water samples, food samples, soil). Information on standards may be available through the International Standards Organization (ISO) in Geneva, Switzerland.

Enforcement of requirements is critical to effective legislation and regulations. Public authorities should seek to assist parties in meeting requirements but it is important for enforcement mechanisms to be available, including suitable sanctions or penalties in the event of non-compliance.

2.5.7 Management of Accidents and Emergencies

The risks associated with major accidents or emergencies arising from fixed installations or transportation of hazardous goods raise a number of issues related to management of risks, including the need for emergency preparedness and response. The problem of chemical accidents from industrial or natural sources appears to be of particular concern for less developed countries, where experience indicates that inadequate or ineffective response to accidents has resulted in disproportionately high morbidity and mortality when compared to similar incidents in developed countries.

Chemical Accidents at Facilities

The potential for major accidents as result of increasing production, storage, transport and use of hazardous substances implies that a systematic approach should be undertaken to prevent accidents. The risk of chemical accidents can never be entirely eliminated, but it can be minimized. With respect to fixed installations, good design, construction and maintenance of the plant and equipment are vital, as are the development and implementation of good operating practices. This includes establishing safety as a priority for all workers as well as implementing training programmes for workers on appropriate actions to be taken under

normal and abnormal working conditions. In addition, there should be regular safety audits at facilities to assess hazards. These could be promoted by governments and industry as part of overall environmental audits. Industry should disclose the results of safety performance assessments.

Given the impossibility of eliminating all risk of chemical accidents, it is vital for governments and industry to work together to have clear emergency plans for responding to accidents. The objective of the plans should be to localize and contain any accidents that may occur, and minimize the potential for harmful effects on health and the environment. Emergency plans should reflect a co-ordinated effort of all sectors concerned including fire, police, and health care personnel, and be based on a clear identification of personnel, equipment and resources available for response, and the development of good communications structures. Community awareness and education of the public should be a major component of any emergency plan. Exercises should be carried out on a regular basis to test and, if necessary, revise the emergency plans.

A number of international guidance documents exist to facilitate the development and implementation of policies and programmes to prevent, prepare for and respond to chemical accidents. For example, countries could consider using the *Awareness and Preparedness for Emergencies at Local Level* (APELL) programme as a tool in developing emergency response programmes. This UNEP programme assists decision makers, technical personnel and the community to co-operate in developing comprehensive and co-ordinated response plans and in improving community awareness of hazardous installations.

In addition, the ILO's Practical Manual on *Major Hazard Control* and its Code of Practice on *Prevention of Major Industrial Accidents* discuss the various components of a major hazard control system. The manual was written particularly for those countries which are considering such controls for the first time, although it is also useful for other countries. It recognizes that achievement of major hazard control is usually the result of a step-by-step approach. Following the elaboration of this manual, the ILO Convention concerning the Prevention of Major Industrial Accidents and its accompanying recommendation were adopted in 1993.

Furthermore, the OECD published *Guiding Principles for Chemical Accident Prevention, Preparedness and Response* and the related *Guidance Concerning Health Aspects of Chemical Accidents*. The Guiding Principles document sets out comprehensive guidance addressed to all concerned parties including public authorities at all levels, industry, workers and their representatives, and the public. It deals with all aspects of chemical accident prevention, preparedness and response, focussing on fixed installations although many of its provisions also apply to transport accidents. The related *Guidance Concerning Health Aspects*, based on an joint activity of OECD, UNEP, WHO and IPCS, was prepared to provide guidance to managers and other decision makers to prevent or minimize adverse health effects from accidents. The text is particularly directed to officials in the health and medical fields and deals with prevention, emergency preparedness and response, training and education and communication with the public. A complementary guidance document specifically for the public health sector at the local level will be issued by IPCS.

Accidents During Transportation

Transportation currently results in more accidents than any other single activity involving chemicals. Often the response is limited because the exact nature of the chemicals may not be immediately known, there may be difficulty in reaching the scene of the accident, and the accident may occur outside of an area covered by an emergency plan.

Strategies can be developed which will reduce the incidence, or impact of, accidents during the transport of hazardous substances. These may include some or all of the following elements:

- methods of ensuring that loads are secure, which can be achieved through legislation or codes of practice;
- training of drivers in the correct methods to be used when transporting chemicals:
- required placarding of vehicles carrying hazardous substances in order to identify the chemicals being transported;
- emergency procedure guides, or similar documentation defining appropriate emergency action, being carried on all vehicles transporting hazardous substances; and
- methods to restrict the transport of substances which may be incompatible.

There are extensive international and national codes, legislation and guidelines detailing requirements for the safe transport of chemicals, including appropriate labelling. The use of internationally agreed symbols, while it cannot prevent accidents, can help greatly in quickly determining the correct response procedures. The *UN Recommendations on the Transportation of Dangerous Goods* contain provisions for pre-transportation labelling and inspection, and have been widely adopted.

2.5.8 Poison Prevention and Response Programmes

Countries should establish programmes for poison control, with particular emphasis on capabilities for diagnosis, treatment and prevention. Poison information centres have proven to be critical in toxic exposures and control programmes. Such centres can provide information and advice on toxic exposures to the whole community and support medical response to poisoning (see Box 7). A poison control centre can form part of a national information centre (see section 2.3.2). In some countries there is one central centre, whereas other countries have established centres on a regional basis. In the latter case, it is important for the centres to establish a network to support each others' activities and ensure co-ordinated responses to emergencies. Information services need to be available around the clock.

Case data on poisonings are an important source of information on human toxicology and patient management. Arrangements should be made to ensure the co-ordinated collection and recording of such data, and to facilitate international data exchange. Collection of data in a harmonized way increases their usefulness in research. The IPCS INTOX Project is

promoting the collection and exchange of such harmonized data, as well as networking arrangements among poison information centres and related facilities.

The IPCS INTOX package provides standardized formats for collecting data on toxic chemicals (including naturally occurring toxins) and the data set for recording poisoning cases and requests for information The package is designed to assist information management at poisons information centres. Its main component is a poisons information data management computer software system, which can be operated on anything from a stand-alone personal computer to an international network (see Haines 1992). IPCS has also prepared guidelines for poison control centres, including technical guidance and recommendations on clinical information services, analytical toxicology services, preparedness for chemical emergencies, antidotes and their availability, and toxicovigilance and prevention.

Box 7
Poison Information Centres

The main functions of a poison information centre and related facilities include:

- provision of information on the signs and symptoms of poisoning, both by individual chemicals and by mixtures of chemicals as found in commercial products, to aid diagnosis, with such information available on a round the clock basis;
- provision of information on the management of poisoned patients;
- provision of laboratory analytical services for diagnosis and prognosis, and to support the management of poisoned patients;
- toxicovigilance and advice on prevention of poisoning;
- development and implementation of preventive measures; and
- teaching and training in prevention and control of poisoning, including promoting public awareness.

A manual on basic analytical techniques and a handbook for health care workers on management of poisoning have also been issued. Guidelines on conducting public awareness and prevention campaigns are in preparation. These can provide a sound basis for training courses.

With respect to the first category, legislation on chemicals per se, certain aspects of legislation tend to be similar for all classes (e.g., agricultural, industrial or consumer use chemicals). For example, most existing laws related to pesticides, pharmaceutical and industrial chemicals provide a system for screening chemicals before they enter the market (including information gathering, identification of potentially harmful chemicals, and measures for protecting health and the environment). Other aspects of such legislation may

vary according to the use of chemicals. For example, laws on pharmaceuticals and pesticides in general are more concerned with standards of quality and efficacy than are laws addressing industrial chemicals; laws on industrial chemicals and pesticides place greater emphasis on environmental effects than laws related to pharmaceuticals, food additives and cosmetics. Many chemicals have multiple uses and may therefore be subject to several different laws.

2.5.9 Problems of Small and Medium-sized Enterprises

A major difficulty in addressing the risks of hazardous chemicals is dealing with small and medium-sized enterprises (SMEs). Although relatively small, such facilities may use a number of very hazardous chemicals. Often the owners, managers and workers in SMEs are unaware of the risks of these chemicals and may lack the skills, knowledge or means to control such risks. SMEs typically have limited capital and may be operating on the margin of economic viability, and thus are unable or reluctant to undertake the costs associated with environmental management and regulatory compliance. They may lack access to the necessary infrastructure for sound chemicals management, such as hazardous waste disposal facilities. A list of industries in which SMEs are typically prevalent is provided in Box 8.

Box 8
Small and Medium-sized Enterprises Which Typically Use Hazardous Chemicals

Small and medium-sized enterprises are generally defined on the basis of output or employee numbers. The following are examples of industries that often have smaller sized facilities and use hazardous chemicals:

- Woodworking including saw-milling and carpentry;
- Metal work including welding, sheet metal work, motor vehicle repair, and general engineering work;
- Agricultural industries including food and fruit processing and canning, and flour milling;
- Painting, spraying, and making signs;
- Battery services and auto-electric works;
- Printing operations;
- Manufacturing of soaps and detergents;
- Leather tanning;
- Automobile service stations; and
- Dry cleaning facilities.

It is generally difficult for public authorities to maintain an inventory of such facilities or to effectively conduct inspection and enforcement activities, given that the facilities may be many in number and are often operating within the informal sector. Nevertheless, such facilities should not be ignored since, in aggregate, they pose a great risk to health of workers, the public and the environment.

In order to address the chemicals-related problems and risks of SMEs, there is a need for governments, trade associations, and others to make efforts to locate the SMEs of concern

and to provide assistance and services to increase awareness and reduce chemical risks. Establishing assistance and support services on a sectoral basis can be an effective approach.

Assistance might include providing advice and training on: the practical and economic aspects of new technologies, safer alternatives and good housekeeping practices; adapting recycling technologies to meet the needs and capacities of SMEs; establishing incentive programmes for SMEs to relocate in areas dedicated to light industry; fostering the growth of a local hazardous waste industry so that each waste generator is not left to deal with its own hazardous wastes; and encouraging large-scale manufacturers that have skilled personnel and expertise to provide technical assistance to SMEs.

2.6 RISK COMMUNICATION AND PUBLIC AWARENESS

Widespread co-operation among all relevant government authorities, industry, workers, non-governmental organisations and the public is basic to sound national management of chemicals. This, in turn, calls for a widespread awareness of the potential risks associated with the use (and misuse) of chemicals and chemical accidents, and an appreciation of the ways in which chemicals can be safely used. To promote such awareness, efforts should be made to facilitate access to, and sharing of, information. In this respect, decision makers, workers and the general public should have access (within the constraints of legitimate commercial confidentiality) to relevant information on chemicals and chemical products. The public should also have the opportunity to provide input into decision-making processes related to chemicals management. Public authorities should facilitate the sharing of information, for example by supporting efforts to distribute information to local communities.

2.6.1 Risk Communication

The aims of risk communication in the context of chemical safety are to raise awareness generally about risks related to hazardous chemicals and about ways to minimize or avoid such risks. This includes providing information which can enable individuals to use and handle chemicals safely, to reduce or avoid accidental exposures, to understand existing or potential risks in their community, and to be aware of actions which should be taken in an emergency situation. In the event of an accident, risk communication is used to provide advice and information to the public.

Risk communication programmes should cover the full range of health and environmental issues that are of concern to the target audience and which are relevant to local circumstances. This information should be provided in a manner and with a level of detail that is appropriate to the needs of each audience or target group. Box 9 provides some important considerations for effective risk communication.

How people perceive risk depends not only on the effectiveness of the risk communication process, but also on each individual's social and cultural background. The public tends to judge risk subjectively, with moral, economic and political factors all contributing to their perception of the degree and acceptability of the risk. In general, people are less willing to accept risks that are involuntary, unfamiliar, or potentially catastrophic, or that result in particularly emotive outcomes such as diseases in children. It is important to recognize the

legitimacy of this subjective understanding of risk as well as of the scientific view, and to involve affected communities in planning and risk management.

Box 9
Effective Risk Communication

Overall aim: To ensure that the nature and the extent of risk is understood by all who are affected and/or involved.

***Meeting the needs of the target audience*:** After identifying the groups to be specifically targeted (e.g. workers, members of the community, non-governmental organisations, the media) and the main message to be conveyed, a tailored risk communication strategy should be developed for each group, taking into consideration their particular needs, concerns and perspectives. It is particularly important to listen to the target audience and to take into account their existing perceptions of the risk, which may be related to specific social and cultural factors. It is also important to carefully consider how the information will be presented. For example, a very different style of communication is needed for the provision of information to the public after an accident than for general awareness raising.

Providing information that is comprehensive, balanced and easily understood: Information should be presented openly and honestly, and the type of language used should be appropriate to the audience. Information provided to the general public must be relatively simple and non-technical. The use of examples and anecdotes that work at a personal level can be particularly useful. Where necessary, materials should be translated into local languages and dialects, and appropriate symbols and pictograms used where illiteracy exists.

Ensuring that the provider of the information is reliable, credible and accountable: The nature of the person providing the information will be very different depending on the audience and the objectives of the activity. For example, to raise general awareness of chemical risks it may be best to have a person popular in the community (or for children a television character) to share information on chemicals. However, for provision of information after an accident, a specific spokesperson should be designated to avoid giving out conflicting messages, and when applicable, should co-ordinate with other credible sources. The presenter should be frank, honest and open, and willing to accept and involve the public as a legitimate partner.

Evaluating the effectiveness of the risk communication programme: Subsequent communication efforts should be revised based on evaluation and feedback from the community or other target group on the relevance of the message and the effectiveness of its delivery.

Ideally, information on chemicals should be presented to the general public by a trusted and objective organisation that can provide information which is scientifically accurate and has not been distorted by special interests. People are often more concerned about trust, credibility, competence, control, fairness, caring and compassion than they are about statistics

and quantitative risk assessment. Once lost, trust and credibility are almost impossible to regain. Thus, it is essential that communicators understand their audience, are perceived to be trustworthy, and meet that audience's particular needs. One way to improve credibility is to involve stakeholders in the risk communication process and to provide a means for input by the public into decision making.

When communicating on risk-related issues, it is important for the communication to be two-way; the communicator should be prepared to listen and address the concerns expressed by the audience. The use of risk comparisons using familiar examples can be particularly effective in conveying the degree of risk involved in any given case. It is also useful for risk communication programmes to be co-ordinated with other information dissemination and training activities. Receiving conflicting information drastically reduces credibility and adds to the community's uncertainty and confusion about the health effects of exposure to hazardous chemicals.

2.6.2 Raising Public Awareness

The community should be well informed about, and actively involved in, chemical safety. This is difficult to achieve, and assumes some measure of good will and political commitment from the major decision-makers. Awareness-raising should be a cooperative process, with members of the community, industry and government working towards the common goal of better health and environmental protection. This can be achieved through collaboration among government, educators, trade unions, local businesses, grass-roots organisations and other non-governmental organisations (NGOs) including environmental, consumers' and women's groups. A well informed and active public will build community confidence in the feasibility and benefits of using chemicals safely. It will also demonstrate that social organisations and individuals can contribute, both in the short and the long term, to solving the environmental and health problems caused by chemicals.

Governments and local authorities should consult with the public on specific chemicals-related issues affecting them under particular circumstances. The aim should be to build a more co-operative and unified approach to local issues. This requires co-ordination among the agencies concerned with particular chemicals-related issues and whose decisions will affect health and the environment. They should be prepared to listen to the views of representatives of local communities and organisations that might not ordinarily be consulted and then re-direct activities or policies, where appropriate, to address community concerns.
Countries and organisations have used a number of different mechanisms for improving public awareness of risks. For example, in many localities providing information in schools in an interesting and informative manner has proven very successful in improving overall understanding by the community, since children are often successful in educating their families. Many larger companies provide opportunities for members of the public to visit their facilities and to ask specific questions about the risks posed and actions being taken to minimize these risks. Member countries of the EU and the OECD are obligated to ensure that information is provided to members of the public who would potentially be affected in the event of an accident, in order to ensure that they understand the risks and know the proper actions to take should an accident occur. To meet these obligations, communities are experimenting with mechanisms for reaching all households and offices located near hazardous installations.

The media are the main transmitters of information on risk to the general public. Therefore, it is important for media personnel to be properly briefed and integrated into risk communication and public awareness programmes. Training to assist reporters in understanding issues related to toxicity and chemical safety can also be useful. Efforts should be made to address difficulties in obtaining the background information necessary for accurate reporting and to overcome the tendencies of the media to oversimplify and focus on political rather than safety aspects of chemical risks.

2.6.3 Education and Training

Education and training in chemicals risk management is needed for different parties at many different levels. In addition to government employees, this includes for example, managers and workers in industry, union officials, farmers, representatives of non-governmental organisations, emergency service personnel, and the general public. As indicated in section 1.3 above, public authorities at all levels need a core of trained people to develop and implement chemical safety policies and programmes, including monitoring and enforcement activities. Industrial managers and workers who deal with hazardous chemicals should be given initial and on-going education and training pertaining to proper management, safe handling and appropriate actions under both ordinary conditions as well as during emergencies. In this regard, industries should provide employees with safety data sheets or similar relevant information for all hazardous chemicals in use on the premises. A trained and aware workforce can also provide important contributions to implementation of voluntary initiatives, to improved environmental management and to create a safer workplace environment. Training for farmers using agricultural chemicals, including safe handling and application methods as well as principles of Integrated Pest Management (IPM) and information on safer chemical alternatives, can also be important.

Efforts to ensure that the community is aware of and understands chemical risks and appropriate preventive measures should begin with schoolchildren by including chemical safety principles in primary and secondary school curricula and health education courses. Universities, colleges and technical training institutes have a critical role to play in helping to ensure that there will be sufficient numbers of trained personnel in the various concerned sectors, including government authorities. In addition, professional societies and technical/scientific organisations should also be actively involved in training and education activities.

Box 10
Public Awareness Programmes: At-Risk Target Groups

Public awareness programmes need to take into account local culture and circumstances. In this regard, special efforts should be made to ensure that public awareness programmes reach those members of the community who are particularly at risk, or who have responsibilities which require them to be able deal with chemicals in a safe manner. In addition to individuals which may be subject to occupational exposures, such groups may include:

Women, who are at particular risk of exposure to: chemicals in cosmetics, toiletries, laundry, garden and other consumer products; chemicals used in cottage industries, where home is also the workplace; and chemicals (mainly pesticides) in irrigation water, which may be used for washing and bathing. In addition, women are likely to care for family members who are exposed to or poisoned by toxic chemicals.

Small children and those responsible for child care, who need to understand the high risk of exposure of young children to chemicals found in and around the home.

People in areas where home and workplace are closely linked. Concerns in such situations include use of pesticides in fields near villages; agricultural workers coming home in contaminated clothing; exposure of children when playing in the fields; use of pesticide containers for food or water; and inadequate storage or disposal of pesticides. Contamination of food by pesticides and other toxic chemicals, as well as by mycotoxins, is common in developing countries and may affect whole families.

People in areas where pesticides are used domestically in large quantities to combat insects carrying disease.

PART III

SUPPORT FOR NATIONAL CHEMICALS MANAGEMENT ACTIVITIES

Introduction

Many countries, particularly developing countries and countries in economic transition, are facing a difficult dilemma in the area of chemicals management and safety. There is pressure to establish or update chemicals management policies and programmes in order to protect their populations and environment, particularly as chemicals are increasingly being used, and misused, in their countries. In addition, the international community, through declarations and international agreements, is encouraging all countries to develop the infrastructure to manage chemicals safely. At the same time, however, resources are limited and the necessary information and expertise may not be readily available, thereby constraining the ability of countries to effectively manage chemicals and protect the environment and public health.

This section outlines some specific areas and activities for the establishment, improvement and implementation of chemicals management programmes, based on the key elements outlined in Parts I and II of this document. It also provides examples of the types of assistance to support such activities which may be available from countries with relatively more experience in the field, from international organisations, from industry and from other non-governmental organisations. The aim of the assistance activities provided by such entities ideally should be to facilitate the ability of countries to become self-sufficient over the long term. Thus, the assistance should be directed to developing national capabilities and capacities which can be maintained over time, even as personnel change.

A primary purpose of this section is to provide countries with an overview of the types of assistance that may be available so that they are better able to identify and request such assistance. Most assistance is demand-driven, that is, countries have to determine their priorities and make specific requests through appropriate channels in a form which is compatible with the requirements of those providing the assistance.

3.1 ACTIVITIES AT THE COUNTRY LEVEL

As indicated in Parts I and II, developing and implementing chemicals management policies and programmes depends on access to a wide range of information on chemicals and chemical safety including information that is specific to the national or local situation. It also depends on availability of expertise and suitable technology. Therefore, countries seeking to develop or improve chemicals management and safety programmes can benefit from further guidance, information, expertise and other resources for strengthening national capabilities, particularly when such assistance and information is relevant to the specific circumstances within their countries.

Examples of country-level capacity-building issues and activities include:

- finding the most effective way of using very limited facilities for the control of chemicals, and identifying means for obtaining the resources needed for control (e.g., through the application of the polluter-pays principle);

- establishing a funding source for the long-term support of a country's chemicals management activities, such as chemical registration fees;

- further development of administrative and scientific structures to support government efforts to manage chemicals;

- enhancement through training of the scientific, technical and managerial skills needed to deal safely with new and advanced technology, and with the storage, transportation, use and disposal of chemicals;

- improving information management, e.g., gathering of information on chemicals used or produced in the country, including data needed for assessments;

- adapting guidance on legislation and regulations to national circumstances;

- identifying cost-effective approaches to the enforcement of regulations where trained staff are few;

- implementing information and technical assistance programmes on substituting suitable alternatives for persistent or toxic chemicals;

- exploring means to make safer the use of chemicals by illiterate or poorly educated users in small-scale enterprises, by farmers, or by householders;

- setting up systems for preventing and responding to chemical accidents, including the treatment of victims and rehabilitation of the environment, that operate effectively even if only limited record-keeping facilities are available;

- establishing means for handling and disposal of unwanted chemicals (e.g., outdated supplies of pesticides);

- improving public awareness and risk communication in the local context; and

- promoting environmentally sound technology suited to the needs of newly industrializing countries.

3.2 ACTIVITIES AT THE REGIONAL LEVEL

Examples of capacity-building issues and activities at the regional level include:

- establishment and implementation of regional research and training programmes directed at identifying and assessing local problems and the means for addressing them;

- establishment of regional chemical information sharing networks, involving "networking" of information specialists who can exchange information, e.g. via electronic information networks, particularly the Internet. Such networks can help to address information needs that tend to be common within a region and can help to generally improve access to information available from outside of the region;

- the enhancement of regional networking among people from all types of organisations concerned with chemicals management policies. This can enhance regional co-operation to address chemicals management issues that are regional in nature, and can facilitate an exchange of ideas on policies and approaches.

Some assistance is available to address these issues from a number of different sources including international organisations, more developed countries, industry and industrial organisations and other non-governmental organisations. Furthermore, it may be useful for countries to explore the possibility of establishing bilateral or regional co-operation with neighbouring countries, in order to learn from the experience of other countries that may face similar problems and circumstances as well as to share the resources needed for, and the tasks associated with, chemicals management programmes.

3.3 ADDRESSING GLOBAL CONCERNS

In addition to the need for international co-operation to help countries deal with local problems, some problems associated with chemical use and misuse require international solutions. These include:

- chemical pollution that crosses national boundaries;

- chemicals which are persistent and mobile (such as CFCs, heavy metals and persistent organic pollutants);

- chemicals that are widely present in the global environment in significant quantities as a result of their transport through air, water, soil and food chains, or because they are present in commodities that are traded internationally on a large scale;

- chemicals that cause problems that, although they are local in scope, nevertheless occur so often as to cause wide-spread concern. In such cases, international co-operation can ensure maximum utilization of resources and avoid unnecessary duplication of work; and

- newly discovered chemical risks which may create wide-ranging impacts, such as the concern about endocrine disruptors presently being discussed in international fora.

A number of major international agreements have been negotiated and agreed to in order to address some of the cross-boundary and international problems. These are listed in Annex VII.

3.4 SOURCES OF INFORMATION AND ASSISTANCE

3.4.1 International Organisations

Throughout Parts I and II of this document, reference is made to assistance activities of various international organisations. International organisations generate, collect and disseminate information about chemicals and prepare a range of guidance, resource and

training materials. They also provide a framework for international co-operation and the exchange of ideas and technology. Another important function of these organisations is that they often provide mechanisms for the two-way transfer of information between developed and developing countries.

Annex VIII provides references to the major inter-governmental organisations working in the area of chemicals information and management, along with indications of how to contact these organisations. A resource document on activities and resources of international and bilateral organisations to support national chemicals management and safety programmes is being developed through the UNITAR/IOMC Pilot Capacity Building Programme. The aim is to provide general information on the areas of expertise and relevant programmes of key actors in the field of chemicals management capacity building.

A number of the guidance documents prepared by international organisations are listed in the Selected Bibliography included as Annex III. While many guidance materials exist, additional guidance is needed to address specific issues such as new technological solutions and other means for replacing or containing hazardous chemicals, criteria for technology transfer from developed to developing countries, etc.

In addition to preparation and distribution of guidance materials and other types of information, several organisations including UNEP, FAO, ILO, WHO, IPCS and UNITAR have extensive training programmes. These programmes are aimed at individual countries or groups of countries to facilitate capacity building including implementation of guidance and international agreements related to chemicals management. Organisations responsible for broader types of development assistance also provide support for countries in establishing and implementing chemicals management programmes. For example, UNIDO, the World Bank, and the Regional Development Banks provide some guidance on chemical safety as part of their development assistance activities. This applies particularly for industrial and agricultural development and transfer of environmentally sound technologies.

Multi-lateral, including regional, organisations may have an increasingly important role to play, especially with respect to sharing resources and development of data related to local effects of chemicals on populations and the environment. For example, OECD countries have reached an agreement on the "mutual acceptance of data" according to which countries have agreed to accept data developed in other OECD countries provided that the data has been generated in accordance with specified, internationally accepted test guidelines and Good Laboratory Practice procedures. This agreement is being extended beyond the OECD region and efforts are underway to share assessments of chemicals.

Furthermore, with the increasing development of regional economic groupings, it is becoming more important for countries to co-operate with respect to chemicals management issues. Not only does regional co-operation allow countries to share the burdens associated with managing chemical risks, but it also creates opportunities for improved trade and other economic development, and decreases the likelihood of unnecessary barriers to trade.

3.4.2 Countries with More Advanced Chemicals Management Programmes

There are a number of activities underway, primarily through international organisations, for developed countries to make information and assistance available to countries in the process of developing and updating chemical safety policies and programmes. Furthermore, there has been general agreement that countries exporting chemicals have a responsibility to assist importing countries in assessing and managing the risks associated with those chemicals. This premise underlies the PIC principle, as set out in the UNEP London Guidelines and FAO International Code of Conduct and in the export notification provision (Article 19) of the ILO Chemicals Convention.

There is also growing sentiment that countries exporting technologies should take action to discourage the export of hazardous installations (e.g. polluting and dangerous second-hand plants) to countries which are unable to manage the hazards. Furthermore, such exporting countries should help ensure that education and training accompany the transfer of new technologies. This issue is the subject of Article 22 of the ILO Convention concerning the Prevention of Major Industrial Accidents.

One of the most effective ways of providing guidance and support with respect to chemical safety is for individual countries with experience related to chemicals management to make arrangements to assist individual developing countries, e.g., through technical co-operation agencies. This enables the assistance activity to be designed to meet the specific needs of the developing country. In addition, it allows for direct in-country involvement by people with expertise from more developed countries, working to achieve practical outcomes and systemic, long-term change. The country providing the assistance may have long-term and extensive experience with chemicals management or it may be a country which has recently developed national chemicals management programmes and can provide insights on the problems associated with the establishment of new programmes.

Among the types of activities which could be undertaken by countries with more developed chemicals management systems to assist other countries include:

- assist in the creation of national chemical information systems and improve access to existing international systems;

- support the improvement of databases and information systems on toxic chemicals (e.g. emissions inventories, chemical incident and environmental exposure surveillance programmes) through provision of training in the use of those systems as well as software, hardware and other facilities, and through twinning arrangements among chemicals information centres;
- provide knowledge and information to importing countries on severely restricted or banned chemicals, to enable them to judge and take decisions on whether to import those chemicals, how to handle them and on possible alternatives;

- share experience related to inspection and enforcement including, for example, setting priorities where staff and other resources are limited;

- provide data necessary to assess risks to human health and the environment posed by possible alternatives to banned or restricted chemicals;

- provide opportunities for training of personnel including, for example, training on the fundamentals of toxicology (e.g. for government policy-makers who establish and regulate standards relating to the manufacture, use, labelling and disposal of hazardous chemicals and who need to understand the potential for adverse effects of exposure to chemicals);

- assist in the development of systems for chemical accident prevention, preparedness and response including access to equipment and antidotes; and

- provide assistance in gaining access to "clean technology" and for evaluating the safety and efficiency of proposed new technology, and any risks posed under local conditions.

3.4.3 Industry

Chemical producers, and other industrial organisations, have increasingly undertaken to help ensure the safe use, handling and disposal of chemicals. In this regard, some industry associations and companies have established specific programmes to assist customers, importers and others to manage chemicals safely. In developing countries with poorly developed infrastructures, industry has a particular responsibility for chemical safety. Following are some examples of industry programmes:

- Chemical industry associations have adopted Responsible Care™ and product stewardship programmes, according to which companies agree, *inter alia*, to work with customers and communities to improve chemical safety.

- Industry associations in the chemical and petroleum industry have developed emergency response programmes (e.g., the Community Awareness and Emergency Response programme in the United States (CAER), and the European CICERO). The associations offer help to their members to implement these programmes.

- Chemical associations are working with UNEP to implement the Awareness and Preparedness for Emergencies at Local Level (APELL) activities, in which plant managers cooperate with local authorities and community leaders to develop a co-ordinated emergency response plan.

- Some industry associations have established centres that give around-the-clock information on how to handle accidents involving chemicals, and networks between chemical shippers that provide mutual aid in case of an accident during transport. See, for example, the "Directory of Emergency Response Centres" published by OECD and UNEP, and the IPCS "Yellow Tox, World Directory of Poisons Centres".

- A number of national chemical associations have established community advisory panels that review the codes of practice and provide forums for interactions between industry, the community, emergency services and the environmental sector. Associations have also implemented performance indicators and audits, reviewed annually, covering health,

safety, environment, and the provision of information to measure performance improvements.

All companies and industrial organisations should be encouraged to take further actions to facilitate improvements in the development and implementation of chemicals management policies and programmes in developing and other interested countries. In this regard, industry should be encouraged to:

- provide information on substances they produce, including data that are needed to assess the risks to human health and the environment, and to respond to poisoning by these products. Industry has a basic duty to supply such data (taking into account legitimate claims of confidentiality) to relevant national authorities, international bodies, other interested parties involved in risk assessment and poisons control, and the public;

- develop further, on a voluntary basis, community right-to-know programmes based on international guidelines, including sharing of information on causes of accidental releases and means of preventing them, and reporting on annual routine emissions of toxic chemicals to the environment;

- fulfill the commitments made at UNCED, and incorporated in Responsible Care™ and product stewardship initiatives, to take responsibility for chemicals which they produce over their entire life cycle;

- implement the UNEP Code of Ethics on the International Trade of Chemicals and the provisions related to industry in the FAO International Code of Conduct on the Distribution and Use of Pesticides;

- provide labelling and packaging which facilitates understanding of the risks of chemicals and which reduces the likelihood of unintentional exposures of workers and the public;

- in the case of trans-national corporations, demonstrate their commitment to adopt standards of operation that are at least as stringent as those existing in their country of origin, wherever they may operate;

- in the countries where they operate, support the efforts of the government authorities to reduce chemical risks;
- work with industry in developing countries to encourage and support the development and adoption of relevant procedures for risk reduction; and

- ensure, to the extent possible, that hazardous installations in developing countries have sufficient resources, equipment and skilled personnel to respond effectively in the event of an accident.

3.4.4 Other Non-governmental Organisations

There are a multitude of public interest non-governmental organisations which work to ensure the protection of human health and the environment. These range from large international groups, such as the major environmental organisations (e.g., Greenpeace,

Pesticide Action Network) to small community-based organisations formed to deal with the risks in their own neighborhoods. In addition to environmental groups, public interest groups include organisations designed to address local health issues including women's health, consumer protection, and citizen/political action.

Non-governmental organisations concerned with chemical safety also include professional organisations, such as associations of chemical engineers, poison information centres and clinical and analytical toxicologists, workers unions and their confederations, research institutes, universities, scientific associations, libraries, and health care facilities. Some of these are discussed in section 1.2 above; they are also described in the UNITAR/IOMC guidance document on preparing a National Profile.

Each of these organisations can play an important role in facilitating the development and implementation of chemicals management policies and programmes. In this regard, the possible roles of NGOs was addressed in Agenda 21 of UNCED. It is difficult to generalize about the nature of information and assistance that NGOs can provide to developing countries with respect to chemical safety. It is dependent on the type of NGO, its field of interest, and the level of expertise of its employees/members, as well as the local political and cultural circumstances. Nevertheless, there are certain areas where NGOs have often proven to be very effective. These include:

- providing advice and insights as to the precise nature of the problems being caused by chemicals, especially those in small and medium-sized enterprises (SMEs), farms, and households. In addition, NGOs often have a good understanding of the concerns of the community;

- facilitating exchange of information among countries: many NGOs maintain contacts with counterparts in other countries and communities and therefore have insights concerning the experience of others;

- providing toxicological, epidemiological and other information concerning the risks of specific chemicals, including local information. Information and other resources of research institutes, universities, libraries, health care facilities and other NGOs should be made accessible by government authorities;
- providing education and training to various sectors including public officials and workers;

- improving community awareness of chemical hazards, how to handle chemicals safely and how to respond in the event of an accident; and

- making contacts with others outside the country who may be in a position to provide resources and assistance.

For these reasons, and others, it is important for countries to consult with a range of NGOs before establishing or updating chemicals management policies and programmes and making other decisions related to chemicals management.

3.4.5 Electronically Available Information

In order to enable greater access to chemical information and to facilitate regional and global communication on chemical safety issues, it is important for governments, and particularly in developing countries, to place a high priority on establishing computer capacity and training for officers responsible for chemical safety. This should include access to the Internet and the ability to use information distributed on CD-ROM.

Such computer capability will enable users to take advantage of a rapidly expanding store of chemical information. The Internet is becoming a major global repository of chemical information, and other chemical information resources are being created on CD-ROM. These are of particular value when the information provided is validated and the system is accompanied by search mechanisms (e.g. IPCS INCHEM). Because of such information technologies, it is relatively easy for chemical regulators and other organisations to provide public access to their information. Information sharing by both the public and private sectors is likely to continue increasing at a steady pace.

Computer networking facilitates the sharing of large amounts of data, as well as day-to-day communication, and strengthens networks among organisations. Electronic mail has already greatly increased the speed, magnitude, and scope of communications on chemical safety among developed countries. By linking organisations who share the common goal of improving chemical safety and management, information sharing with computerized information systems has the capacity to transform chemicals management within countries, within regions, and globally.

While easy access to information on chemicals through electronic media has provided significant benefits, there are risks associated with the use of such information. Specifically, there is a significant amount of information available which has not been validated or may not be reliable. Thus, care should be taken in relying on such information especially when the source is not known.

ANNEXES

ANNEX I

Abbreviations/Acronyms

APELL: Awareness and Preparedness for Emergencies at the Local Level

CAER: Community Awareness and Emergency Response

CBA: Cost-benefit analysis

CICERO: Communication between the Chemical Industry and the Community on Emergency Response Organisation

EC: European Commission

ECETOC: European Centre for Ecotoxicology and Toxicology of Chemicals

EU: European Union

FAO: Food and Agricultural Organization of the United Nations

GELNET: Global Health and Environment Library Network

GINC: Global Information Network for Chemicals

HELM: Health and Environment Library Modules

IARC: International Agency for Research on Cancer (WHO)

ICCA: International Council of Chemical Associations

IFCS: Intergovernmental Forum on Chemical Safety

ILO: International Labour Organisation

INTOX: Poisons Information Package for Developing Countries

IOCC: Inter-Organization Co-ordination Committee (of the IOMC)

IOMC: Inter-Organization Programme for the Sound Management of Chemicals

IPCS: International Programme on Chemical Safety

IPM: Integrated Pest Management

ISG: Intersessional Group (of the IFCS)

ISO: International Standards Organisation

MSDS: Material Safety Data Sheet

NGO: Non-governmental Organisation

OECD: Organisation for Economic Co-operation and Development

PAHO: Pan American Health Organization (WHO Regional Office for the Americas)

PIC: Prior Informed Consent

POPs: Persistent Organic Pollutants

SME: Small and Medium-sized Enterprise

UNCED: United Nations Conference on Environment and Development

UNIDO: United Nations Industrial Development Organization

UNITAR: United Nations Institute for Training and Research

UNEP: United Nations Environment Programme

WHO: World Health Organization

ANNEX II
Glossary of Key Terms

The following glossary is provided only to assist the reader of this document. It is important to recognize that, for many terms, there are no internationally agreed definitions. Therefore, countries should not utilize these definitions for other purposes without careful review.

The citation after certain definitions indicates the source of the definition.

acute effects	Effects that occur rapidly following exposure and are of short duration. (WHO 1989)
bioavailability	The extent to which a chemical substance to which the body is exposed (by ingestion, inhalation, injection, or skin contact) reaches the systemic circulation, and the rate at which this occurs. (WHO 1989)
bioaccumulation	The process by which the amount of a substance in a living organism (or its parts) increases with time. (WHO 1989)
chronic effects	Effects that develop slowly and have a long duration. They are often, but not always, irreversible. Some irreversible effects may appear a long time after the chemical substance was present in the sensitive tissue. In such cases, the latent period (or time to occurrence of an observable effect) may be very long, particularly if the level of exposure is low. (WHO 1989)
code of practice	A document offering practical guidance on policy, standard-setting and practice for use by governments, employers, workers and others to promote health, safety and/or environmental protection. A code of practice is not a substitute for legislation, regulations, and standards.
concentration	A general term referring to the quantity of a material or substance contained in unit quantity of a given medium. (WHO 1989)
epidemiology	The study of the distribution and determinants of health-related states or events in populations, and the application of this study to control health problems (WHO 1989).
exposure	The amount of an environmental agent that has reached an individual (external dose) or has been absorbed into the individual (internal dose, absorbed dose). The term can also be applied to the community. **Cumulative exposure** is the exposure to additive doses over time. **Synergistic exposure** is exposure to the interactive impact of different agents which of themselves may not necessarily constitute a hazard, but which may become toxic in conjunction with other agents.

exposure assessment	The quantification of the dose, or level of a chemical in the environment, to which various populations or ecosystems are actually exposed.
exposure limit	A general term implying the level of exposure that should not be exceeded. (WHO 1989)
food additive	Any non-nutritive substances added intentionally to food, generally in small quantities, to improve its appearance, flavour, texture, or storage properties, with the exception of substances which are added to food exclusively for their nutritive properties, but including animal feed adjuncts which may result in residues in human food, and other contaminants. (WHO 1989)
food chain	The sequence of transfer of matter and energy in the form of food from organism to organism in ascending or descending trophic levels. (WHO 1989)
harmonization	This term is used to describe the process of achieving improved consistency of approaches and transparency of results. It seeks to meet collective goals, while remaining sensitive to national differences.
hazard	The inherent property of a substance which makes it capable of causing adverse effects to people or the environment under conditions of exposure.
hazard identification	The identification of the substance of concern, its adverse effects, target populations, and conditions of exposure. (WHO 1989)
morbidity	Any departure, subjective or objective, from a state of physiological or psychological well-being. It can be measured in terms of three units: persons who were ill; the illness (periods or spells of illnesses) that these persons experienced; and the duration (days, weeks etc.) of these illnesses. (WHO 1989)
persistence	a measure of the length of time a compound will remain in the environment before being broken down or degraded into other and less hazardous substances.
pollutant	Any undesirable solid, liquid, or gaseous matter in a gaseous, liquid or solid medium. (WHO 1989)
polluter pays principle	The principle, first adopted by the OECD in 1972 and later adopted by other organisations, according to which the polluter should bear the costs of pollution prevention and control measures.
pollution	The introduction of pollutants into a solid, liquid, or gaseous medium, the presence of pollutants in a solid, liquid or gaseous medium, or any undesirable modification of the composition of a solid, liquid or gaseous medium. (WHO 1989)

precautionary approach	Where there are threats of serious or irreversible damage, the lack of full scientific certainty shall not be used as a reason for postponing cost effective measures to prevent environmental degradation or deleterious heath effects.
prior informed consent	The principle that international shipment of a chemical that is banned or severely restricted in order to protect human health and the environment should not proceed without the agreement, where agreement exists, or contrary to the decision of, the designated authority in the importing country.
prior informed consent procedure	The procedure for formally obtaining and disseminating the decisions of importing countries as to whether they wish to receive future shipments of chemicals which have been banned or severely restricted, being implemented jointly by UNEP and FAO.
public health	Encompasses the problems affecting the health of population, the collective status of health of the people, environmental health and health services, and the administration of health care services.
registration	The process by which authorities review and assess a product and approve its sale or use for specific purposes.
responsible care	A commitment by companies both independently and collaboratively to seek improvement in performance in all aspects of safety, health and protection of the environment; to educate all staff in these areas; and to work with customers and communities to build closer links regarding product use and overall operation.
rights	Limited permits, usually specific in nature, granted to companies or organisations to induce them to act in a particular way, and incorporating strict conditions to ensure that the requirements are not exceeded. Rights may be used, for example, to control disposal of waste water, or of toxic or non-toxic waste.
risk	The probability of occurrence of an adverse effect from a substance on people or the environment combined with the magnitude of the consequence of that adverse effect.
risk assessment	The identification of environmental health hazards, their adverse effects, target populations, and conditions of exposure. A combination of hazard identification, risk estimation, exposure, and risk characterization.
risk characterization	The outcome of hazards identification and risk estimation applied to a specific use or occurrence of a health or environmental hazard (e.g., a chemical compound). The assessment requires quantitative data on the human or environmental exposure in the specific situation.

risk communication	The process of sharing information and perceptions about risk. Risk communication should not simply be a process whereby experts inform lay people, but should be a two-way interaction in which experts and non-experts exchange and negotiate perceptions relating to both scientific facts and community values and preferences.
risk estimation	The quantification of dose-effect and dose-response relationships for a given environmental agent, showing the probability and nature of the health or environmental effects of exposure to the agent.
risk management	The managerial, decision-making and control process to deal with those environmental agents for which risk evaluation has indicated that the risk is too high. (WHO 1989)
risk perception	The subjective perception of the gravity or importance of the risk based on the subject's understanding of relative risks and the social and personal judgement of their importance.
standard	A guideline or limit which dictates an acceptable performance level and which is legally enforceable through accompanying regulatory mechanisms. Standards may be based on an objective assessment of risk, or more commonly, on a threshold exposure below which there are no adverse effects; alternatively, a risk coefficient may be defined in terms of adverse effects per million persons per unit of exposure, a judgement made on the risk that is acceptable to society in return for the benefits, and exposure limits and regulatory control set accordingly.
sustainable development	Sustainable development aims to meet society's needs in ways that maintain the productivity and variety of resources and ecosystems without compromising the ability of future generations to meet their own needs.
transfer of technology	The export of technologies from one country to another in various forms, including the building of complete factories and plants, the import of equipment and software, the financing of major industrialization or infrastructural projects, the provision of foreign experts as consultants and the training of local personnel.
toxicity	The capacity of a substance to cause injury to a living organism. A highly toxic substance will cause damage to an organism if administered in very small amounts and a substance of low toxicity will not produce an effect unless the amount is very large. However, toxicity cannot be defined in quantitative terms without reference to the quantity of substance administered or absorbed, the way in which this quantity is administered (e.g. inhalation, ingestion, injection) and distributed in time (e.g. single or repeated doses), the type and severity of injury, and the time needed to produce injury. (WHO 1989)

toxicovigilance	The active process of identification and evaluation of the toxic risks in the community in order to reduce or eliminate them. It also includes the evaluation of the measures taken to reduce the risks identified.

ANNEX III
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ANNEX IV
Intergovernmental Forum on Chemical Safety:
Overview and Priorities for Action

The concept of an Intergovernmental Forum on Chemical Safety was developed during the preparatory process of the United Nations Conference on Environment and Development (UNCED) in 1989. The Forum was created by the International Conference on Chemical Safety held in Stockholm in April 1994, and its inaugural session was held at this time. The next session is planned for 1997, and the third, for the year 2000. In the intervening years, the work of the Forum is carried out by an Intersessional Group (ISG) of not more than 26 elected Government Participants. The ISG meets in an open forum in which other IFCS participants are entitled to participate without the right to vote. It also provides advice to the cooperating organisations of the IOMC.

The Forum is not an agency, but a mechanism to integrate and consolidate national and international efforts to promote chemical safety. It is an arrangement whereby representatives of governments meet to consider chemical risk assessment and environmentally sound management of chemicals, and to provide consultation and advice and make recommendations (where appropriate) to governments, international organisations, intergovernmental bodies and non-governmental organisations involved in chemical safety. It seeks co-operation among governments in promoting chemical risk assessment and environmentally sound management of chemicals. It is based on the premise that strengthening direct co-operation between all those concerned in the field of chemical safety would offer new opportunities to carry out its purposes. These purposes are to:

- provide policy guidance with emphasis on regional and sub-regional co-operation;
- identify priorities and develop strategies in a co-ordinated and integrated manner and foster understanding of the issues; and
- promote the policy support needed to discharge these functions.

According to its mandate, in pursuing these purposes the Forum shall provide:

- clear and consistent advice for cost-effective, integrated risk assessment and management of chemicals using environmentally sound and generally accepted principles, including advice on alternatives to banned or severely restricted chemicals; and
- improved delineation and mutual understanding of roles, initiatives and activities both within and among governments and international organisations having responsibilities for chemical safety.

Its functions shall be to:

- identify priorities for cooperative action on chemical safety, advise and, where appropriate, recommend concerted international strategies for hazard identification and

risk assessment and for environmentally sound management of chemicals, including risk reduction programmes and risk communication, particularly taking into account the special needs of developing countries;

- assist in securing the collaboration of national, regional and international bodies active in the field of chemical safety, and avoid any duplication in this area;

- promote the strengthening of national co-ordinating mechanisms and of national capabilities and capacities for chemicals management, especially in relation to infrastructure building, training, education, research and monitoring, and provision of information;

- promote international agreements and commitments on harmonized classification and labelling of chemicals;

- assist in identifying gaps in scientific knowledge and promote information exchange and scientific and technical co-operation, including training, and education and technology transfer;

- review periodically the effectiveness of relevant ongoing activities to implement recommended international strategies concerning chemical safety and make recommendations for further activities and, where necessary, advise on the strengthening or establishing the necessary follow-up mechanisms;

- advise governments in their work on chemical safety with particular reference to legislative aspects, promote co-operation among governmental and non-governmental organisations and encourage the appropriate distribution of work among organisations and other bodies within and outside the United Nations system in as clear a way as possible;

- promote the strengthening of national programmes and international co-operation for the prevention of, preparedness for, and response to chemical accidents including major industrial accidents;

- promote the strengthening of programmes for the prevention of and response to poisoning by chemicals; and

- perform other functions in pursuance of the purposes and aims of the Forum, as agreed by the Government Participants.

These activities all stem from the Forum's overarching brief, which is to seek consensus among countries on the development of strategies to implement UNCED's comprehensive programme for enhancing sound management of chemicals, outlined in chapter 19 of Agenda 21.

The IFCS has adopted over 40 specific recommendations on priorities for action to achieve the objectives set out in Agenda 21. The priorities, which include both immediate actions and longer-term goals, are set out below.

They are concerned particularly with priorities for action by governments, in line with the Agenda 21 statement that successful implementation is first and foremost the responsibility of governments. Several priorities, however, involve work by which international bodies may develop effective tools for use by governments.

All members of the Forum are urged to cooperate to the fullest extent, particularly on a regional basis, in the effective implementation of these priorities. Most of the goals set should be achieved by the year 2000, and several specify sub-goals to be achieved by 1997. Others have a longer term perspective, and were made with a view to identifying steps that need to be taken now in order not to lose momentum.

The Priorities for Action have been endorsed by the Commission on Sustainable Development. In addition, the Commission stressed the importance of:

- efficient co-ordination at the national level of the work on chemical safety by concerned sectors;

- the active participation of industry and employees as part of the mobilization of the non-governmental sector;

- the strengthening of the community right to know through environmental reports, eco-audits, emission inventories and similar instruments;

- strengthening national capabilities and capacities for management of chemicals, particularly developing countries. It encouraged the commitment of governments to concrete bilateral action in this area.

In order that the priorities for action may be successfully implemented, the Resolution for Action calls for:

- close co-operation between international organisations and governments, and the development and strengthening of co-operation at the regional level;

- national implementation of international agreements on chemical safety;

- at the national level, efficient co-ordination of the work on chemical by concerned sectors, with active participation of employers and workers, mobilization of the-non-governmental sector, and strengthening of the community right to know;

- an expanded knowledge and use of the many tools for improving chemical safety that have stemmed from work carried out by United Nations bodies and programmes, the OECD, the European Union, a number of countries, industries, trade unions and other NGOs;

- an increase in bilateral technical assistance, transfer of technology, and other kinds of support to developing country and countries with economies in transition, in order to accelerate their development and provide them with adequate and good quality

information on scientific, technical, economic and legal matters. Such information is essential for the sound management of chemicals;

- increased education and training in all programme areas, with an emphasis on careful co-ordination and training the trainers;

- risk reduction activities that take into account the whole life cycle of a chemical; close integration of chemical controls and pollution control initiatives; and application of the precautionary principle, where relevant;

- special attention to occupational safety and health problems caused by chemicals, primarily in the interest of protecting workers' health, but also to encourage collection of epidemiological and other data that may be valuable with respect to other-chemical-related problems.

The Forum acknowledges that the priorities to be implemented will vary depending on the chemicals management capabilities of individual countries. Regarding international activities, high priority should be given to those where the goals can be achieved only by action at an international level. Activities leading to greater efficiency and cost-saving, e.g. sharing of risk assessment reports, is encouraged. Where significant initiatives are underway, completion of this work should have priority over initiating new programmes.

Priorities for Action

Introduction:

1. While Agenda 21 gives the overall objectives of the six programme areas and suggestions for their implementation, the adopted recommendations indicate priorities for immediate actions and goals to be achieved in the longer term. Agenda 21 states that its successful implementation is first and foremost the responsibility of governments. Accordingly, the given recommendations are first of all dealing with priorities for action by governments, but several of them regard work by which international bodies may develop effective tools for use by governments.

2. Close co-operation between international organisations and governments, and the development and strengthening of co-operation at the regional level are in a great number of cases important means to enhance significantly the result of recommended actions.

3. National implementation of international agreements on chemical safety should be encouraged.

4. At the national level, an efficient co-ordination of the work on chemical safety by concerned sectors is a prerequisite for successful results. Active participation of employers and workers, mobilization of the non-governmental sector, and strengthening of the community right to know are important factors for increased chemical safety.

5. Much of the work to strengthen chemical safety has been carried out by several United Nations bodies and programmes, the Organisation for Economic Co_operation and Development (OECD), the European Union, a number of countries, industries, trade unions and other NGOs, resulting in many useful tools for improvement of chemical safety. An expanded knowledge and use of these means should be promoted.

6. Adequate and good quality information on scientific, technical, economic and legal matters is essential for the sound management of chemicals. Developing countries and countries with economies in transition have particular problems in this regard. Bilateral technical assistance, transfer of technology, and other kinds of support should be increased in order to accelerate their development.

7. In all programme areas, there is a need for education and training. Efforts to satisfy this need should be carefully co-ordinated, and emphasis should be put on training the trainers.

8. Risk reduction activities should take into account the whole life_cycle of a chemical, and chemical controls and pollution control initiatives should be closely integrated. Where relevant, the precautionary approach, as outlined in principle 15 of the Rio Declaration, should be applied.

9. Special attention should be paid to occupational safety and health problems caused by chemicals, primarily in the interest of protecting workers' health. In addition, epidemiological

and other data based on human experience have always proven to be valuable with respect to other chemical-related problems.

10. When determining priorities for risk management, the implementation of these will be dependent upon the chemicals management capabilities of individual countries. When setting priorities for international activities, high priority should be given to those where achievement of goals can occur only when action is carried out at the international level. Activities leading to greater efficiency and cost savings, e.g. sharing of risk assessment reports of adequate quality, should be promoted. Completion of work where significant initiatives are well underway should have priority before initiating new programme activities.

11. Major actions undertaken should be monitored to assess progress.

12. The order in which the following recommendations are presented does not indicate various degrees of importance.

Programme Area A: Expanding and accelerating international assessment of chemical risks

1. Needs for different types of health and environmental risk assessments should be identified and criteria for setting priorities for the various types of risk assessments should be agreed. Applying these criteria, an initial list of chemicals (including those of high production volume) for risk assessment by the year 1997 should be established as soon as possible.

2. Harmonized approaches for performing and reporting health and environmental risk assessments should be agreed as soon as possible. Such protocols should be based on internationally agreed principles to permit the full use of risk assessments performed by both national authorities and international bodies.

3. An inventory of risk assessments that are planned, in preparation or completed should be established before the end of 1994.

4. Industry should be encouraged to generate and supply data required for risk assessment to the greatest possible extent.

5. Human exposure data, and good quality health effects data from developing countries, should be generated.

6. Taking into account the results of the activities recommended in items 1 and 2 and making full use of the evaluations produced by United Nations bodies, OECD, and others, 200 additional chemicals should be evaluated by 1997.

7. If the target in item 6 is met, another 300 chemicals should be evaluated by 2000.

8. The general principles for establishing guidelines for exposure limits, including the setting of safety factors, needs to be harmonized and described. Countries should establish guidelines for exposure limits for humans and for particular environmental compartments for

as many chemicals as possible, taking into account the harmonization efforts and the potential use of such guidelines.

9. Research and development should be promoted for the better understanding of the mechanisms of adverse effects of chemicals on humans and the environment.

10. Attempts should be made to further reduce the use of vertebrate animals in toxicity testing by encouraging the development, validation and use of alternative methods.

Programme Area B: Harmonization of classification and labelling of chemicals

1. The ongoing technical work on classification criteria should be strengthened to enable finalization by 1997. Continued work to harmonize classification systems and to establish compatible hazard communication systems, including labelling and safety data sheets, should be completed by 2000.

2. Countries should ensure that there is sufficient consultation to allow the development of a consistent national position on harmonization of classification systems.

3. An international framework for translating the result of the technical work on harmonization into an instrument or recommendations applicable legally at the national level should be established at an appropriate time.

Programme Area C: Information exchange on toxic chemicals and chemical risks

1. Networks for information exchange should be strengthened to take full advantage of the information dissemination capacities of all governmental, intergovernmental and non_governmental organisations.

2. Both the types of information exchanged and the methods of effecting the exchange should be tailored to meet the needs of major groups of users, taking due account of different languages and literacy levels.

3. Relevant data available from international bodies should be consolidated, if economically feasible, by 1997 on CD/ROM or other appropriate electronic media, together with suitable searching and updating facilities.

4. Sources of information useful to responding to chemical emergencies should be established and access to these sources should be readily and rapidly available.

5. Regional co-operation and information exchange networks should be established in all regions as soon as possible.

6. National institutions responsible for information exchange on chemicals should be created or strengthened, according to needs.

7. All countries should have nominated, by 1997, designated authorities for participation in the PIC procedure.

8. Work should continue to evaluate and address problems with implementation of the voluntary PIC procedure and to develop effective international legally binding instruments concerning the PIC procedure.

9. All countries which export chemicals subject to the PIC procedure should have the necessary mechanisms in place by 1997, including implementation and enforcement provisions, to ensure that export does not take place contrary to importing countries' decisions. Importing countries should also establish the necessary mechanisms.

10. In all developing countries and countries in economic transition, training should have been made available by 1997 in the implementation of the London Guidelines and the PIC procedure.

11. The circulation of safety data sheets for all dangerous chemicals being traded should be encouraged, as promoted by the recently agreed Code of Ethics on The International Trade in Chemicals.

Programme Area D: Establishment of risk reduction programmes

1. In all countries chemical risks which are both readily identifiable and readily controllable should be reduced as soon as possible. In countries with sufficient resources, plans for the possible reduction of other chemical risks should be elaborated and enacted without delay. Industry, in accordance with the Polluter Pays Principle, has a particular responsibility to contribute to the implementation of risk reduction programmes. Governmental experience and progress in national risk reduction programmes shall be presented in a report by 1997 to serve as a basis for setting goals for the year 2000.

2. The feasibility and usefulness of extending pollutant release and transfer registers to more countries, including newly industrialized countries, should be evaluated and a report prepared by 1997.

3. As a particular priority, the recently agreed Code of Ethics on The International Trade in Chemicals should be applied widely by industry in all countries without delay.

4. Efforts to promote the development and use of clean technology regarding the production and use of chemicals should be encouraged.

5. Countries should review their pesticides safety strategy in order to protect human health and the environment, including surface and ground water. To reduce pesticide risks, countries should consider promoting the use of adequate safer pesticides, as well as the decreased use by better management practices and the introduction of alternative pest management technologies. A progress report should be prepared by 1997.

6. By 1997 not less than 25 more countries should have implemented systems for prevention of major industrial accidents in accordance with international principles such as those contained in the 1993 ILO Convention (No. 174) on the Prevention of Major Industrial

Accidents, and the United Nations Economic Commission for Europe (UN/ECE) Convention on Transboundary Effects of Industrial Accidents.

7. By 1997 not less than 50 more countries should have introduced national systems for emergency preparedness and response, including a strategy for education and training of personnel, with the aid of, inter alia, the APELL programme and the ILO Code of Practice on the Prevention of Major Industrial Accidents (1991).

8. By 1997 not less than 40 more countries should have established poison control centres with related clinical and analytical facilities and good progress should have been made on harmonizing systems for recording data in different countries.

9. Priority attention should also be given to finding and introducing safe substitutes for chemicals with which high and unmanageable risks are associated. Governments, industries and users of chemicals should also develop, where feasible, new less hazardous chemicals and new processes and technologies which effectively prevent pollution.

10. While recognizing that risk reduction activities are primarily national responsibilities, international risk reduction programmes could also be warranted for those problems that are international in scope.

11. Attention should also be paid to ensuring that all countries introduce appropriate legislation to implement UN Recommendations on the Transport of Dangerous Goods and to ensuring that this legislation is regularly updated whenever the Recommendations are revised, especially in the context of the global harmonization of classification and labelling systems.

Programme Area E: Strengthening of national capabilities and capacities for management of chemicals

1. The strengthening of national capabilities and capacities to manage chemicals in a great number of developing countries requires, in addition to funding and support from developed countries, innovative thinking as to how to make best use of existing systems. Bilateral assistance arrangements between developed and developing countries and countries with economies in transition should be encouraged. Efficient regional co-operation is of the utmost importance.

2. National profiles to indicate the current capabilities and capacities for management of chemicals and the specific needs for improvement should be elaborated as soon as possible and not later than 1997.

3. Comprehensive guidelines for chemical legislation and enforcement should be elaborated as soon as possible, taking into account, inter alia, the principles of the 1990 ILO Chemicals Convention (No. 170).

4. By 1997 mechanisms for ensuring liaison of all parties involved in chemical safety activities within a country should be established in the majority of countries.

5. Further education programmes and training courses should be arranged at the national and regional level to provide a core of trained people, both technical staff and policy makers, in developing countries and countries with economies in transition.

6. Efforts should be made to improve the co-ordination of activities in the area of education, training and technical assistance.

7. As a longer term objective, chemical information systems should be established in all countries, comprehensive legislation should be enacted and enforcement procedures be in place. Continued campaigns to increase the public awareness of chemical risks and their prevention should be run.

Programme Area F: Prevention of illegal international traffic in toxic and dangerous products

Until control legislation is in place in a sufficient number of countries, as a basis for further legal international instruments to halt illegal traffic in toxic and dangerous products, all efforts should be made to improve the situation, including strengthening of the PIC procedure.

ANNEX V
Excerpts from UNCED Chapter 19 of Agenda 21

Agenda 21 was produced at the UNCED Rio meeting in June 1992, and is a blueprint for action in all major areas affecting the relationship between the environment and the economy. Chapter 19 outlines six programme areas for action to ensure environmentally sound management of chemicals, with the objectives for each, as follows:

A. Expanding and accelerating international assessment of chemical risks

Objectives:

(a) To strengthen international risk assessment. Several hundred priority chemicals or groups of chemicals, including major pollutants and contaminants of global significance, should be assessed by the year 2000 using current selection and assessment criteria;

(b) To produce guidelines for acceptable exposure for a greater number of toxic chemicals, based on peer review and scientific consensus distinguishing between health or environment-based exposure limits and those relating to socio-economic factors.

B. Harmonization of classification and labelling

Objective:

A globally harmonized classification and compatible labelling system, including material safety data sheets and easily understandable symbols, should be available, if feasible, by the year 2000.

C. Information exchange of toxic chemicals and chemical risks

Objectives:

(a) To promote intensified exchange of information on chemical safety, use and emissions among all involved parties;

(b) To achieve by the year 2000, as feasible, full participation in and implementation of the PIC procedure, involving possible mandatory application through legally binding instruments contained in the amended London Guidelines and in the FAO International Code of Conduct, taking into account the experience gained within the PIC procedure.

D. Establishing of risk reduction programmes

Objective:

To eliminate unacceptable or unreasonable risks and, to the extent economically feasible, to reduce risks posed by toxic chemicals, by employing a broad-based approach involving a wide range of risk reduction options and by taking precautionary measures derived from a broad-based life-cycle analysis.

E. Strengthening of national capabilities and capacities for management of chemicals

Objective:

By the year 2000, national systems for environmentally sound management of chemicals, including legislation and provisions for implementation and enforcement, should be in place in all countries to the extent possible.

Basic elements of sound management of chemicals are: (a) adequate legislation, (b) information gathering and dissemination, © capacity for risk assessment and interpretation, (d) establishment of risk management policy, (e) capacity for implementation and enforcement, (f) capacity for rehabilitation of contaminated sites and poisoned persons, (g) effective education programmes and (h) capacity to respond to emergencies.

F. Prevention of illegal international traffic in toxic and dangerous products

Objectives:

(a) To reinforce national capacities to detect and halt any illegal attempt to introduce toxic and dangerous products into the territory of any state, in contravention of national legislation and relevant international legal instruments;

(b) To assist all countries, particularly developing countries, in obtaining all appropriate information concerning illegal traffic in toxic and dangerous products.

ANNEX VI
Inter-Organization Programme for the Sound Management of Chemicals (IOMC): An Overview

The IOMC was established in response to recommendations in Agenda 21 of UNCED. It is designed to serve as a mechanism for co-ordinating policies and activities pursued by the participating organisations, jointly and separately, related to the assessment and management of chemicals. The IOMC is a co-operative undertaking among seven intergovernmental organisations that, within the framework of their own respective constitutional mandates, work together as partners to promote international work in the environmentally sound management of chemicals. The IOMC was initially comprised of six participating organisations: i.e. the three co-operating organisations of the IPCS (WHO, UNEP, and ILO) as well as FAO, UNIDO, and OECD. In 1998, UNITAR was officially accepted as a seventh member. Other intergovernmental organisations may also become participating organisations with the unanimous consent of the participating organisations.

The Secretariat of the IOMC is located at the WHO, the administering organisation. It is functionally distinct from the Secretariat of the IFCS, although both are located at WHO. The participating organisations share in the costs of the secretariat, through voluntary and in-kind contributions and secondment of staff.

An Inter-Organization Co-ordination Committee (IOCC), composed of representatives of the participating organisations of the IOMC has been established to co-ordinate and foster joint planning of relevant activities of the organisation. Such co-ordination should ensure full consultation among all those involved, with the aim to ensure effective implementation without duplication. The IOCC normally meets twice a year and may invite observers to attend its meetings.

Scientific and technical work of the IOMC will be carried out through the existing structures of the participating organisations, either individually or jointly.

According to the memorandum of understanding among the participating organizations, co-ordination is sought for activities of the organisations which support the programme areas of Chapter 19 of Agenda 21. These include: international assessment of chemical risks; harmonization of classification and labelling of chemicals; information exchange on chemicals and chemical risks; establishment of risk reduction programmes; strengthening of national capabilities and capacities for management of chemicals; prevention of illegal international traffic in toxic and dangerous products; and other areas as agreed by all participating organisations.

ANNEX VII
Major International Agreements related to Chemicals

Legally Binding International Agreements:

- Convention for the Prevention of Marine Pollution from Land-Based Sources, UNEP, 1974
- Montreal Guidelines for the Protection of the Marine Environment from Land Based Sources of Marine Pollution, UNEP, 1985
- Vienna Convention - Montreal Protocol on Substances that Deplete the Ozone Layer, UNEP, 1989
- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, UNEP, 1992
- Convention Concerning Safety in the Use of Chemicals at Work, ILO, 1990
- (1988) Convention Against Illicit Traffic in Narcotic Drugs and Psychotropic Substances, UN, 1990
- (1971) Convention on Psychotropic Substances, UN, 1976
- (1961) Single Convention on Narcotics, UN, 1964, as amended by 1972 Protocol, 1975
- Convention on the Transboundary Effects of Industrial Accidents, UN/ECE 1992
- Convention concerning the Prevention of Major Industrial Accidents, ILO, 1993
- Chemicals Weapons Convention, UN, 1993
- Convention of Long-range Transboundary Air Pollution, UN/ECE, 1979
- Convention on Asbestos, ILO, 1986
- Convention on Benzene, ILO, 1971

Voluntary Agreements:

- Amended London Guidelines for the Exchange of Information on Chemicals in International Trade, UNEP, 1989
- Code of Ethics on International Trade in Chemicals, UNEP, 1994
- Amended International Code of Conduct on the Distribution and Use of Pesticides, FAO, 1989
- Certification Scheme on the Quality of Pharmaceutical Products Moving in International Trade, WHO, 1975

Notes: At the time of publication, a number of negotiations were underway to develop further international agreements, including ones to address the Prior Informed Consent (PIC) procedure and Persistent Organic Pollutants (POPs).

In addition to the agreements listed above, there are a number of agreements addressing chemicals issues developed by regional and multilateral organisations, such as the OECD and EU which establish requirements for member countries.

ANNEX VIII
Major International Organisations Involved in Chemicals Management

International Organisation, Body, Programme or Agency	**Address, Phone, Fax, Internet Address**
Food and Agriculture Organization of the UN (FAO)	Via delle Terme di Caracalla 00100 Rome, Italy TEL +39 6 52251 FAX +39 1 5225 3152 or 5225 5155 Internet: http://www.fao.org/
International Agency for Research on Cancer (IARC)	150, cours Albert Thomas F-69372 Lyon Cédex 08, France TEL +33 472 73 84 85 FAX +33 472 73 85 75
International Labour Organization (ILO)	4, route des Morillons CH-1211 GENEVE 22, Switzerland TEL +41 22 799 61 11 FAX +41 22 798 86 85
International Maritime Organization (IMO)	4, Albert Embankment London SE1 7SR, United Kingdom TEL +44 171 735 7611 FAX +44 171 5873210
International Programme on Chemical Safety (IPCS)	World Health Organization 20, avenue Appia CH-1211 GENEVE 27, Switzerland TEL +41 22 791 35 88 FAX +41 22 791 48 48 Internet: http://www.who.ch/
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Co-ordinating Mechanisms for Chemicals Management

Intergovernmental Forum on Chemical Safety (IFCS)

c/o World Health Organization
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Inter-Organization Programme for the Sound Management of Chemicals (IOMC)

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