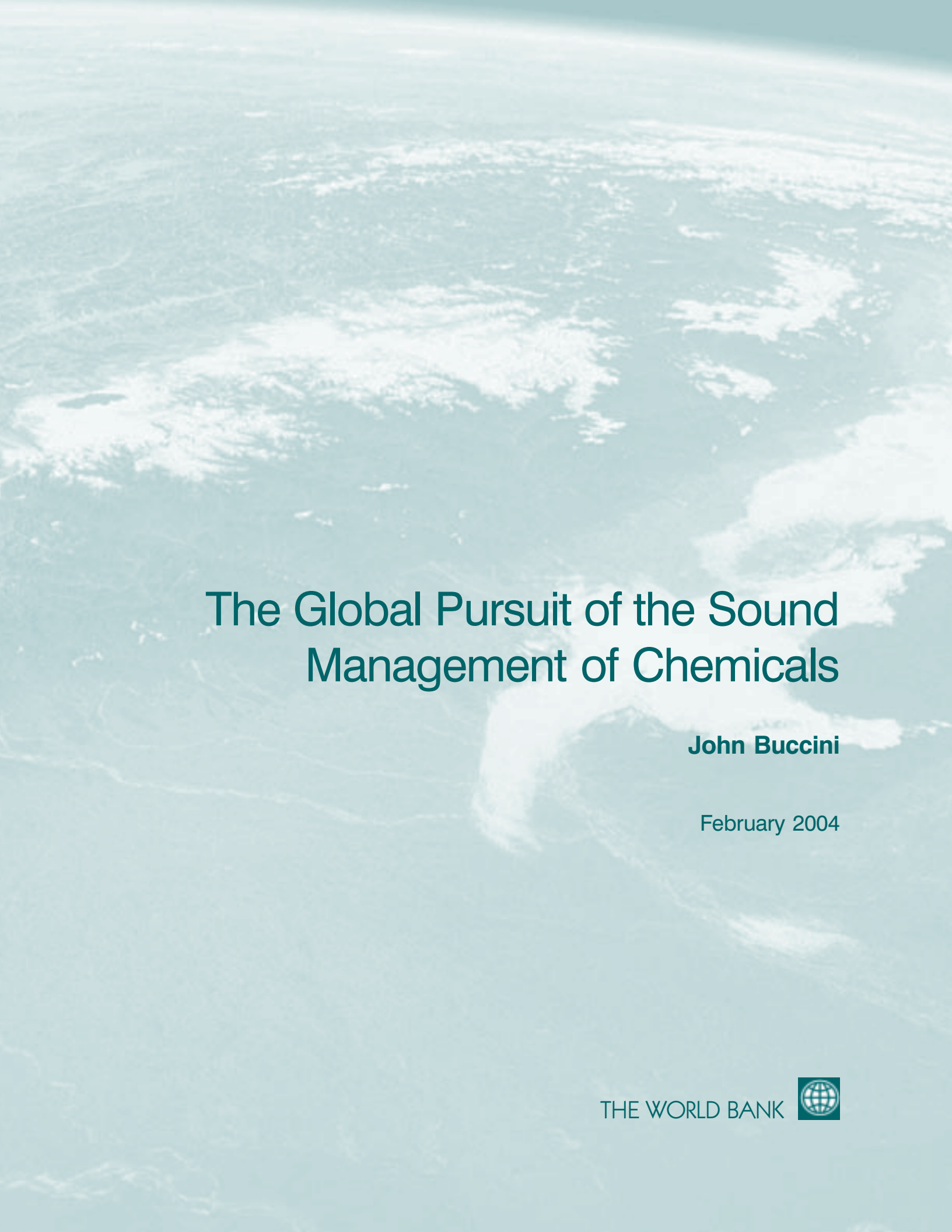
Pages 1-67

The Global Pursuit of the Sound Management of Chemicals

John Buccini

THE WORLD BANK



The Global Pursuit of the Sound Management of Chemicals

John Buccini

February 2004

THE WORLD BANK

The International Bank for Reconstruction
and Development/THE WORLD BANK
1818 H Street, N.W.
Washington, D.C. 20433 U.S.A.

Manufactured in the United States of America
Printed in 2004

The author and the World Bank POPs team would like to thank the following individuals for their assistance in reviewing this report: Helen Chan, Mary-Ellen Foley, Steve Gorman, Steve Maber, Catalina Marulanda, Bill Rahill, Ruma Tavorath, Ellen Tynan, Viraj Vithoontien, Bob Watson, and Jim Willis.

John Buccini, Ph.D., joined the Canadian Government in 1972 as a toxicologist in Health Canada. In 1982, he became a program manager in Environment Canada where, until his retirement in October 2000, he was involved at the national and international levels in science based regulatory programs involving the development and implementation of legislation, policies, and programs to assess and manage the risks posed by environmental contaminants. During his career at Environment Canada, he worked extensively with multilateral organizations that addressed chemicals management and toxic chemicals issues, including the North American Commission on Environmental Cooperation, the OECD Chemicals Programme, and the Intergovernmental Forum on Chemical Safety (IFCS). In 1996, he coordinated the development of IFCS recommendations, subsequently approved by the United Nations Environment Programme (UNEP) and the World Health Organization, to initiate negotiations for a global convention to control the generation, use, and release of POPs. Since 1998, he has served as the Chair of the UNEP Intergovernmental Negotiating Committee and led the development of the Stockholm Convention on POPs, which was adopted in 2001.

Cover photo: Image courtesy of Earth Sciences and Image Analysis Laboratory, NASA Johnson Space Center
Cover and book design: Jim Cantrell

Letter from the Vice President of the Environmentally and Socially Sustainable Network

OVER THE PAST DECADE, WE HAVE WITNESSED growing international concern over the state of the global environment and the relationships between human and environmental health and economic and social development at the local and global levels. The management of chemicals throughout the cycle of their production, use, and disposal figures significantly in these relationships.

A number of international, global and regional agreements have been developed to address the management of chemicals, considering their extensive use in food and agriculture, energy, and consumer products, and their potential to impact human health and the environment. However the magnitude and complexity of the issues, as well as continued developments in chemicals-related industries and scientific research on chemical impacts, has led to the need for increased and targeted international efforts to deal with chemicals. This is particularly relevant for developing countries which face special challenges in addressing chemical issues.

The World Bank's Environment Strategy aims "to promote environmental improvements as a fundamental element of development and poverty reduction strategies and actions." The strategy is based on an approach to sustainable development, built on a balance of economic growth, social equity and long-term environmental sustainability. The opportunities for economic growth in developing countries through the use of chemicals must be recognized, but with an eye on the need for their safe and sound management.

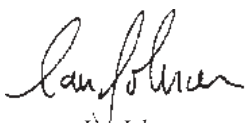
The 2002 World Summit on Sustainable Development (WSSD) adopted the goal that, by 2020, chemicals are used and produced in ways that minimize significant adverse effects on human health and the environment, taking into account the precautionary approach. This came with the recommendation to support developing countries in capacity strengthening for the sound management of chemicals by providing technical and financial assistance. The World Bank strongly supports this course of action.

Moreover, the international community has been supportive of recent initiatives by UNEP's Governing Council for a more integrated approach to managing chemicals, including looking at relationships between key multilateral environment agreements (MEAs), such as the Basel Convention on hazardous waste and the recently adopted Stockholm Convention on persistent organic pollutants, and more fundamentally, the linkages of chemical management issues to development strategies.

These calls for global, integrated action need to be taken seriously. Already, the Global Environment Fund (GEF) has responded by allowing funding for chemicals issues if they are related to one or more of the six GEF focal areas, and the governing bodies of three key intergovernmental bodies have included the promotion of an integrated approach to chemical safety in their mandates.

Current discussions on a strategic approach to international chemicals management (SAICM) can generate more synergies between MEAs and chemical-related programs, facilitating the adoption of environmentally sustainable approaches to development and allowing developing countries to protect their populations and environment while meeting their global commitments. The identification of synergies will undoubtedly call for close coordinated work among partners to maximize effectiveness and bridge gaps in existing activities. The global nature of chemicals issues requires a comprehensive, global approach—one that involves all stakeholders and partners in development.

It is my hope that the information provided in this document will be useful for the international community in its dialogue on the pursuit of an overall strategy for managing chemicals in a sound fashion.



Ian Johnson

Contents

Foreword

THIS REPORT PROVIDES A DESCRIPTION OF THE international chemicals agenda from an historic and global perspective and includes a review of current international agreements, programs, initiatives, and current and emerging issues and opportunities related to the sound management of chemicals. It was prepared for the World Bank to serve as a source of information on those aspects of the current international chemicals agenda that have the potential to impact on economic growth and development, human health and the environment and, thereby, affect global sustainable development.

As it is intended to inform ongoing strategic discussions within the World Bank, this report highlights opportunities and possible relevance of the chemicals agenda to the Bank's overall strategy and programs but it does *not* contain direction for the Bank's work on the chemicals agenda. Such information can only be produced by the Bank following its internal analysis, consultations and strategic discussions of the growing importance of chemicals management as a global environmental issue.

Acronyms and Abbreviations

AMAP	Arctic Monitoring and Assessment Program
BAT	best available techniques
BEP	best environmental practices
CAS	Country Assistance Strategies
DDT	1,1'-(2,2,2-trichloroethylidene)bis(4-chlorobenzene)
e.i.f.	entry into force
EPR	extended producer responsibility
EU	European Union
FAO	Food and Agriculture Organization
GC	Governing Council (of UNEP)
GEF	Global Environment Facility
GHG	greenhouse gas
HCB	hexachlorobenzene
IFCS	Intergovernmental Forum on Chemical Safety
ICCA	International Council of Chemicals Associations
IGO	intergovernmental organization
ILO	International Labour Organization
IMO	International Maritime Organization
INC	intergovernmental negotiating committee
IOCC	Inter-Organization Coordinating Committee
IOMC	Inter-Organization Programme for the Sound Management of Chemicals
IPCS	International Program for Chemical Safety
LMO	living modified organism
LRTAP	long-range transboundary air pollution
NACEC	North American Commission on Environmental Cooperation
NGO	non-governmental organization
ODS	ozone-depleting substances

OECD	Organization for Economic Cooperation and Development
OPCW	Organisation for the Prohibition of Chemical Weapons
PCBs	polychlorinated biphenyls
PIC	prior informed consent
POPs	persistent organic pollutants
PRSPs	Poverty Reduction Strategy Papers
PRTR	pollutant release and transfer register
SAICM	strategic approach to international chemicals management
TBT	tributyl tin
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UN ECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNIDO	United Nations Industrial Development Organization
UNITAR	United Nations Institute for Training and Research
USA	United States of America
VOC	volatile organic chemicals
WHA	World Health Assembly
WHO	World Health Organization
WSSD	World Summit on Sustainable Development

Executive Summary

THIS REPORT WAS PREPARED FOR THE WORLD Bank to provide information on current and emerging international chemicals issues that have the potential to impact on economic growth and development, human health and the environment, thereby affecting global sustainable development. It is intended to inform ongoing strategic discussions within the World Bank.

All living and inanimate matter is made up of chemicals. Virtually every man-made product involves the use of intentionally produced chemicals in some manner and thousands are produced and new ones developed every year in response to demands for new and improved products. Some chemicals are unintentionally produced as by-products in manufacturing, industrial and combustion processes. Once released into the environment, chemicals may undergo short- or long-range transport as a result of natural environmental processes, are transformed into other chemicals and may cause local, regional and/or global contamination, exposure of humans and wildlife and, in some cases, toxic effects. Recent concern has focussed on chemicals that degrade very slowly in the environment and accumulate in wildlife and humans.

Chemicals serve in a wide variety of roles that establish and/or preserve an elevated standard of living in countries at all stages of development and are now viewed as essential components of modern societies. While chemicals contribute to resolving many modern issues, they are also implicated with problems relating to unintentionally produced by-products, waste generation and disposal, environmental contamination and human and wildlife exposure due to the production, use and release of the thousands of chemical formulations and products in the marketplace. The key current international chemicals issue is whether modern society can balance the benefits derived from industrial growth, and the accompanying use of chemicals, with the immediate and long-term threats posed by chemicals to health and environment. This is a classic sustainable development issue. Policies for the sound management of chemicals are now recognized as essential components of overall public policy in countries at all stages of development and they should be reflected in national sustainable development plans.

All industry sectors release chemicals to the environment due to the use or intentional or unintentional production of chemicals at industrial sites, waste disposal practices, or distribution of products and articles that eventually release chemicals to the environment. The chemicals industry is regarded as a prime contributor and while it is highly regulated, concerns remain that the releases from this sector or its products may be causing environmental contamination and damage to wildlife or humans. For this reason, information is included on this global industry.

The chemicals industry, considered by some to be the first high-technology industry, has played a central role in enabling technological change in all sectors of society since the mid-19th century. This industry transforms raw materials into commodity and specialty chemicals and makes possible the development of countless products, many of which have become

commonplace and are viewed as essential in elevating and/or maintaining the quality of life in modern society in both developed and developing countries. This research-intensive industry has evolved for over 150 years and will continue to do so as it responds to the constantly changing needs of the global community.

The global chemicals industry is highly diversified in terms of the nature, size and geographic location of the companies involved. It employs more than 10 million people and accounts for 7% of global income, 9% of international trade and an estimated US$ 1.5 trillion in sales in 1998. While the top 10 companies in 2000 had revenues of US$ 10-30 billion, employed tens of thousands of workers at sites around the globe and produced very large amounts of chemicals, most chemical producers have less than 50 employees and produce the largest number of substances, albeit in relatively small amounts. This industry is also highly diversified in terms of the number, types and volume of products produced. Primary producers convert basic materials into bulk commodity chemicals that are sold to downstream producers and processors for conversion into other chemicals, formulations, products or articles. Tens of thousands of chemicals are in commercial use at any time and this mix is constantly changing as older chemicals are withdrawn from use and new ones are introduced. Hundreds of thousands of products, articles and formulations are currently in the marketplace, most of which are produced in relatively small amounts.

Over the past 30 years, the global chemicals industry has experienced steady growth in production, consumption and trade. The value of chemical shipments increased almost 9-fold from 1970 to 1998 and there is now a genuine global chemicals industry, with 16 countries accounting for about 80% of global production. The total demand for chemicals is predicted to increase more rapidly in developing than in developed regions and the chemicals industry is undergoing changes in terms of what is being produced and where. In the future, there will be fewer and larger multinationals and the production of high volume basic chemicals will shift to non-OECD countries as OECD countries shift production to speciality and life science chemicals.

Governments and the public are concerned about releases from the chemicals industry during manufacturing, processing, transportation, waste disposal, accidents and the use and disposal of products, articles and formulations. The industry has instituted the *Responsible Care* program in many countries and taken actions to reduce, reuse and recycle materials, decrease releases to the environment, and prevent or minimize the generation or release of unwanted by-products. However, concerns remain about the impacts of the remaining releases from this sector and its products.

Recognition of health and environmental impacts has led to action at the national and international levels to address the risks posed by industrial chemicals,

J. Pickerell

Industrial workers in Argentina.

pesticides, by-products, narcotics, warfare agents, pharmaceuticals and food additives. Early attempts to manage environmental risks were directed at problems involving releases of 'bulk' pollutants from industrial sites. As progress was made in reducing these releases, attention turned to the problems caused by long-term low-level exposures to chemicals, leading to national programs and legislation being developed in the 1970's and 1980's, especially in OECD countries. Attention then turned to toxic effects attributable to even lower levels of chemicals in the environment and to developing international measures on accidents, food safety, poisoning, occupational health and the transportation and handling of dangerous chemicals.

Concerns about the risks of environmental contamination provided context for discussions at the United Nations Conference on Environment and Development (UNCED) in 1992. This conference made recommendations to address the global problems posed by chemicals and identified six priority program areas for action by the global community. By acknowledging the importance of the environmental impacts of chemicals, especially the long-range effects of such pollution, activity was stimulated on the sound management of chemicals, with significant national and international results. Since 1992: risk assessments have been produced on several hundred chemicals; initiatives have begun to generate data and assessments on thousands of high production volume chemicals; dozens of regional and global agreements, programs and initiatives on chemicals have been initiated, strengthened or completed; and a globally harmonized system for classification and labelling of chemicals has been developed.

Despite this progress, concerns remain that population level effects may be occurring in present or future generations of wildlife and/or humans due to widespread environmental contamination by chemicals, especially those that are persistent, toxic and bioaccumulative. Furthermore, as progress is made in addressing recognized problems, new issues appear as scientists continue to improve their abilities to detect increasingly smaller amounts of environmental contaminants and identify more sensitive toxicological endpoints. At the World Summit on Sustainable Development (WSSD) in September 2002, there remained sustained concern that, despite the progress made in the sound management of chemicals, much more needed to be done.

This report reviews international chemicals agreements, programs and initiatives that are important elements of the current international chemicals agenda. As a framework for this review, a model is used to represent the four main processes used in well-established risk assessment and management programs for toxic chemicals: problem identification and priority setting, risk assessment, risk management, and monitoring and evaluation. About 80 agreements, programs and initiatives were examined for their contributions to these four stages.

Of the 22 global and 27 regional agreements that were reviewed, all but two were adopted within the last 30 years: seven were adopted in the 1970's, 13 in the 1980's, and 27 since 1990. This paralleled the rising concern of all stakeholders during this period about the need to manage various aspects of chemicals. Almost all the agreements represent risk management commitments and some include provisions to add new substances, a form of risk assessment. A few agreements involve research programs that serve primarily to identify new problems and/or monitor human health and/or the environment to assess the effectiveness of agreements. Only a few agreements address all four stages. The agreements address several aspects of chemicals safety including: protection of water or air; occupational health; production and/or release of intentionally and unintentionally produced toxic chemicals; transportation of dangerous goods; industrial accidents prevention and response; waste transportation and disposal; and protection and conservation of biodiversity.

Almost 40 international chemicals safety programs and initiatives are reviewed. Conducted by 15 intergovernmental and other international organizations, these include a wide range of activities, most of which relate to risk assessment and risk management. The risk assessment activities include: a proposed new European approach for new and existing chemicals;

assessment of new pesticides and pesticide levels in foods; evaluating pesticides and industrial chemicals for addition to a voluntary prior informed consent procedure; assessing the properties of chemicals for the purposes of hazard classification and labelling; assessing high production volume chemicals, mercury and its compounds, and other specific chemicals; and assessing the health impacts of climate change and ozone depletion. As this is the key scientific stage in the toxics cycle, these activities will inform future decisions on risk management.

Most programs and initiatives address risk management and include: setting maximum pesticide levels in foods; promoting an international code of conduct to address pesticide distribution and use; addressing stockpiles of obsolete and unwanted pesticides in developing countries; implementing the voluntary PIC procedure pending entry into force of the Rotterdam Convention; the industry *Responsible Care* program; promoting a capacity-building program to address the needs of developing countries; procedures and support for chemicals accidents, emergencies and poison control centres; implementing the globally harmonized system for the classification and labelling of chemicals; promoting 'environmentally friendly' chemicals; developing approaches for risk management decision-making; risk reduction measures for pesticides; the transboundary movement and environmentally sound management of wastes; recommendations on the transport of dangerous goods; assisting the phase-out of ozone-depleting substances; promoting cleaner industrial production; the global program for the protection of the marine environment; international action to reduce the risks of mercury and its compounds; phasing-out the use of lead in gasoline; and developing information, guidance, training, codes, manuals and recommendations to support capacity-building activities related to chemicals management. These activities reflect the efforts of a wide range of stakeholders to advance the sound management of chemicals. However, concerns remain that numerous developing countries lack the capacity to implement many of these activities.

One important initiative in this group was the development of the *Bahia Declaration on Chemical Safety* and the *Priorities for Action Beyond 2000* by the Intergovernmental Forum on Chemical Safety (IFCS) in October 2000. Stakeholders concluded that the international community should promote measures to ensure all countries have the capacity for sound management of chemicals, particularly through coordinated national policies, legislation and infrastructure. It was noted that many countries lacked national coordinating mechanisms, essential infrastructure and chemical safety standards to protect health and the environment and that insufficient resources were available to address many issues. Twenty-one goals were specified for the period 2000-2005 relating to the six UNCED priority program areas.

In a more recent initiative, governments agreed on the need for improved coordination in the area of chemical safety and invited UNEP to lead the development of a strategic approach to international chemicals management (SAICM), based on the IFCS Bahia priorities, in cooperation with relevant stakeholders including governments, intergovernmental organizations and major agencies responsible for the funding and delivery of international development cooperation. The SAICM should promote the incorporation of chemical safety issues into the development agenda and identify concrete proposals for strengthening capacity for the sound management of chemicals in all countries, taking into account the vast difference in capabilities between developed and developing countries. In September 2002, the World Summit on Sustainable Development reviewed the progress made since the 1992 UNCED conference and adopted an overall plan of implementation that included a 2020 goal to implement the sound management of chemicals to minimize significant adverse effects on human health and the environment and to support developing countries in strengthening their capacities related to chemicals management by providing technical and financial assistance. The meeting also endorsed the development of a SAICM by 2005 and urged the active engagement of all relevant actors including the major agencies responsible for the funding and delivery of international development cooperation. This clear mandate to pursue a SAICM, linking policy and development elements, is the result of demonstrated interest at the

political level in shaping the future international chemicals agenda.

The World Bank provides assistance to countries in order to alleviate poverty and improve living standards through sustainable growth and investment in people. In developing and reviewing lending projects, the Bank ensures that attention is paid to sustainable development issues, including protection of the environment, pollution prevention and chemical safety. The present review of current issues, agreements, programs, and initiatives related to chemicals provides an information base for ongoing strategic discussions within the World Bank to assess the future role of the Bank in the international chemicals area. Attempting to balance the benefits derived from industrial growth and the accompanying use of chemicals with the immediate and long-term threats posed by chemicals to health and environment is a classic sustainable development issue and, therefore, initiatives related to the global pursuit of the sound management of chemicals, such as the SAICM, should warrant the attention of the Bank.

Y. Kozyrev

Inside the Nickeleviy Zavod nickel processing plant, Russian Federation.

Shivakasi. © International Labour Organization

Child working in the match-making industry.

1 Introduction

CHEMICALS HAVE BECOME AN ESSENTIAL component of modern societies, serving in a wide variety of roles that establish and/or preserve an elevated standard of living in countries at all stages of development. While many current uses of chemicals are likely obvious to the public (*e.g.,* household products, cleaning agents, pesticides), this may not be the case for other uses such as in products and articles (*e.g.,* gasoline, components of electronic devices such as computers, newly-developed alloys and plastics in automobiles). While many chemicals issues are seen as highly technical in nature, public concerns about chemicals policies are now a mainstream issue similar to other highly visible technology-based issues such as telecommunications and transportation. Chemicals are, in fact, a significant component of many modern issues, both in developing solutions to problems and in addressing problems related to hazardous waste generation, environmental contamination and human exposure as a result of the production, use and release of the thousands of formulations and products in today's marketplace. Policies for the sound management of chemicals are now recognized as essential components of overall public policy in countries at all stages of development.

1.1 PURPOSE OF THE REPORT

This report was prepared for the World Bank for the purpose of stimulating discussion within the Bank on current activities and emerging issues and trends related to the sound management of chemicals at the regional and international levels that have the potential to impact on economic growth and development, human health and the environment, and thereby affect global sustainable development.

An introduction is presented to the basic considerations involved in the examination of toxic chemicals issues and this is followed by descriptions of the current state of the global chemicals industry and the historical developments that have contributed to the current state of play in the international chemicals agenda. A large number of regional and international chemicals agreements, programs and initiatives are reviewed and discussed in the context of current and emerging chemicals issues. The report concludes with a brief analysis of the agreements, programs and initiatives and a discussion of the relevance of the international toxic chemicals issues and programs to the World Bank.

1.2 WHAT ARE CHEMICALS?

All living and inanimate matter is made up of chemicals that are formed by different combinations of the more than 100 elements found in our world, such as the two major components of the air we breathe - nitrogen (~80%) and oxygen (~20%). Simply stated, a chemical may be either an element or a compound that is formed by a combination of elements.

An organic chemical includes carbon in it and, while many are found in living organisms (*e.g.,* DNA, hormones, proteins, fats), hundreds of thousands of synthetic organic compounds have been developed (*e.g.,* DDT, PVC and other polymers made from petroleum products). Inorganic chemicals do not

World Bank

Indonesian worker in a salt mine.

include carbon and there are thousands of natural and synthetic ones (*e.g.,* borax, chlorine, sulphuric acid) and compounds of metals are common examples (*e.g.,* sodium chloride, better known as table salt). Some compounds include both metals and carbon and these are referred to as organometallic compounds (*e.g.,* tetraethyl lead, once widely used as an octane enhancer in motor gasoline).

Virtually every man-made product involves the use of chemicals in some manner. New chemicals are developed every year in response to the constant demands for new and improved materials, plastics, drugs, etc. and recent advances in such high technology areas as electronics and telecommunications have been made possible by the development of new chemical materials.

While tens of thousands of chemicals are intentionally produced for commercial purposes, some chemicals are unintentionally produced as by-products in industrial, manufacturing and combustion processes. These by-products may be distributed as contaminants in products and articles, occur as contaminants in wastes or be released directly into the environment, thus contributing to the burden of chemicals in the environment and, ultimately, to exposure of humans and wildlife.

1.3 ENVIRONMENTAL ASPECTS OF CHEMICALS

Once released into the environment, a chemical substance will be subjected to a series of natural processes that are determined by:

- The conditions of its release to the environment (*e.g.,* emissions to air, water or soil, releases during waste disposal, releases from a limited number of point sources *vs.* a large number of diffuse sources)
- Environmental conditions (*e.g.,* temperature of the receiving medium, season, amount of sunlight)
- The physical and chemical properties of the substance.

As a result of these factors, a released chemical will:

- Become distributed in different media (air, water, sediment, soil, plants, animals, humans)
- Undergo transport over short or long distances as a result of natural environmental processes, usually involving air and/or water
- Undergo transformation and degradation into other chemicals.

Eventually the chemical and/or its transformation products will be distributed between soil, sediment, water, air, and living organisms. It is generally accepted that chemical substances exhibit this *multimedia behaviour* in the environment.

Because the specific properties, release conditions and environmental fate are unique to each substance, chemicals need to be assessed systematically to see whether they will be broadly distributed following release to the environment or will preferentially concentrate in one medium (air, water, sediment, soil, or biota). Systematic assessments are important in ascertaining the nature and extent of local, regional and global impacts of chemicals that are released to the environment as a result of their generation, use, release and/or disposal. In assessing the risks posed by a chemical it is important to include consideration of

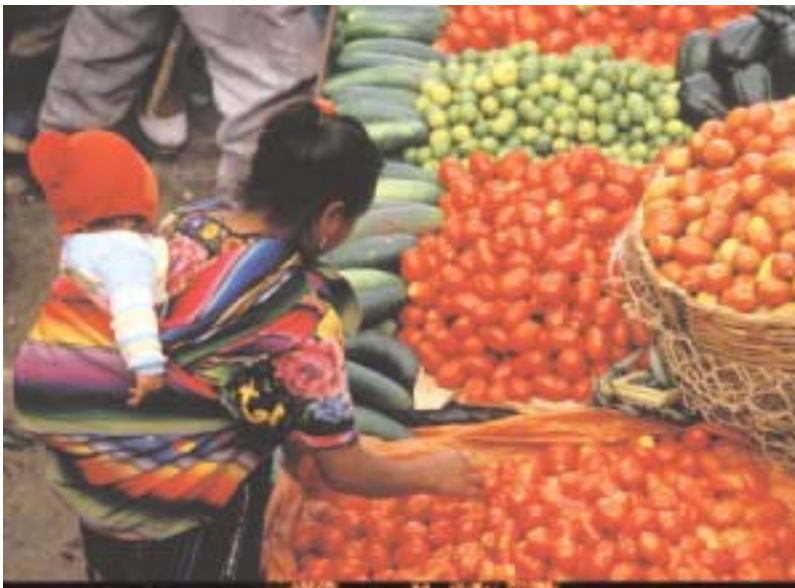
releases from the widest range of activities including during manufacturing and processing, handling and transportation, accidents involving manufacturing and transportation, the use of products and articles, and disposal of wastes from manufacturing processes and from the end-of-life stage of products. This is sometimes referred to as assessing the *life cycle* of the chemical.

The generation and release of intentionally and unintentionally produced chemicals has led to local, regional and global contamination of the environment, with consequent exposure of humans and wildlife. While many environmental contaminants degrade quickly in the environment, some chemicals are released in quantities, concentrations or under conditions such that elevated concentrations are sustained in environmental media. Some other chemicals have a combination of physical and chemical properties such that once released to the environment, they degrade very slowly and remain in environmental media and organisms for years or even decades, even when released in relatively small quantities, and are said to be *persistent*. Natural environmental processes can distribute these persistent substances over long distances, leading to regional and global contamination. Some of these environmental contaminants are taken up by wildlife and are retained in their bodies at concentrations higher than in their food and water: such substances are said to be *bioaccumulative*. When predators at higher levels in the food chain consume contaminated wildlife, this can result in very high body burdens of contaminants and this effect is referred to as *biomagnification*. In recent decades, there has been increased attention paid to addressing the risks posed by substances that are persistent, bioaccumulative and toxic (PBT), including persistent organic pollutants (POPs) and some metal compounds.

Another environmental impact of chemicals is less well recognized and results from the current trend to

Chemicals are a fundamental part of modern society and serve a variety of roles such as in growing and protecting crops, as commodities or raw materials for producing products; and in finishing products.

C. Carnemark



World Bank

J. Etchart

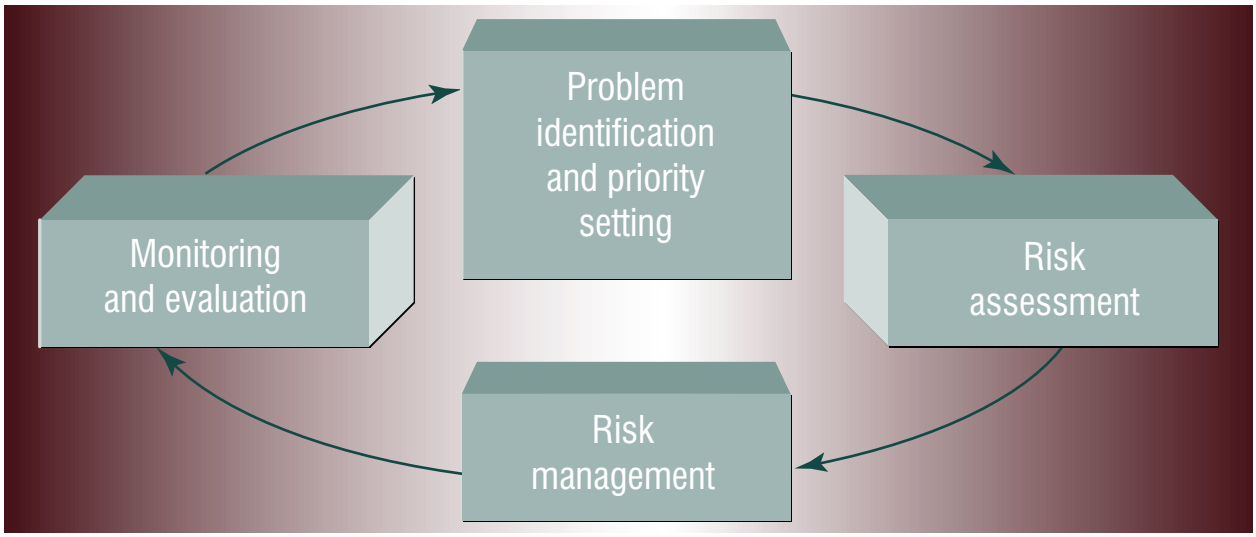
consumerism, wherein individuals in societies around the world accumulate a wide range of products, formulations and articles in their homes and workplaces. These materials are produced by transforming enormous amounts of renewable and non-renewable resources into consumable products and durable goods. In addition to the environmental and health impacts that are associated with the production, distribution and use of these materials, the "inventory" that we are all individually and collectively accumulating represents a huge burden on waste management systems when these materials are no longer wanted or needed. A recent example can be found in the computer industry where laptops, desktops and monitors are piling up in waste sites and dumps because they no longer either function properly or meet current expectations after less than five years of use. There are many hazardous chemicals in these materials and this represents a demand on a waste management system that was not designed to respond to these waste streams. In addition, the health and environmental impacts of toxic chemicals released during accidental fires in homes and buildings and at recycling depots is now widely recognized. A recent study has shown that the rate of accumulation of such materials within cities has been growing steadily for at least 50 years and that this needs to be addressed from both a "chemicals" loading aspect and the waste stream aspect.

The exposure of humans and wildlife to toxic chemicals can result in either acute or long-term effects. Some chemicals, such as PCBs or pesticides, can act directly on organisms. Others cause changes in the environment that create hazards to humans or wildlife, such as volatile organic chemicals and oxides of nitrogen that give rise to tropospheric ozone (or "smog"), and chlorofluorocarbons that degrade the stratospheric ozone layer allowing increased ultraviolet radiation to impact on the earth's surface. Recent scientific investigations have been unable to demonstrate a "no effect" level for some pollutants on humans (*e.g.,* sulfate particles in air, lead levels in children) and this has recently raised concerns and questions about the adequacy of past health protection measures.

In order to assess the health and environmental risks of chemicals, the physical, chemical and toxicological properties of high and low production chemicals as well as unintentionally produced by-products need to be known and assessed.

1.4 A MODEL FOR EXAMINING TOXIC CHEMICALS ISSUES

In this report, as an aid to examining issues related to toxic chemicals in the environment, the main processes involved are represented by the following model comprising four distinct stages (problem identification and priority setting; risk assessment; risk management; and monitoring and evaluation) connected in a cyclical manner. This is referred to in this report as the "toxics cycle".



The *problem identification and priority setting stage* involves scientific activities carried out with information and data provided by a wide range of sources, including government, academia and industry. Potential toxic chemicals issues may be identified through routine or targeted environmental or human health monitoring programs, laboratory or field toxicology studies, or ongoing government programs involving the screening of new or existing chemicals. At this stage, identification of an emerging issue or priority for further action can result in a demand for a risk assessment to determine whether the initial indication of a problem is valid or not. New issues may be identified at this stage of the cycle as well as different aspects of previously considered issues, for example through outputs from the *monitoring and evaluation stage*.

The second stage is *risk assessment*, wherein a chemical, a class of chemicals or a complex mixture is subjected to a critical review of available data on: sources of releases to the environment; presence, levels and trends in environmental media and organisms; and exposure of and effects on humans and environmental organisms. Risk assessment methods evolve with time due to continuous developments in the science involved and changes in understanding of the mechanisms of action of toxic chemicals. Indeed, risk assessment processes create demands for new scientific methods, data and information. Approaches vary significantly from one jurisdiction to another, although international organizations such as the OECD and the World Health Organization (WHO) are making efforts to bring some commonality to the approaches used. This stage of the cycle is predominantly a scientific activity to determine whether a substance poses a risk to human health or the environment.

Substances that have undergone risk assessment and are found to pose an unacceptable risk may then be subjected to *risk management*, wherein consideration is given to the need to impose measures to control or manage the risk. While science remains an important factor at this third stage in the cycle, other key factors must also considered such as socio-economic considerations, the availability of technology and alternative products and processes, international comparisons and impacts, and communication and consultation with the public and stakeholders that will be affected by proposed changes. In many ways, this stage is the most complex, and in the final analysis, usually involves political considerations.

The final stage involves *monitoring and evaluation* of the effectiveness of implemented risk management measures. These scientific activities may be performed by government, academia, industry, etc. and can occur at the national or international level. These activities are of a similar nature to those involved in problem identification and priority setting and if risk management measures are not appropriate or adequate, this stage can lead to the identification of new aspects of an issue that had been previously addressed.

It is worth noting at this point that this four-stage cycle is a model that describes what happens in countries with well-established risk assessment and management programs, such as in most developed countries. For countries with economies in transition and developing countries, not all of these stages may be followed, at least not in all cases, due to inadequate legal measures and/or lack of scientific and technical staff and resources to carry out the required activities to identify, assess, manage and monitor toxic substances. This issue of capacity for the sound management of chemicals will be addressed in later sections of this report.

In evaluating the manner in which a specific program or issue may impact on the international chemicals agenda, it is necessary to understand which stage of the cycle that a program or issue represents, as well as other relevant considerations, such as common concern for an issue and/or transboundary aspects, that demonstrate the need for intergovernmental action. As difficult as it is to take a chemical through the stages of problem identification, risk assessment and risk management on a national level, it is much more difficult to go through these stages at the regional or global level due the different political, legal and social factors involved and the need to develop the consensus which is required to make a decision to take action and sustain the necessary effort to implement action over time.

Almost all of the conventions, protocols and agreements included in section 4 represent risk management (stage 3) commitments. Some also include measures to add new substances to the agreement, which is a form of risk assessment (stage 2), and to monitor human health and/or the environment to assess the effectiveness of the agreements (stage 4). A few of the agreements and several other initiatives consist of research programs and these primarily serve to identify new problems (stage 1) and/or monitor the impacts of implemented risk management measures (stage 4). It is important to keep these distinctions in mind while reviewing the various agreements, programs and initiatives as one cannot expect a research program to accomplish risk management goals, and the performance of risk management actions will not necessarily inform on the state of the environment.

1.5 THE APPROACH USED IN THIS REPORT

This first section of the report introduces the considerations involved in the examination of toxic chemicals issues and establishes that chemicals may be generated, intentionally or unintentionally, by a wide range of industrial sectors and processes and be released into the environment through a wide range of processes, practices and products. Once released into the environment, these chemicals undergo multimedia distribution and result in local and/or widespread contamination and, in some cases, in long-term contamination. Toxic chemicals can cause direct impacts on wildlife or humans (*e.g.,* POPs, metals), or impacts on the environment that then affect wildlife or humans (*e.g.,* ozone-depleting chemicals). It should be noted that issues related to greenhouse gases are not addressed in this report.

This is followed in Section 2 by a brief description of the current state of the global chemicals industry, based largely on a report released by the Organization for Economic Cooperation and Development (OECD) in 2001. While most of the data and information in the report relate to the 30 OECD countries, sufficient observations and conclusions are included on non-OECD countries that the report is of sufficient general interest and importance to warrant including a summary of its highlights in this report.

Section 3 includes a brief historical perspective of the developments over the past 150 years that have contributed to the current state of play in the international chemicals agenda, highlighting the United Nations Conference on Environment and Development (UNCED) in 1992 and the impacts of the decisions taken at that meeting on subsequent developments in the international chemicals area.

Section 4 includes short descriptions of selected current regional and international chemicals agreements, programs and initiatives that include research, hazard and risk assessment, risk management, and monitoring and surveillance activities. These are discussed in the context of current and emerging chemicals issues. The information incorporated in this section of the report was compiled in mid-2002, with the exception of a few high profile issues for which updated information was included as the report was being completed (June 2003). This lengthy but not exhaustive summary demonstrates the importance of chemicals issues in modern societies and why failure to address such issues can seriously undermine sustainable development initiatives at the national, regional and global levels.

Section 5 includes a brief summary of the contents of sections 1 to 3, an analysis of the agreements, programs and initiatives in section 4 based on the toxics cycle, and concludes with a brief discussion of the relevance of international toxic chemicals issues and programs to the World Bank.

As it is intended to inform ongoing strategic discussions within the World Bank, this report highlights opportunities and possible relevance of the chemicals agenda to the Bank's overall strategy and programs but it does *not* contain direction for the Bank's work on the chemicals agenda. Such information can only be produced by the Bank following its internal analysis, consultations and strategic discussions of the growing importance of chemicals management as a global environmental issue.

2 The Nature of the Global Chemicals Industry

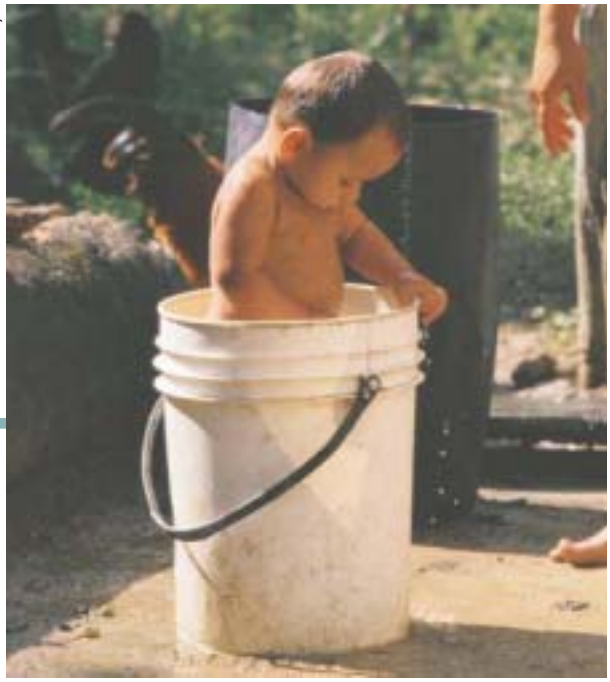
ALL INDUSTRY SECTORS CONSUME CHEMICALS and, thus, they all make a contribution to the loadings of chemicals to the environment through losses from industrial sites and waste disposal practices, distribution of products and articles that eventually result in the releases of chemicals to the environment, or the generation of by-products in industrial and combustion processes at industrial sites. However, within the industrial sector, the chemicals industry is frequently regarded as a prime contributor and while it is among the most highly regulated in the world, concerns remain that the release of intentionally and unintentionally produced chemicals during manufacture, use, transportation or disposal of chemicals and related wastes may be causing damage to environmental organisms or humans. This section provides a brief look at the global chemicals industry, including developments over the past 30 years and a projection to the year 2020. Most of this information was condensed from the 2001 report entitled *OECD Environmental Outlook for the Chemicals Industry* that includes an excellent review of the current situation and some predictions that are pertinent to the current report. While most of the data and information relate to the 30 OECD countries, sufficient observations and conclusions are included on non-OECD countries to make the report of general interest and importance. Interested readers can access the full report at the OECD website (www.oecd.org/ehs).

2.1 CHARACTERISTICS

The chemicals industry is considered by some to be the first high-technology industry. Since the middle of the 19th century, it has played a central role in enabling technological change in all sectors of society including agriculture, construction, automobiles, electronics, aerospace, telecommunications, and health services.

The large-scale conversion of basic raw materials such as coal, oil, gas, minerals, air and water into numerous commodity chemicals and thousands of specialty chemicals has made possible the development of countless products. This industry includes companies engaged in the manufacture of a wide range of products including basic chemicals, fertilizers and nitrogen compounds, solvents, paints, varnishes, coatings, pigments and dyes, printing ink and mastics,

J. Pantoja



A young boy is bathed in a plastic bucket in the Amazon region of Brazil.

pharmaceuticals, food additives, medicinal chemicals and botanic products, soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations, pesticides and other agrochemical products, plastics, synthetic rubber, rubber tires and other rubber products, and man-made fibres. Many of these products have become commonplace and are now viewed as essential in elevating and/or maintaining the quality of life in modern society in both developed and developing countries. This research-intensive industry faces constant challenges to develop new products. It has evolved for over 150 years and will continue to do so as it responds to the never-ending demands for innovation to meet the constantly changing needs of the global community.

The global chemicals industry is highly diversified in terms of the nature, size and geographic location of the companies involved. It employs more than 10 million people and accounts for 7% of global income, 9% of international trade and an estimated US$ 1.5 trillion in sales in 1998, which was more than twice the size of the global market for telecommunications equipment and services.

Some companies are very large. For example, the top ten companies in 2000 had revenues of US$ 10-30 billion, employed tens of thousands of workers at numerous large and small sites, and produced very large amounts of some chemicals. However, most chemical producers have less than 50 employees (many have less than 10) and, while these relatively small firms produce the largest number of substances (*e.g.,* ~95% of the ~50,000 chemicals currently produced in the United States), the quantities involved are relatively small and account for less than 10% of total sales of chemicals.

This industry is also highly diversified in terms of the number, type and volumes of products produced. Primary producers convert basic materials into bulk commodity chemicals, which are sold to downstream producers and processors for conversion into other chemicals, formulations, products or articles. Many manufacturing stages may be involved between the primary producer and the final industrial or public consumer of a chemical or product. The output of the chemicals industry may be allocated into the following four categories:

- **Basic (or commodity) chemicals** are typically produced in large quantities at major facilities for consumption in downstream processing and manufacturing facilities in the production of other basic and specialty chemicals or finished products and articles (*e.g.,* ethylene, methanol, sulfuric acid, chlorine gas).
- **Specialty chemicals** are high value-added chemicals that are produced in relatively small quantities for specific applications (*e.g.,* paints, adhesives, dyes).
- **Life science chemicals** are a type of specialty chemical that includes pharmaceuticals, crop protection chemicals and products of biotechnology.
- **Consumer care chemicals** are produced, in some cases in large volumes, for use in formulations in consumer products (*e.g.,* soaps, detergents, cleaners, shampoos).

There are tens of thousands of chemicals in commercial use at any time and this mix is constantly changing as older chemicals are withdrawn from use while new ones are introduced to commerce at the rate of a few hundred per year. As a consequence of the global production, distribution, transformation and formulation of this large number of chemicals, there are currently hundreds of thousands of products, articles and formulations in the marketplace.

Most chemicals in use at any given time are produced in relatively small quantities as demonstrated by data from the European Union and Japan that shows:

- ~1% of all the chemicals on the market are produced in volumes greater than 1,000,000 tonnes/year, and these account for more than 75% of the total annual production volume of all chemicals.
- ~90% of all the chemicals on the market are produced in volumes less than 10,000 tonnes/year and these account for about 1% of the total annual production volume of all chemicals.

In addition to the chemicals that are intentionally produced, many unwanted by-products are uninten-

J. Mallard. © International Labour Organization.

Chemical worker.

tionally produced in chemical processes and these can be present as impurities in basic chemicals, formulations, products and articles. Unintentionally produced by-products may also be generated in industrial and combustion processes. Some by-products are collected and disposed of as hazardous wastes but many are released in emissions and effluents from industrial sites or are distributed in products and subsequently released into the environment during use or disposal, thus causing environmental pollution and exposure of humans and wildlife to toxic substances.

2.2 TRENDS

Over the past 30 years, the global chemicals industry has experienced steady growth in production, consumption and trade, with the value of chemical shipments rising from US$ 171 billion in 1970 to US$ 1.5 trillion in 1998. OECD countries accounted for 83% of world output in 1970 but, despite overall growth at the global level, dropped to 78% in 1998 due to stronger growth in non-OECD countries. Industry growth is projected to continue until 2020, but non-OECD countries are expected to experience a greater rate of growth than OECD countries.

Over the past 40 years, there has been a global expansion of the chemicals industry due to the following factors.

- Multinational chemical companies emerged as OECD-based companies invested in non-OECD countries, a trend that is expected to continue.
- Domestic chemical industries in many developing countries increased investments, began producing specialty chemicals and increased their exports of bulk chemicals.
- Some countries with a small chemicals industry became major suppliers of chemicals (*e.g.,* Korea, China, Taiwan, Saudi Arabia, Canada).
- Global markets have developed along with world economic growth.
- There has been a progressive increase in international trade as tariffs and other trade barriers have been reduced.
- There have been significant advances in telecommunications and transportation.

There is now a genuine global chemicals industry, with sixteen countries accounting for about 80 percent of current global production (US, Japan, Germany, China, France, UK, Italy, Korea, Brazil, Belgium, Luxembourg, Spain, Netherlands, Taiwan, Switzerland, Russia). Despite the dominant position of the US, Western Europe and Japan since the 1970's, other countries initiated or increased their production. For example, in 1975, 65% of world production of methanol occurred in developed regions, with 35% from the rest of the world: by 1993, this situation had reversed. In some countries, the chemicals industry has grown to become a significant economic sector such as in Taiwan where the chemicals industry accounted for 30% of manufacturing in 1996 *vs.* 10% in the US and Western Europe. As another reflection of the globalization of the industry, it is now represented in international fora by the International Council of Chemical Associations (ICCA, see section 4.3.5).

The production for all chemical sectors is currently higher in OECD countries than in non-OECD

countries and the *per capita* consumption of chemicals in the developed world is also far greater than in the developing world. This correlation between chemical consumption and gross domestic product (GDP) *per capita* suggests that there is considerable scope for increased consumption of chemicals in the developing world.

Trade is currently dominated by OECD countries that have almost balanced trade with each other but which register trade surpluses with most other regions. Between 1979 and 1996, chemicals trade in each region of the world grew more than demand and production. The growth in trade volume in developing markets increased more rapidly than in developed markets: this growth rate in exports and imports of chemicals from and to non-OECD countries represents a major change.

2.3 FUTURE PROSPECTS

The chemicals industry is undergoing changes in terms of what is being produced and where it takes place. The OECD predicts continued increasing demands for chemicals (especially in some developing countries) and continued globalization accompanied by an increase in the volume of chemicals in trade and steady growth in chemicals production in non-OECD countries. The largest relative increase is expected to be in the developing countries due to shifts in the production of high volume chemicals to these countries and considerable increases in the rate of investment from OECD countries to non-OECD countries over the next ten years. In response to the strong competition from developing countries on basic chemicals, some OECD-based chemical producers are increasingly turning to production of specialty chemicals and life science products.

Global chemicals output in 2010 is predicted to increase by 63% in real terms compared to 1996, with estimates for annual growth rates for the global industry ranging between 2.6% and 3.5%, about the same as the predicted rate of growth for the world GDP. As the world population is expected to grow at a slower rate, global chemical production *per capita* will increase.

By 2020, the global output of chemicals is expected to increase by 85% over 1995 levels. While the shift to increased chemicals production in non-OECD countries will continue, OECD countries will remain the largest producers in 2020, but their share will decrease to 69% of total world production, declining 10% from 1995 levels.

Total demand for chemicals will increase more rapidly in developing than in developed regions, with China having the highest growth rate, reflecting higher GDP growth and increasing use of chemicals in these regions. By 2020, the developing world will increase its share from 23% of global chemical demand and 21% of production in 1995 to 33% and 31%, respectively.

Industry predictions are that future global growth will be led by pharmaceuticals, followed by specialty chemicals, agricultural chemicals, textile fibres and industrial chemicals. For example, estimates for the US are for annual growth rates over the next ten years of 4.75% in the life sciences sector, 3.25% in specialty chemicals, 1.75% in consumer products, and more than 1.25% in basic chemicals. One prediction is that by the year 2020, specialty chemicals, especially life science products, should exceed annual US revenues for basic chemicals and that production of high volume basic chemicals will have shifted to non-OECD countries.

By 2020 there will likely be fewer and larger multinationals as increasing scale and growth of the global chemicals industry, continuing globalization, increased market openness, competition, and regulatory requirements to protect health and the environment lead to company mergers and alliances to achieve efficiencies and economies of scale. In support of this prediction, the OECD noted that the agrochemicals sector had gone from 27 major companies in 1983 to 12 in 2000, and that in 1998, the merger of so many large and medium sized chemical companies had led *Chemical and Engineering News* to trim its "Top 100" to a "Top 75" list.

2.4 ENVIRONMENTAL ASPECTS

The chemicals industry is heavily reliant on natural resources for feedstocks, including coal, oil, gas, minerals and water. Within the OECD countries, this sector is the largest single consumer of water (43%), followed by iron and steel (26%), pulp and paper (11%) and other sectors (20%). By way of comparison, agriculture is the largest sector on a global basis (69%) followed by manufacturing (23%) and domestic uses (8%). Being a significant consumer of water, it is noteworthy that the chemicals industry uses a high proportion of its water in cooling applications and large volumes of spent water are returned to receiving waterways. Since chemicals may be used to treat the cooling water to prevent the growth of organisms in distribution lines and cooling towers, there may be concerns about the release of chemical contaminants as well as possible impacts of "thermal pollution" resulting from the discharge of warm wastewater to receiving water bodies.

This industry has become more energy efficient in the past ten to fifteen years but still accounted for about 7% of the global energy demand in 1998. Of the total amount of energy consumed by this industry sector, the share used in non-OECD countries increased from 20% in 1971 to 43% in 1998. This trend can be expected to accelerate over the next 20 years if the predictions of stronger growth in the chemicals industry in non-OECD countries are realized.

In regards to the release of greenhouse gases (GHG), the chemicals industry accounts for one quarter of the total releases of carbon dioxide from industrial sector operations, although this amounted to only 4% of the emissions from all sources in 1997. This could change over the next 20 years if the predicted growth in the chemicals industry takes place, especially if predicted stronger growth is realized in non-OECD countries that rely on coal and other fuels that contribute more to GHG (and toxic chemicals) emissions. OECD predicts that, absent improvements in energy efficiency and/or decreased rates of release, the carbon dioxide emissions from OECD and non-OECD countries will increase by 66% and 165%, respectively, from 1995 to 2020. OECD predicts that the emissions from China alone could equal those of all 30 OECD countries by 2020.

The chemicals industry is responsible for the release of significant amounts of toxic chemicals to the environment. This occurs during manufacturing and processing operations, transportation, waste disposal operations, accidents and the use and disposal of products and articles by downstream industrial users and the public. This aspect of the industry is a major concern of governments and the public. Within some OECD countries, the industry has responded by reducing, reusing and recycling materials (thus reducing wastes), by decreasing the amounts of materials that are released to the environment during industrial operations and by taking actions to prevent or minimize the generation or release of unwanted by-products.

The industry also releases volatile organic chemicals (VOC) and oxides of nitrogen (NOx) that contribute to the formation of smog. The reported releases from chemical industry sites in OECD countries do not appear to be increasing and in many cases are declining when expressed in terms of emissions per unit of production. Thus this industry is not regarded as a major contributor to the smog problem in OECD countries. However, this does not take into account the impacts of the products produced by the chemicals industry when they are used by industrial consumers or the public.

3 Historical Perspective

THE NEED TO MANAGE CHEMICALS HAS BEEN evident since the large-scale production of chemicals began in Europe over 150 years ago. There was early recognition that chemicals could cause health and environmental impacts and this led to responses being taken over the years to reduce or eliminate exposure and risks from chemicals used in the workplace or as narcotics, warfare agents, pharmaceuticals or food additives, and from chemicals present as contaminants in environmental media and food. Considerable activity followed the establishment of the UN in 1945 and during the period that led up to the UN Conference on Environment and Development (UNCED) meeting in 1992. The outcomes of the UNCED meeting led to heightened activity and have significantly impacted on national and international developments since 1992. This section provides a brief overview of several developments prior to, during and after the UNCED meeting.

3.1 THE FIRST 150 YEARS

One of the first areas to be addressed was occupational exposure to chemicals. An early case in point was establishing the cause-effect relationship between exposure to polycyclic aromatic hydrocarbons (PAHs) and testicular cancer in chimney sweeps and this led to hygiene measures being taken to reduce the incidence of this disease. Establishing the International Labour Organisation (ILO) in 1919 was a milestone in worker protection and in that year recommendations were made to address the health hazards of using white lead pigments in paints and white phosphorus in the manufacture of matches, followed in 1921 by a convention to further address the hazards posed by the use of white lead in paints. The ILO continued to take measures through the years and information on conventions pertinent to the present report is included in section 4.1.2.

Narcotics were another early area of interest. Meetings of nations began in 1909 and led to the development in 1912 of the *Hague Convention on Exercising Control Over Opium*, which entered into force in 1920 following creation of the League of Nations. After the United Nations was formed in 1945, considerable efforts were made to address this problem with international conventions being signed in 1961, 1971 and 1988. Despite an ever-increasing number of countries becoming signatories to these conventions, the illicit market for narcotic drugs remains a multi-billion dollar per year business. Problems related to this issue include the release to the environment of chemicals used in making illicit narcotics and the environmental releases of large amounts of pesticides and other chemicals that are used in anti-drug programs in an attempt to destroy drug crops. This aspect of chemicals is not addressed further in this report.

The recognition that chemicals could be used in warfare led to what is possibly the earliest international agreement on chemicals, the *St. Petersburg Declaration* of 1868, which was intended to prevent the use of incendiary or fulminating substances in warfare. Following the use of chlorine and mustard gases on troops in World War I, and other chemical agents in subsequent conflicts, the global community agreed on

F. Dobbs

Rachel Carson's Silent Spring was instrumental in demonstrating the long-term affects of chemicals on wildlife.

the need to outlaw such practices and developed agreements to prohibit the manufacture and stockpiling of chemical weapons of mass destruction. The most recent agreement is the *Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and Their Destruction*, which is addressed in section 4.1.4. There continue to be fears that chemical agents may be used in attacks on both military and civilian populations and recent terrorist attacks in the US and elsewhere have heightened concerns in this regard.

At the beginning of the twentieth century, the need was recognized for establishing international standards for pharmaceuticals. In 1902, a meeting of 18 countries initiated a process that led to an agreement in 1906 on an "International Formulary" which addressed nomenclature, methods of preparation and standards for 41 medicines. Work was subsequently carried out by an increasing number of countries under the League of Nations and, following establishment of the United Nations in 1945, the World Health Organisation (WHO) released the first *Pharmacopeia Internationalis* in 1951. WHO has continued actively to ensure that international standards are available for many drugs. While the present report does not address standards for drugs as part of the review of chemicals issues, it should be kept in mind that the processes involved in the manufacture of chemical drugs are just like any other chemical manufacturing processes. The issues relating to occupational exposure, factory emissions, wastes, etc. would apply to this industry sector and the fact that drugs are biologically active chemicals should only add to the interest in them. One aspect of drugs that is starting to attract attention relates to the release of human drugs, especially birth control drugs (hormones), from sewage treatment facilities. Recent studies have shown that sewage treatment processes do not eliminate these drugs or their metabolites and that there may be significant impacts on fish and wildlife from long-term exposure to even low levels of these substances.

The formation of the United Nations in 1945 was followed by the establishment of most of the intergovernmental organizations (IGOs) we are now familiar with, including the UN specialized agencies that have programs or agreements dealing with chemicals issues (FAO, ILO, UNECE, UNEP, WHO, etc.). These IGOs have been active in developing and implementing agreements and programs that directly or indirectly address a wide range of chemicals issues. Section 4 of this report provides brief summaries of several of these.

The early attempts to manage the risks posed by toxic chemicals involved problems involving relatively high levels of pollutants. For example, early efforts were made to reduce air pollution based on problems related to odours, visible releases of 'soot and smoke' (particulate pollutants such as PAHs, metals, etc.) and dust deposition. Control efforts produced noticeable decreases in odours and in releases of pollutants such as particulate matter from such sources as industrial operations, including combustion of coal and other fuels. This is sometimes referred to as the "macropollutant" era, as actions were triggered by the obvious releases of 'bulk' pollutants from stacks and industrial sites.

Over the years, good progress was made in reducing the release of macropollutants. At the same time scientific advances were made that allowed measurement of smaller quantities of chemicals in environmental media and biota, the determination of adverse effects at lower doses and the identification of more subtle toxicological end-points. This was also accompanied by a greater awareness of the potential effects of long-term low-level exposure to chemicals in the environment. In 1962, Rachel Carson effectively communicated this in her book *Silent Spring,* wherein she drew attention to the effects on wildlife populations that were being caused by the widespread and growing use of pesticides. Many countries had developed national regulatory programs in the 1940's and 1950's to assess the effectiveness and health and environmental implications of pesticides, and to control their sale and use. However, Carson's book drew attention to the largely unrecognized problems caused by the use of pesticides and to the effects that can result from long-term low-level exposures to environmental levels of chemicals such as pesticides. The existence of the "minipollutant" era was acknowledged. Interest continued to grow in the effects that could be attributed to persistent toxic substances in the environment and increased public awareness of toxic chemicals issues led to national programs and legislation being developed in the 1970's, especially in OECD countries where action was taken to control releases of mercury and polychlorinated biphenyls (PCBs) in the early 1970's. This also marked the beginning of a 30-year period of developing regional and global legal agreements, programs and other initiatives that still continues.

In the 1970's and 1980's, new or augmented programs were initiated to address the risks of pesticides and those posed by new and in-use industrial chemicals. This period was characterized by the active development of chemicals management programs, particularly within OECD countries. This surge of interest within the OECD continues to this day and the OECD program remains pre-eminent in international fora in terms of the development of methods for characterizing the physical, chemical and toxicological properties of chemicals and pesticides (see section 4.3.10). The recognition that trade in hazardous chemicals was another problem led to the development of measures at the OECD that would lead to the *London Guidelines for the Exchange of Information on Chemicals in International Trade*. Another issue that was recognized during this period was the threat posed to the earth's stratospheric ozone layer by ozone depleting substances. This resulted in the adoption of the Vienna Convention in 1985 and the Montreal Protocol in 1987 to control the manufacture, use and release of several chemicals (section 4.1.5.1). It was also recognized that subtle adverse effects were occurring as a result of human exposures to lead due to the widespread use of lead additives as octane enhancers in motor gasoline. Actions were taken in many countries to phase out the use of lead additives, although the problem still has yet to be addressed in several countries (section 4.3.12.2).

A child in Bhutan with a basket of fruit.

C. Carnemark

With the passage of time, and as experience and knowledge were gained, attention became focussed on the toxic effects that were attributable to lower and lower concentrations of chemicals in the environment. The era of "micropollutants" was recognized sometime during the late 1970's or early 1980's and concerns remain today that there may be population level effects occurring in present or future generations of wildlife and/or humans as a result of the widespread presence in the environment of complex mixtures of pesticides, industrial chemicals and by-products. Most attention in this regard was directed to substances that were known to be persistent, toxic and bioaccumulative. These concerns were already evident by 1990 and helped set the stage for the discussions that would take place in 1992 at a global meeting to address a wide range of environment and development issues.

3.2 UNITED NATIONS CONFERENCE ON ENVIRONMENT AND DEVELOPMENT (UNCED)

UNCED was held from June 3-14, 1992, in Rio de Janeiro, Brazil, and was well attended by Heads of State from many countries. The meeting produced a lengthy report, entitled *Agenda 21*, which addressed the environment and development needs for pursuing sustainable development in the 21st century. Chapter 19 of this report (*Environmentally Sound Management Of Toxic Chemicals, Including Prevention Of Illegal International Traffic In Toxic And Dangerous Products*) addressed the issues of toxic chemicals. Other related material is found in Chapter 20, concerning the management of hazardous wastes, and Chapter 37, concerning capacity building in developing countries.

Chapter 19 acknowledged:

- The importance of the adverse impacts of chemicals on the environment, especially the long-range effects of such pollution.
- The need for increased efforts at the national and international levels to achieve environmentally sound management of chemicals.
- A broad awareness of chemical safety issues as a prerequisite for achieving chemical safety.
- Insufficient scientific information was available to assess the risks posed by the generation, use and release of the thousands of chemicals in use.
- The need for increased coordination of UN bodies and other IGOs involved in assessing and managing chemicals to address toxic chemicals issues.
- The public and workers had a 'right to know' the risks posed by chemicals that are generated, used and/or released in their communities and workplaces.
- Industry had a role to play in promoting adequate operating standards in all countries to protect health and the environment.
- Illegal trade in toxic and dangerous products

PRIORITY PROGRAM AREAS FOR MANAGING TOXIC CHEMICALS (CHAPTER 19, *AGENDA 21*)

1. **Expanding and accelerating international assessment of chemical risks.** Objective: to strengthen international risk assessment, assess several hundred priority chemicals or groups of chemicals by 2000, and produce exposure guidelines for a large number of toxic chemicals.
2. **Harmonization of classification and labelling of chemicals.** Objective: to develop, by 2000, a globally harmonized hazard classification and labelling system, including material safety data sheets and easily understandable symbols.
3. **Information exchange on toxic chemicals and chemical risks.** Objective: to increase the exchange of information on chemical safety, use and emissions among all involved stakeholders, and achieve full participation in and implementation of the procedure for prior informed consent (PIC) by the year 2000.
4. **Establishment of risk reduction programs.** Objective: to eliminate unacceptable or unreasonable risks posed by toxic chemicals and, where economically feasible, to reduce such risks through risk reduction and precautionary measures based on life-cycle analyses.
5. **Strengthening of national capabilities and capacities for managing chemicals.** Objective: all countries should have in place, by 2000, national systems for the sound management of chemicals.
6. **Prevention of illegal international traffic in toxic and dangerous products.** Objective: to reinforce national capacities to detect and prevent traffic in toxic and dangerous products that contravenes national legislation or international legal instruments.

damaged health and environment, particularly in developing countries.

Chapter 19 identified six priority program areas (see box, page 16), made recommendations to address the global problems posed by toxic chemicals and set objectives for the global community. In addition, WHO, ILO and UNEP were invited to convene an intergovernmental meeting within one year (*i.e.,* in 1993) to establish an "intergovernmental forum on chemical risk assessment and management" to increase coordination among IGOs involved in chemical risk assessment and management. This recommendation led to the establishment of the IFCS in 1994 (see section 4.3.4). Another result was the creation of the Inter-Organisation Programme for the Sound Management of Chemicals (IOMC) in 1995 (section 4.3.9).

Expanding and accelerating international assessment of chemical risks: The objectives for this program area were to strengthen international risk assessment and assess several hundred priority chemicals or groups of chemicals by 2000, and to produce exposure guidelines for a large number of toxic chemicals.

It was acknowledged that while assessing the health and environmental risks posed by toxic chemicals was a prerequisite to their safe and beneficial use, basic data for risk assessment were lacking for most high production volume chemicals. Recognizing the resource-intensive nature of risk assessment, and as every country would not be able to acquire sufficient trained staff to perform this work, it was recommended that international cooperation and coordination be strengthened to optimize the use of available resources and avoid duplication of effort.

Governments were encouraged to cooperate with relevant stakeholders to strengthen and expand programs on chemical risk assessment, promote mechanisms to increase collaboration among stakeholders, encourage development of procedures for exchanging national assessment reports on chemicals, give high priority to hazard assessment of chemicals as a basis for conducting risk assessments, and generate data needed for assessment by building on regional and international programs. Industry was encouraged to provide the data needed in this assessment work.

Harmonization of classification and labelling of chemicals: The objective for this program area was to develop, by the year 2000, a globally harmonized hazard classification and labelling system, including material safety data sheets and easily understandable symbols. The system should be based on existing systems and not create trade barriers.

Information exchange on toxic chemicals and chemical risks: The objectives for this program area were to increase the exchange of information on chemical safety, use and emissions among all involved stakeholders, and to achieve full participation in and implementation of the procedure for prior informed consent (PIC) by the year 2000. Governments were encouraged to cooperate with stakeholders in elaborating these measures and in establishing a core of trained personnel within each country.

Establishment of risk reduction programs: The objective of this program area was to eliminate unacceptable or unreasonable risks posed by toxic chemicals and, where economically feasible, to reduce such risks through risk reduction and precautionary measures based on life-cycle analyses.

Governments were encouraged to cooperate with stakeholders in a wide range of efforts including:

- Adopting policies based on producer liability principles and precautionary, anticipatory and life-cycle approaches to the management of chemicals
- Undertaking concerted regulatory and other activities to reduce risks presented throughout the life cycle of toxic chemicals (*e.g.,* promoting the use of cleaner products and technologies, emission inventories, product labelling, use limitations, economic incentives)
- Adopting policies and regulatory and other measures to identify and minimize exposure to toxic chemicals by substituting less toxic products
- Phasing out or banning toxic chemicals "that pose an unreasonable and otherwise unmanageable risk to the environment or human health and those that

are toxic, persistent and bio-accumulative and whose use cannot be adequately controlled"
- É Preventing accidents and undertaking preparedness and response measures for hazardous facilities
- É Establishing or strengthening national poison control centres
- É Addressing the risks posed during the storage of outdated chemicals
- É Reducing the use of agricultural chemicals through such measures as alternative farming practices and integrated pest management
- É Minimizing adverse effects of chemicals in food.

Industry was encouraged to develop emergency response procedures and plans, an international code of principles to manage trade in chemicals in cooperation with governments and relevant IGOs, a "responsible care" approach covering the life cycle of products, voluntary community right-to-know programs, and reports on annual emissions of toxic chemicals released to the environment.

Strengthening of national capabilities and capacities for managing chemicals: Recognizing that many countries lacked adequate legal systems to manage toxic chemicals and the scientific and technical expertise needed to assess health and environmental risks, the objective for this program area was for all countries to have in place, by 2000, national systems for the sound management of chemicals, including:
- É Adequate legislation
- É A risk management policy
- É Effective education programs
- É Capacity to gather and disseminate information
- É Capacity to perform risk assessment and interpretation
- É Capacity to implement and enforce legislation and policy
- É Capacity to rehabilitate contaminated sites and poisoned persons
- É Capacity to respond to emergencies.

Prevention of illegal international traffic in toxic and dangerous products: The objectives of this program area were to:
- É Reinforce national capacities to detect and prevent traffic in toxic and dangerous products that contravenes national legislation or international legal instruments.
- É Assist countries, particularly developing countries, in obtaining appropriate information concerning illegal traffic in toxic and dangerous products.

It was recognized that strengthened international and regional cooperation was needed to prevent illegal transboundary movement of toxic and dangerous products that are banned, severely restricted, withdrawn or not approved for use or sale by governments, and that capacity-building was needed to improve national monitoring and enforcement capabilities in order to protect public health and the environment.

3.3 THE POST-UNCED PERIOD

Since UNCED, much has been accomplished in the area of chemical safety. Global and regional programs on toxic chemicals have been initiated or strengthened to respond to the challenges in Chapter 19 of *Agenda 21* and many of these are described in section 4 of this report. The IFCS and IOMC were established and have contributed to coordinating international efforts to advance the sound management of chemicals and achieve progress on the goals laid out in Chapter 19. Risk assessments have been produced on several hundred chemicals and initiatives are underway to generate data and assessments on thousands of high production volume chemicals. In terms of managing the risks of toxic chemicals, several conventions and protocols have been adopted at the global level (*e.g.,* climate change, Stockholm Convention on POPs, Rotterdam Convention on PIC) and regional level (*e.g.,* UNECE Protocols on POPs, heavy metals and emission of sulphur and volatile organic substances; UNEP regional seas conventions) and development of a globally harmonized system for classification and labelling of chemicals has been completed.

However, new issues continue to appear and the presence of endocrine disrupting chemicals in the environment is a recent example. It has now been determined that, even at very low levels in the environment, some chemicals have the ability to

interfere with the functioning of the endocrine systems of fish and wildlife, in some cases causing changes in the organs or sex of some species. One clear example is an ingredient widely used in anti-fouling paints on the hulls of ships (tributyl tin, TBT) that caused deformations and sex changes in sea organisms. This result led to the development of a recent IMO convention to phase out the use of TBT (section 4.1.3.3). While it is already accepted that endocrine disruption has occurred in fish and wildlife, there is no clear agreement on whether environmental contaminants are interfering with the endocrine systems of humans. This is currently a hotly debated topic and the subject of intense research efforts.

Other toxic substances issues are being discovered as scientists continue to improve their abilities to analyse environmental contaminants in increasingly smaller amounts. One recent example involved the discovery that a large family of fluorinated compounds was contaminating humans and the environment in previously undetected amounts. These chemicals were used in dozens of consumer and industrial products and this discovery led 3M to abandon worldwide manufacture of its "Scotchguard" products in 2000, after over 50 years of production. The OECD is now assessing the significance of current levels of these chemicals in the environment and in humans and released a comprehensive report on this subject in November 2002. We can expect discoveries of a similar nature to be made in the future.

The World Summit on Sustainable Development (WSSD) was held in September 2002 to review progress in implementing Agenda 21. With regard to the chemicals area, there remains concern that, despite all the progress that has been made in international approaches to the sound management of chemicals, much more needs to be done. Concerns remain for chemicals that:

- Are already known to be of concern (*e.g.,* POPs, heavy metals, etc.)
- Possess certain physical and chemical properties (*e.g.,* persistent toxic chemicals, volatile organic chemicals that cause smog)
- Cause toxicological effects of concern (*e.g.,* endocrine disruption, cancer)
- Affect certain target groups (*e.g.,* the poor, pregnant women, children, elderly, aboriginal populations)
- Are produced in large volumes and lack data on their physical and chemical properties.

The recent support by WSSD and all stakeholder groups for a UNEP-led initiative to develop a strategic approach to international chemicals management (section 4.3.12.3) will likely sustain interest in advancing the sound management of chemicals for years to come.

4 Chemicals Agreements, Programs, and Activities

THIS SECTION CONTAINS SUMMARIES OF THE main points of international agreements, programs and activities that directly or indirectly address chemicals issues. No attempt has been made to include information on national programs, as the intent of the present analysis is to assess the current state of play at the international level. However it is worth noting that national research findings, new chemicals management policies and risk management decisions can strongly influence international activity. While the coverage in this section is not complete, sufficient material is included to show the current situation in the global chemicals area. The sequence follows the order of global agreements, regional agreements (from larger to smaller regions), and international programs and initiatives on chemicals. Much of this information has been digested from relevant websites and the UNEP report *International Activities Related to Chemicals* (third edition, 2001), available in hard copy from UNEP Chemicals or on the UNEP website (http://www.chem.unep.ch/irptc/Publications/pb0901.html).

4.1 GLOBAL AGREEMENTS

This section is arranged alphabetically by organization and, where there is more than one agreement for an organization, they are presented in order of historical development. This is established by the date of signing or adoption of an agreement, as such actions constitute political commitment to honour the agreement and its measures are normally implemented on a voluntary basis prior to the date of formal entry into force (e.i.f. date).

4.1.1 Agreements under the Food and Agriculture Organization (FAO) and United Nations Environment Programme (UNEP)

The **Rotterdam Convention on the Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals and Pesticides in International Trade** was adopted on September 10, 1998 (e.i.f. February 24, 2004). Its objective is to protect human health and the environment from specified hazardous chemicals by promoting shared responsibility and cooperation among Parties in respect to their international trade and environmentally sound use, by facilitating relevant information exchange, and by providing an agreed process for making national decisions on the import and export of these chemicals and for distribution of such decisions to Parties. The convention includes procedures for formally obtaining and distributing decisions of importing countries on future shipments of specified chemicals and for ensuring compliance with these decisions by exporting countries. The result is that Parties will not be able to export the 22 pesticides and 5 industrial chemicals currently specified in the convention without the prior informed consent of the importing Party. There are provisions for exchanging specified information between Parties, for labelling potentially hazardous chemicals that may be exported and imported, and for informing Parties of any national decision to ban or severely restrict a chemical. Chemicals will be added to the convention in the future through a specified process in which a Chemicals Review Committee will evaluate candidates for addition, including hazardous

pesticide formulations, nominated by developing countries or countries with economies in transition, and chemicals or pesticides that have been banned or severely restricted for health or environmental reasons by Parties in at least two geographic regions. Parties have agreed to cooperate in promoting technical assistance and capacity building in implementing the convention but there is no financial mechanism.

When the convention enters into force, it will provide a legal basis for and expand the existing voluntary PIC procedure operated since 1989 by FAO and UNEP as set out in the *London Guidelines for the Exchange of Information on Chemicals in International Trade* and the *FAO International Code of Conduct on the Distribution and Use of Pesticides* (section 4.3.3). FAO and UNEP jointly serve as interim secretariat pending entry into force of the convention, after which time they will form the joint secretariat. The Intergovernmental Negotiating Committee that developed the convention continues to meet annually to provide oversight for the interim PIC procedure, including operation of an Interim Chemicals Review Committee that is reviewing candidate chemicals and preparing recommendations for formal consideration following entry into force of the convention.

4.1.2 Agreements under the International Labour Organization (ILO)

4.1.2.1 Convention 13: Use of White Lead in Painting

Adopted on November 19, 1921 (e.i.f. August 31,1923), this convention was intended to protect workers by prohibiting the use of white lead, lead sulphate and all products containing more than 2% of lead-containing pigments in the interior painting of buildings, except for a few situations where such use is deemed necessary. Where these pigments are used, males under eighteen years of age and all females are effectively prohibited from being employed and such uses must be regulated to prevent exposures to dusts or sprays and to provide for education and hygienic measures for workers to prevent contamination of their clothing or person. Worker health must be monitored, cases of lead poisoning must be notified and certified, and national statistics on such cases must be maintained.

4.1.2.2 Convention 136: Protection against Hazards of Poisoning Arising from Benzene

This convention was adopted on June 23, 1971 (e.i.f. July 27, 1973), and is intended to protect workers from the hazards posed by benzene or products that contain more than 1% benzene. The use of benzene or benzene-containing products is prohibited, except for uses in enclosed systems or situations where workers are protected (*e.g.,* by respirators), and persons under 18 years of age, pregnant women and nursing mothers should not be exposed to benzene-containing products in the workplace. The convention promotes substitution of less harmful substances and products and requires measures to be taken to protect workers from inhalation and dermal exposure to benzene or benzene-containing products. Workplace concentrations of benzene must be monitored and maintained below standard levels and the health status of workers must be monitored.

4.1.2.3 Convention 139: Prevention and Control of Occupational Hazards caused by Carcinogenic Substances and Agents

Adopted on June 24, 1974 (e.i.f. June 10, 1976), this convention was intended to prohibit worker exposure to carcinogenic substances and agents and requires Parties to substitute non-carcinogenic or less harmful substances or agents for known carcinogens. Where substitution is not possible, processes must be implemented to authorize the use of carcinogenic materials, while reducing to a minimum the number of workers exposed and the duration and degree of such exposure, and to maintain an appropriate system of records on exposed workers. Such workers must be informed of the dangers involved and the measures to be taken and be provided with medical examinations or tests during and after the period of employment to evaluate their exposure and state of health.

Courtsy of Srishti/Toxics Link

Woman at Alang Ship Breaking Yard in India.

4.1.2.4 Convention 148: Protection of Workers against Occupational Hazards in the Working Environment Due to Air Pollution, Noise and Vibration

This convention was adopted on June 20, 1977 (e.i.f. July 11, 1979), and is intended to protect workers from the hazards posed by noise, vibration and air that is contaminated by substances that are dangerous or harmful to health. Parties must establish legislation and programs to protect workers from these occupational hazards and establish and update criteria and limits for exposure in the workplace. Measures should apply to both existing and new plants or processes. When implemented measures fail to bring workplace air pollution within specified limits, workers must be provided with suitable personal protective equipment. Workers must be informed of potential occupational hazards and the measures available for the prevention, control of and protection against these hazards and the health of exposed workers must be evaluated periodically.

4.1.2.5 Convention 162: Safety in the Use of Asbestos

Adopted on June 24, 1986 (e.i.f. June 16, 1989), this convention was intended to protect workers from exposure to airborne respirable forms of asbestos, a carcinogen. Parties are required to develop, implement and periodically update strict national requirements to prevent and control occupational exposure to asbestos. Spraying of all forms of asbestos should be prohibited. The use of asbestos should be subject to total or partial bans and less hazardous replacement products and technologies should be sought for most uses. All continued uses must be authorized and employers are subject to strict hygiene requirements to protect worker health and must inform workers of the dangers involved and the protective measures to be taken. Workplace air standards must be developed and employers must monitor occupational levels and the health of exposed workers and retain pertinent records. Actions are required to prevent workers from leaving the workplace with contaminated clothing and to prevent the release of asbestos during demolition and waste disposal activities.

4.1.2.6 Convention 170: Safety in the Use of Chemicals at Work

This convention was adopted on June 25, 1990 (e.i.f November 4, 1993), and was intended to enhance existing legal measures to protect workers from the harmful effects of chemicals by regulating the management of chemicals in the workplace. Provisions include the right of workers to be informed about and have access to information on all workplace chemicals. Specific measures are included to assess risks to workers from hazardous chemicals and to inform of and protect workers from such risks. Workers have the right to remove themselves from dangers posed by workplace chemicals if they believe there is an imminent and serious risk to their health or safety. The convention also requires Parties that export a chemical that is prohibited for reasons of workplace safety or health to communicate this fact to importing countries: this is similar to the information exchange provisions in the Rotterdam Convention on Prior Informed Consent (section 4.1.1). ILO has published two related documents: *Code of Practice on Safety in the Use of Chemicals (1993)* and *Safety and Health in the Use of Chemicals in Work: A Training Manual (1993).*

4.1.2.7 Convention 174: Prevention of Major Industrial Accidents

Adopted on June 22, 1993 (e.i.f. January 3, 1997), this convention was intended to protect workers, the public and the environment against risks of major industrial accidents involving hazardous substances by preventing such accidents and limiting their consequences. Parties are required to develop coherent national policies and implement them through preventive and protective measures for major hazard installations and, where practicable, promote the use of best available safety technologies. Employers must report major accidents and national authorities must establish emergency plans and procedures, disseminate information to the public on safety measures and take corrective action in the event of an accident. There is also provision for an international exchange of information on major accidents and on related safety and organizational measures. ILO has published *Major Hazard Control – A Practical Manual (1988)* and adopted a *Code of Practice on the Prevention of Major Industrial Accidents (1991)* as guidance for national authorities.

4.1.3 Agreements under the International Maritime Organization (IMO)

4.1.3.1 Convention for the Prevention of Pollution from Ships

This convention was adopted on November 2, 1973, and modified by a Protocol that was adopted on February 17, 1978. The two agreements are regarded as one legal instrument (commonly referred to as *MARPOL 73/78*) that entered into force on October 2, 1983. Its objective is to prevent and control marine pollution from oil, noxious liquid substances, sewage and garbage by eliminating discharges from all types of ships in the course of operations and by minimizing accidental releases from the collision or stranding of ships, floating platforms or fixed platforms. The disposal of waste into the sea by dumping is exempted. Some control provisions specify "special areas" that are accorded a higher level of protection than other sea areas: these include the Mediterranean Sea, Baltic Sea, Black Sea, Red Sea, the Gulfs, Gulf of Aden, Antarctic area, North West European waters, North Sea and the Wider Caribbean regions. For these special sea areas, IMO coordinates its activities with relevant international organizations such as UNEP and UNESCO.

4.1.3.2 Convention on Oil Pollution Preparedness, Response and Cooperation and its Protocol

Adopted on November 30, 1990 (e.i.f. May 13, 1995), this convention is intended to facilitate international cooperation and mutual assistance in preparing for and responding to major oil pollution incidents that threaten the marine environment and coastlines, and to encourage countries to develop and maintain the capability to respond to major oil pollution emergencies involving ships, offshore units, sea ports and oil handling facilities. Parties must: report pollution incidents involving ships, offshore units, aircraft, seaports and oil handling facilities; advise neighboring states that are at risk from pollution incidents; develop oil pollution emergency plans for tankers, ships and fixed or floating offshore installations engaged in specified gas or oil activities (exploration, exploitation, production, loading or unloading oil); establish national systems for responding at the national and regional levels to oil pollution incidents; and cooperate on technical issues and in the transfer of technology.

In March 2000, the ***Protocol on Preparedness, Response and Cooperation to Pollution Incidents by Hazardous and Noxious Substances*** was adopted, extending the scope of the convention to hazardous and noxious substances. Pending its entry into force, IMO has been requested to initiate action to meet the Protocol's objectives.

4.1.3.3 Convention on the Control of Harmful Anti-fouling Systems on Ships

This convention was adopted on October 5, 2001, to address the release to water of toxic chemicals that are present in the anti-fouling systems used on the hulls of ships. The first step is a global phase-out of systems that are based on organotin compounds. The use of tributyl tin (TBT) in anti-fouling paints on

ships will be prohibited effective January 1, 2003, and by January 1, 2008, ships must either be free of such compounds on their hulls or have a coating applied as a barrier to prevent them from leaching into water. Certificates of compliance will be required for ships above 400 tonnes that are engaged in international voyages and they will be re-examined when anti-fouling systems are changed or replaced. Ships of 24 metres or more in length but less than 400 tonnes and engaged in international voyages must carry a Declaration on Anti-fouling Systems accompanied by appropriate documentation to confirm that compliant anti-fouling systems are in use. The convention includes a process to evaluate and if necessary restrict the use of other harmful substances in anti-fouling systems.

4.1.4 Agreements under the Organisation for the Prohibition of Chemical Weapons (OPCW)

The ***Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and Their Destruction*** was adopted on September 3, 1992, (e.i.f. April 29, 1997) and is intended to prohibit and eliminate chemical weapons of mass destruction including toxic chemicals, their precursors, specially designed ammunition and devices and equipment for their deployment. Parties to the convention must: prohibit the development, production, acquisition, retention, transfer, stockpiling and use of chemical weapons; prohibit the use of riot control agents as a method of warfare; destroy existing chemical weapons (including those they abandoned on the territory of another Party) following criteria, timelines and procedures in the convention and using designated facilities and means other than dumping in a body of water, land burial or open-pit burning; destroy related production facilities under strict international verification and following criteria, timelines and procedures in the convention; provide transparency through verification in relation to nonproliferation of chemical weapons and related capabilities; provide assistance to Parties when chemical weapons are used against them; and foster international cooperation in the field of peaceful chemical activities.

4.1.5 Agreements under the United Nations Environment Programme (UNEP)

4.1.5.1 Vienna Convention on the Protection of the Ozone Layer and the Montreal Protocol on Substances That Deplete the Ozone Layer

This convention was adopted on March 22, 1985 (e.i.f. September 22, 1988), without an agreement on specific control measures. Intended to foster international cooperation to protect the stratospheric ozone layer from adverse impacts caused by human activities, it provides a framework for the exchange of data on matters related to the ozone layer and served as a foundation for creating a regulatory framework (the Montreal Protocol). Parties to the convention cooperate in: the conduct of scientific research and information exchange on the state of the ozone layer,

Methyl bromide is a controlled substance under the Montreal Protocol because of its ozone depleting characteristic. It is also toxic to humans.

Courtesy of USDA

the chemicals and processes that impact on the ozone layer, alternative chemicals and processes, and the health and environmental impacts of changes in the ozone layer; the development of measures to control human activities that adversely affect the ozone layer and, in this regard, the development of protocols to the convention; and the development and transfer of relevant technology and knowledge. The Parties receive advice on scientific and technical matters from a Meeting of Ozone Research Managers that comprises government experts in atmospheric, health and environmental aspects of ozone layer modification and works with the World Meteorological Organization to review current research and monitoring programs to ensure coordination between them and identification of any gaps that should be addressed.

The ***Montreal Protocol on Substances That Deplete the Ozone Layer*** was adopted on September 16, 1987 (e.i.f. January 1, 1989), and has since been amended several times to expand its scope and stringency. It has as its goal the protection of the ozone layer by reducing and eliminating global anthropogenic emissions of ozone-depleting substances (ODS). For chemicals identified in the protocol, Parties must control their annual rates of consumption and production in comparison with established national baseline amounts, with the objective of reducing and eventually eliminating production and consumption by specified dates (which are specific for each chemical and different for developing and developed country Parties). Parties are prohibited from trade in ODS with Non-Parties and a licensing system was implemented in January 2000 to track each shipment of controlled ODS in international trade in order to discourage illegal trade which was estimated at about 30,000 tonnes/year.

Three expert Panels advise Parties to the protocol. The Scientific Assessment Panel (government and other experts) undertakes a review of scientific knowledge every four years as requested by the Parties. The Technology and Economics Assessment Panel (industrial and nongovernmental representatives) provides advice on technical options for limiting the use of ODS, the needs and likely availability of controlled ODS in developing countries, the cost implications of proposed technical solutions, the benefits of reduced use of controlled ODS, and technology transfer issues. The Environmental Effects Assessment Panel (nongovernmental experts) provides advice on the impacts on health and environment of changes in ozone levels and the consequent changes in ultraviolet radiation impacting on the Earth's surface.

A Multilateral Fund was created to provide developing country Parties with financial and technical assistance to meet the incremental costs of implementing the protocol controls. This Fund became operational on January 1, 1991, and more than US$ 1 billion has been allocated to date for ODS reduction and elimination programs in over 107 countries. The Global Environment Facility (GEF) also funds ODS phase-out programs from its budget, focusing on areas of expenditure and countries not eligible for assistance from the Fund: it has approved more than US$ 138 million for projects in 14 countries with economies in transition that are not eligible for assistance under the Fund.

4.1.5.2 Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, and Related Protocol

This convention was adopted on March 22, 1989 (e.i.f. May 5, 1992), in response to the global production of several hundred million tonnes/year of waste materials that are hazardous to humans or the environment and the consequent need for international action to address the transboundary movement of such wastes and ensure their environmentally sound management and disposal. Implementation is guided by the principles that: hazardous waste generation should be reduced and minimized; hazardous wastes should be treated and disposed of as close as possible to their source of generation; transboundary movements of hazardous wastes should be reduced to a minimum consistent with their environmentally sound management; and assistance should be provided to developing countries and countries with economies in transition.

Under the convention, Parties may decide to prohibit the import of hazardous or other wastes and after

informing other Parties of the decision, the latter must not permit the export of hazardous wastes to Parties that prohibited the import. Parties must: prohibit the export of hazardous and other wastes if the importing Party does not consent in writing to the specific import; prohibit unauthorized transportation or disposal of hazardous or other wastes; and inform any neighboring Party of a risk to health or the environment within the latter's territory as a result of any accident during the disposal or transboundary movement of hazardous or other wastes. In September 1995, Parties agreed to an amendment prohibiting the export of hazardous waste from developed countries to developing countries for final disposal, recovery or recycling. This provision is not yet in force.

In December 1999, the ***Basel Protocol on Liability and Compensation for Damage Resulting from Transboundary Movement of Hazardous Wastes and their Disposal*** was adopted to address damage that may result during transboundary movement of hazardous and other wastes, including illegal traffic, and their disposal. This protocol includes a strict liability regime on the notifier, an obligation for preventive measures, the right of recourse for a liable person, establishment of financial and time limits for liability, insurance and other financial guarantees, and financial mechanisms for damage and compensation. It is not yet in force.

It is worth noting that some regional and subregional agreements of a very similar nature were also developed to complement the Basel Convention. These include the ***Bamako Convention on the Ban of the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes*** (adopted by the Organization of African Unity in January 30, 1991, not yet in force), the ***Regional Agreement on the Transboundary Movement of Hazardous Wastes*** (adopted by the Central American countries in Panama on December 12, 1992, not yet in force), and the ***Waigani Convention to Ban the Importation into Forum Island Countries of Hazardous and Radioactive Wastes and to Control the Transboundary Movement and Management of Hazardous Wastes Within the South Pacific Region*** (adopted in September 16, 1995, e.i.f. September 2001). These agreements are not discussed further and are only mentioned here to indicate the widespread interest in addressing the movement and management of hazardous wastes, including chemical wastes.

4.1.5.3 United Nations Framework Convention on Climate Change and the Kyoto Protocol

This convention was adopted on May 9, 1992 (e.i.f. March 21, 1994), in response to concerns about changes in the levels of atmospheric gases, particularly increases in key greenhouse gases (GHG) that could lead to global warming. The convention goal is to stabilize atmospheric GHG concentrations at levels that would prevent dangerous human interference with the climate system (acknowledging that there is no scientific certainty about what constitutes a "dangerous" level) within a timeframe that would allow ecosystems to adapt to climate change, ensure that food production is not threatened, enable sustainable economic development, and protect the climate system for present and future generations.

The convention encourages relevant scientific research, data gathering, and climate observation and provides a framework and process that enable Parties to develop specific provisions and to make changes to the provisions in the future as new scientific information becomes available. Parties to the convention must: prepare national inventories on GHG emissions; develop and implement control programs; factor climate change into activities related to, *inter alia*, agriculture, energy, natural resources and coastal areas; develop and share environmentally sound technology; enhance public awareness; and cooperate in research and monitoring programs. Some developed country Parties agreed to reduce their GHG to 1990 levels by 2000 by limiting their anthropogenic emissions and enhancing the capacity of sinks and reservoirs for the stabilization of such gases. The convention also established a financial mechanism to provide resources to assist developing countries in meeting their obligations: this role is performed by the GEF.

The ***Kyoto Protocol*** to this convention was adopted on December 11, 1997, but has not yet entered into

force. It includes more stringent commitments on emissions for developed countries, including county-specific legally binding targets of -8% to +10%, that will result in a total reduction between 2008-2012 of at least 5% from 1990 emission levels of the six main GHG (carbon dioxide, hydrofluorocarbons, methane, nitrous oxide, perfluorocarbons, sulphur hexafluoride). The protocol also covers some specified activities relating to land-use change and forestry that emit or remove carbon dioxide from the atmosphere.

The Subsidiary Body for Implementation assesses and reviews implementation of the convention, examines national communications and emission inventories and advises on the financial mechanism operated by GEF. The Subsidiary Body for Scientific and Technological Advice provides advice on scientific, technological and methodological matters and works closely with the Intergovernmental Panel on Climate Change, which was established by UNEP and the World Meteorological Organization in 1988 to assess existing knowledge about the climate system and climate change, related environmental, economic and social impacts and possible response strategies.

4.1.5.4 Convention on Biological Diversity and the Cartagena Protocol on Biosafety

This convention was adopted on May 22, 1992, (e.i.f. December 29, 1993) and is intended to address all aspects of the conservation of biological diversity, the sustainable use of the components of biological diversity, and fair and equitable sharing of the benefits from exploitation of genetic resources. The convention reflects a commitment to reconciling conservation needs with development concerns as part of the overall global and national pursuit of sustainable development. Parties are committed to taking a wide range of measures to conserve biological diversity by establishing protected areas, promoting the protection and, as necessary, the restoration of ecosystems, natural habitats and threatened species, and controlling the risks posed by the use of living modified organisms (LMOs) or other activities that significantly impact on biological diversity. The Subsidiary Body on Scientific, Technical and Technological Advice (comprising government experts) advises the Parties on implementation issues. The GEF serves as the financial mechanism for the convention.

The ***Cartagena Protocol on Biosafety*** was adopted in January 1999 (e.i.f. September 11, 2003) to help minimize the potential risks posed by the transboundary movement, handling and use of LMOs that are produced using modern biotechnology methods and that may adversely affect biological diversity or present risks to human health. The protocol establishes an advance informed agreement procedure for imports of LMOs (with risk assessment and the precautionary principle as a basis for decision-making), requires the identification and labeling of LMOs for food, feed and processing, and addresses risk management, information sharing, capacity building for developing countries and countries with economies in transition, illegal transboundary movements, liability and redress, and a financial mechanism.

While the convention focuses on biological issues, there are distinct chemicals aspects to it. Environmental pollution, especially that caused by persistent bioaccumulative chemicals, is well recognized as a major concern for population level effects in the environment (*i.e.,* biodiversity). Other issues relate to the recent development of genetically modified plants that are resistant to specific pesticides (with concerns for increased uses of these pesticides) and the use of genetically modified field plants to "grow" polymers (with attendant concerns for the possible environmental pollution that could result from such practices, including the disposal of such plants).

4.1.5.5 Stockholm Convention on Persistent Organic Pollutants (POPs)

This convention was adopted on May 22, 2001, and the Intergovernmental Negotiating Committee that developed it continues to meet annually to prepare for a "quick start" for the first meeting of the Conference of Parties following entry into force. Its overall objective is to protect human health and the environment from POPs and Parties will be required to take action on an initial group of 12 specified chemicals including intentionally produced pesticides and

industrial chemicals (aldrin, chlordane, dieldrin, DDT, endrin, heptachlor, hexachlorobenzene, mirex, PCBs, toxaphene) and unintentionally produced by-products of industrial and combustion processes (dioxins, furans, hexachlorobenzene, PCBs). Specific goals are set for both types of POPs as well as for POPs present in stockpiles and wastes.

For **intentionally produced POPs**, the convention goal is elimination of production and use. Each Party must take action to eliminate or restrict production and use of each chemical, as specified in the convention, and restrict any related trade. Some exemptions are specified, many of which are time-limited and have reporting and other requirements. Parties having regulatory and assessment schemes for new industrial chemicals or pesticides must take regulatory measures to prevent the production or use of new POPs. Parties with assessment schemes for existing industrial chemicals or pesticides must use the convention's screening criteria to identify possible POPs as early as possible in their assessment programs.

The goal for **unintentionally produced POPs** is to reduce their total releases derived from anthropogenic sources, continuously minimizing and, where feasible,

PCBs, which can be found in electrical transformers, will be controlled under the Stockholm Convention on POPs.

E. Huffman

ultimately eliminating such releases. Parties must: develop an action plan within 2 years of entry into force of the convention to identify, characterize and address the release of these POPs; implement the action plan; promote the application of measures to achieve realistic and meaningful levels of release reduction or source elimination; promote the development and, as appropriate, require the use of substitute or modified materials, products and processes to prevent the formation and release of these POPs; promote and, as appropriate, require the use of best available techniques (BAT) for new sources within 7 specified industrial source categories with comparatively high potential for POP formation and release, and phase in such requirements within 4 years of entry into force; promote the use of BAT for new sources within 13 specified industrial source categories with potential for POP formation and release; promote the use of BAT for existing sources within all 20 specified industrial source categories; and promote the use of best environmental practices (BEP) for all new and existing sources within all 20 specified industrial source categories.

The third convention goal is to ensure the environmentally sound management of **stockpiles** of intentionally produced POPs, and of **wastes** and products and articles upon becoming wastes that consist of, contain or are contaminated by intentionally or unintentionally produced POPs. Parties must: develop and implement strategies to identify stockpiles, products and articles in use, and wastes containing POPs; manage stockpiles in an environmentally sound manner until they are deemed to be wastes; manage wastes in an environmentally sound manner; dispose of wastes in a way that destroys the POP content, or otherwise in an environmentally sound manner; prohibit recovery, recycle, reclamation, direct reuse or alternative uses of POPs; require that transport of these materials across international boundaries take into account international rules, such as the Basel convention; and develop strategies for identifying contaminated sites and while remediation is not required, if it is attempted, it must be done in an environmentally sound manner.

Parties must promote and facilitate public awareness and education, participate in research, development, monitoring and cooperation, and involve stakeholders in developing and implementing implementation plans. In the future, new POPs will be added to the convention by applying scientific criteria and a specified process for evaluating candidates proposed by Parties. The effectiveness of the convention will be evaluated using data on regional and global environmental transport of POPs and on their presence, levels and trends in environmental and biological media. The convention establishes a financial mechanism to assist developing countries and countries with economies in transition in meeting the incremental costs of implementing the convention obligations and specifies the GEF as the principal entity of the interim financial mechanism.

4.2 REGIONAL AGREEMENTS

4.2.1 UNEP Regional Seas Conventions

In 1974, UNEP established the Regional Seas Programme to form common commitments among coastal nations to mitigate and prevent degradation of coastal areas and oceans. This program focuses on both the causes and consequences of environmental degradation and includes 14 regions and over 140 coastal countries and territories. While developed to meet the specific needs of regional participants, each program has common components such as: an action plan for cooperation on management, protection, rehabilitation, development, monitoring and research of coastal and marine resources; an intergovernmental agreement with general principles and obligations, which in most cases is legally binding; and protocols addressing specific environmental problems such as land-based sources of pollution, dumping, emergency cooperation and protected areas. This programme serves as the core UNEP initiative to implement Chapter 17 of *Agenda 21* on oceans.

Action plans generally involve environmental impact assessment, management of coastal aquatic ecosystems, control of industrial, agricultural and domestic wastes, contingency plans for pollution emergencies, environmental legislation, technical protocols, and financial arrangements. The impact of toxic chemicals on water bodies is a common feature of these pro-

grams. Regional action plans are in effect for the East Asian Seas (a convention is being negotiated), Northwest Pacific, and South Asian Seas and action plans are being developed for the Southwest Atlantic and Northeast Pacific regions. The following 9 regional conventions are in effect and are listed in order of their dates of adoption.

4.2.1.1 The ***Barcelona Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean*** was adopted on February 16, 1976, (e.i.f. February 12, 1987) and includes 21 Parties. It is intended to achieve international cooperation on a coordinated and comprehensive approach to protect and enhance the marine environment and coastal region. An amendment to the Convention was adopted in 1995 but it has yet to enter into force. In 1997, Parties adopted a *Strategic Action Program to Address Pollution from Land-based Activities* that addresses major land-based pollution issues by identifying, costing and setting dates for implementation of necessary control measures.

4.2.1.2 The ***Kuwait Regional Convention for Co-operation on the Protection of the Marine Environment from Pollution*** was adopted April 24, 1978, (e.i.f. July 1, 1979) and includes 8 Parties. Its goal is to prevent, abate and combat pollution of the marine environment in the region and Parties have conducted surveys of land- and sea-based pollution sources and monitored marine contaminants.

4.2.1.3 The ***Convention for Co-operation in the Protection and Development of the Marine and Coastal Environment of the West and Central African Region*** was adopted on March 23, 1981, (e.i.f. August 5, 1984) and includes 10 Parties. Its objective is to protect the marine environment, coastal zones and related internal waters within the jurisdiction of the Parties.

4.2.1.4 The ***Lima Convention for the Protection of the Marine Environment and Coastal Area of the South-East Pacific*** was adopted November 12, 1981, (e.i.f. May 19, 1986) and includes five Parties (Chile, Colombia, Ecuador, Panama, Peru). It is intended to protect the marine environment and coastal zones within the 200 mile area of maritime sovereignty and jurisdiction of the Parties and at greater distances where pollution may affect that area.

4.2.1.5 The ***Regional Convention for the Conservation of the Red Sea and Gulf of Aden Environment*** was adopted on February 14, 1982, (e.i.f. August 20, 1985) and includes 7 Parties plus Palestine. Its goal is to ensure "rational human use of living and non-living marine and coastal resources in a manner ensuring optimum benefit" for present and future generations.

4.2.1.6 The ***Cartagena Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region*** was adopted on March 24, 1983, (e.i.f. October 11, 1996) and includes 21 Parties. The objective of the convention is "to achieve sustainable development of marine and coastal resources in the wider Caribbean region through effective integrated management that allows for increased economic growth". A recent initiative under this convention relates to reducing pesticide run-off through improved management of pesticides in Colombia, Panama, Costa Rica, and Nicaragua. In 1999, agreement was reached on a ***Protocol concerning Pollution from Land-Based Sources and Activities,*** the objective of which is "to prevent, reduce and control land-based marine pollution in the Convention Area". This protocol has yet to enter into force.

4.2.1.7 The ***Convention for the Protection, Management, and Development of the Marine and Coastal Environment of the Eastern African Region*** was adopted on June 21, 1985, (e.i.f. May 30,1996) and includes 8 Parties. It is intended to protect and manage the marine environment and coastal areas in the region and enable coordinated responses to spills of oil and other harmful substances.

4.2.1.8 The ***Noumea Convention for the Protection of the Natural Resources and Environment of the South Pacific Region*** was adopted on November 25, 1986, (e.i.f. August 22, 1990) and includes 12 Parties. It is intended to protect and manage the natural resources and environment of the South Pacific region. Related to the convention are the ***Protocol for the Prevention***

of Pollution of the South Pacific Region by Dumping and the ***Protocol concerning Cooperation in Combating Pollution Emergencies in the South Pacific***.

4.2.1.9 The ***Bucharest Convention on the Protection of the Black Sea against Pollution*** was adopted April 21,1992, (e.i.f. January 15, 1994) and includes 6 Parties. Its objective is to prevent, reduce and control pollution in order to protect and preserve the marine environment of the Black Sea. The convention provides a framework for cooperation in conserving the living resources of the Black Sea and in enhancing its amenities. Parties undertake to prevent pollution, from any source, by substances identified in an annex to the convention. The convention includes three separate protocols addressing the elimination or reduction of discharges of specified substances, the prohibition or restriction of dumping of specified substances, and cooperation in major accidents or spills of oil or chemicals.

4.2.2 United Nations Economic Commission For Europe (UNECE)

4.2.2.1 European Agreement Concerning the International Carriage of Dangerous Goods by Road

Adopted on September 30, 1957, (e.i.f. January 29, 1968) and amended in 1985, this agreement was intended to increase the safety of international transport of dangerous goods by road within Europe. Common rules were established to address transboundary movements and transshipment through the territories of European countries and include aspects related to the classification, packaging, labeling, and testing of dangerous goods and wastes, and the construction, equipping and operation of relevant vehicles. These were based on the *UN Recommendations on the Transport of Dangerous Goods*. In effect, apart from some *excessively* dangerous goods, dangerous goods may be moved internationally in road vehicles provided that the packaging and labeling, vehicle construction, equipment, and operation are in accordance with the agreement.

4.2.2.2 Convention on Long Range Transboundary Air Pollution and Related Protocols

This convention was adopted on November 13, 1979, (e.i.f. March 16, 1983) as the first international legal instrument to address air pollution on a broad regional basis. It was intended to protect health and the environment by limiting, reducing and preventing long-range transboundary air pollution through cooperative action. Parties must develop policies and strategies to combat atmospheric pollution through information exchange, consultation, research and monitoring, and cooperate in research and development on: emission reduction technologies for major air pollutants; monitoring and measuring techniques for air pollutant emission rates and ambient concentrations; models for long-range transport of air pollutants; effects of major air pollutants on health, environment and visibility; and education and training programs related to the environmental aspects of pollution by major air pollutants. Eight protocols to the convention have been developed, none of which include provisions for technical or financial assistance.

The ***Protocol on Long-term Financing of the Cooperative Program for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe*** was adopted in September 1984 (e.i.f. in 1987) and committed Parties to share the costs of a European monitoring program to: review and assess emission data for sulphur and nitrogen dioxides, volatile organic compounds and other air pollutants; measure air and precipitation quality; and model atmospheric dispersion.

The ***Protocol on the Reduction of Sulphur Emissions or their Transboundary Fluxes by at Least 30 Per Cent*** was adopted in July 1985 (e.i.f. in 1987). It provided for a 30% reduction by 1993 from 1980 levels of sulphur emissions or transboundary fluxes and also committed to study the need for further reductions.

The ***Protocol on Control of the Emissions of Nitrogen Oxides or their Transboundary Fluxes*** was adopted in November 1988 (e.i.f. in 1991). Parties agreed to: control or reduce emissions of nitrogen oxides or

their transboundary fluxes to the 1987 level by December 1994; apply national emission standards to new stationary and mobile sources; introduce pollution control measures for existing major stationary sources; make unleaded fuel sufficiently available by 1993; assign priority to research and monitoring techniques in determining necessary reductions of emissions; and exchange relevant information and technology.

The ***Protocol on Control of Emissions of Volatile Organic Compounds or their Transboundary Fluxes*** was adopted in November 1991 (e.i.f September 29, 1997) and was intended to enhance the framework for the control of long-range transboundary air pollution. Parties must: control and reduce national emissions of volatile organic compounds; make cooperative arrangements to control transboundary fluxes of such emissions; cooperate in generating information on controlling emissions; exchange relevant technology; undertake research; and monitor emission control arrangements. Parties may select a base year and designate areas to apply national reductions.

The ***Protocol on Further Reduction of Sulphur Emissions*** was adopted in June 1994 (e.i.f. August 5, 1998) and is intended to protect human health and the environment by reducing sulphur emissions to ensure that long-term critical loads are not exceeded. Parties agreed to: reduce and maintain their sulphur emissions in accordance with specified times and levels; use the most effective available measures; apply emission limit values to major new stationary combustion sources and major existing sources; facilitate exchange of relevant technologies and techniques; and encourage research, development, monitoring and cooperation.

The ***Protocol on Heavy Metals*** was adopted on June 24, 1998 (e.i.f. December 29, 2003) and is intended to "control emissions of heavy metals caused by anthropogenic activities that are subject to long-range transboundary atmospheric transport and are likely to have significant adverse effects on human health or the environment". Cadmium, lead and mercury are identified for risk management action and Parties must: develop strategies, policies and programs to meet protocol obligations; facilitate the exchange of information, technology and techniques; and encourage research, development, monitoring and cooperation on emissions, deposition levels, transport, fate, transformation, effects on health and the environment, socio-economic impacts, release reduction and substitution of these metals in products. Parties must reduce atmospheric emissions of the 3 metals below their levels in 1990, or an alternative year between 1985 and 1995, and target industrial sources, combustion processes and waste incineration. Limit values are established for emissions from some major stationary sources and best available techniques are identified for these sources. Parties must phase out leaded gasoline and lower mercury levels in batteries. Product management measures are recommended for several mercury-containing products.

New substances may be added by a process (specified in Executive Body Decision 1998/1) wherein Parties submit a comprehensive review of scientific information on the health and environmental risks associated with the production, use and release of a substance including information relating to persistence, bioaccumulation, potential for long range transboundary atmospheric transport, and potential to adversely affect human health or the environment. Proposals may also be made to add new product control measures or new product groups.

The ***Protocol on Persistent Organic Pollutants (POPs)*** was adopted on June 24, 1998 (e.i.f. October 23, 2003) and is intended to "control, reduce or eliminate discharges, emissions and losses" of POPs. Sixteen intentionally and unintentionally produced chemicals are identified for risk management action. Parties must: develop strategies, policies and programs to meet the Protocol obligations within 6 months of entry into force; facilitate information exchange and provision of public information; and encourage research, development, monitoring and cooperation on POPs and their alternatives.

One goal of the Protocol is to eliminate the production and use of intentionally produced POPs. Parties will be required to either eliminate or restrict the production and/or use of 13 industrial chemicals and

pesticides: production or use exemptions are allowed for 4 of these. Parties must report production and sales data for all intentionally produced POPs, but there are no trade restrictions.

Parties must reduce their total annual emissions of unintentionally produced POPs (dioxins/furans, hexachlorobenzene, and polycyclic aromatic hydrocarbons) below their levels in 1990, or an alternative year between 1985 and 1995, and provide emission inventory reports. Emission limit values are specified for incineration of municipal, hazardous and medical wastes. Best available techniques (BAT) are required for new sources within major stationary source categories and for existing sources within major stationary source categories, where technically and economically feasible. Emission limit values may be required for existing sources within specified stationary source categories subject to technical and economical feasibility. Advice is provided on BAT to control emissions of POPs from major stationary sources.

For stockpiles and wastes, the protocol requires: environmentally sound destruction or disposal of intentionally produced POPs; compliance with such regimes as the Basel Convention for transboundary movement of waste POPs; and the development of appropriate strategies for identifying articles still in use and wastes containing any of the 16 POPs, and measures to ensure that such materials that become wastes are destroyed or disposed of in an environmentally sound manner.

New substances may be added by a process (specified in Executive Body Decision 1998/2) wherein Parties submit a comprehensive review of scientific information on the health and environmental risks associated with the production, use and release of a substance including information relating to persistence, bioaccumulation, potential for long-range transboundary atmospheric transport, and potential to adversely affect human health or the environment.

The ***Protocol to Abate Acidification, Eutrophication, and Ground-level Ozone*** was adopted on November 30, 1999, and has yet to enter into force. It sets emission ceilings for 2010 for sulphur, oxides of nitrogen, volatile organic chemicals (VOC), and ammonia and limit values for specific emission sources (*e.g.,* combustion plants, electricity production, dry cleaning, vehicles) and requires the use of BAT. VOC emissions from such products as paints or aerosols must also be reduced and farmers will have to take specific measures to control ammonia emissions. Guidance documents provide a wide range of abatement techniques and economic instruments for reducing emissions.

4.2.2.3 Convention on the Protection and Use of Transboundary Watercourses and International Lakes and the Protocol on Water and Health

This convention was adopted on March 17, 1992, (e.i.f. October 6, 1996) and is intended to promote international cooperation and mutual assistance in protecting transboundary surface waters, ground waters and related ecosystems (including the marine environment) from releases of substances that are hazardous, acidifying or contribute to eutrophication. In regard to transboundary waters, Parties must: prevent, control and reduce pollution; exercise economy and rational management; manage point and diffuse sources; avoid the transfer of pollution between locations; act in a precautionary manner to prevent pollution; cooperate on pollution control and related research and development; and consult with and alert Parties of pollution and its control. The convention also includes guidelines for developing best environmental practice and water quality objectives and criteria.

Parties are advised by a Working Group on Water Management, task forces and expert groups addressing the monitoring and assessment of transboundary waters, laboratory quality management and accreditation, water and health, flood protection and prevention, and water and industrial accidents. Countries with economies in transition are assisted through field projects.

A ***Protocol on Water and Health*** was adopted on June 17, 1999, and is not yet in force. It is intended to protect human health and well being by improving

water management and protection of water ecosystems, and by preventing, controlling and reducing water-related disease. Parties must: ensure drinking water is free from microorganisms, parasites and toxic chemicals; ensure sanitary systems are adequate to protect health and the environment; protect raw drinking water sources from pollution; ensure that no health hazards result from the use of water in recreation, aquaculture, or irrigation or the use of sewage sludge in agriculture; implement systems to monitor and respond to outbreaks of waterborne illness; establish targets for the provision of safe drinking water and sanitation to its population; inform the public on the protocol's objectives, obligations, etc.; and cooperate in matters related to the protocol.

4.2.2.4 Convention on the Transboundary Effects of Industrial Accidents

This convention entered into force on April 19, 2000, and is intended to protect human health and the environment from the adverse effects of industrial accidents causing transboundary effects. Parties must: consult with the public in developing and implementing measures to reduce the risk of industrial accidents; take measures to prevent, prepare for and respond to industrial accidents; improve their preparedness for responding to industrial accidents with transboundary effects; establish and operate accident notification systems; consult with other Parties on industrial facilities that might adversely affect them in the event of an accident; assist one another in the event of an accident; cooperate on information exchange and research and development, including on safety management systems and technology; and provide information to the public on the nature of hazardous activities and associated risks and procedures to be used in the event of an accident.

Courtesy of UNEP Chemicals

Industrial complex by Lake Baikal.

Regional Coordinating Centers were established in Warsaw (for industrial accident training and exercises) and Budapest (for prevention of industrial accidents) to strengthen capacity to prevent, prepare for and respond to industrial accidents, with special emphasis on countries with economies in transition. A network of contacts was also established for industrial accident notification and mutual assistance.

4.2.2.5 European Agreement Concerning the International Carriage of Dangerous Goods by Inland Waterways

This agreement was adopted on May 25, 2000, and has not yet entered into force. It is intended to increase the safety of international transport of dangerous goods by inland waterways within Europe, to protect the environment from pollution during transport, and to facilitate transport operations and promote international trade. Common rules were established to address transboundary movements and transhipment through the territories of European countries and include aspects related to the classification, packaging, labelling, and testing of dangerous goods and wastes, and the construction, equipping and operation of relevant vessels. These were based on the *UN Recommendations on the Transport of Dangerous Goods*. In effect, apart from some *excessively* dangerous goods, dangerous goods may be moved internationally in inland navigation vessels provided that the packaging and labelling, vessel construction, equipment, and operation are in accordance with the agreement.

4.2.3 OSPAR Commission

The ***Convention for the Protection of the Marine Environment of the Northeast Atlantic (OSPAR Convention)*** was adopted on September 22, 1992, (e.i.f. March 25,1998) replacing the 1972 *Oslo Convention for the Prevention of Marine Pollution by Dumping from Ships and Aircraft* and the 1974 *Paris Convention for the Prevention of Marine Pollution from Land-Based*

Sources. The "Northeast Atlantic" sea area extends from the east coast of Greenland to the continental North Sea coast, and from the North Pole south to the Straits of Gibraltar: it does not include the Baltic or Mediterranean Seas. The objective of the convention is to protect human health and conserve marine ecosystems by protecting the sea area from the adverse effects of human activities and by restoring degraded marine areas. Parties must: prevent and eliminate marine pollution from land-based and offshore sources and from dumping practices; prohibit incineration at sea; take cooperative measures to assess and report on marine environmental quality; and make relevant information publicly available.

In 1998, an OSPAR Strategy on Hazardous Substances was adopted. Its objective is to prevent pollution of the marine area by continuously reducing discharges, emissions and losses of hazardous substances with the aim of achieving concentrations in the marine environment approaching background values for naturally occurring substances and approaching zero for synthetic substances. The long-term goal is cessation of discharges, emissions and losses of hazardous substances by the year 2020.

4.2.4 Helsinki Commission

The ***Helsinki Convention on the Protection of the Marine Environment of the Baltic Sea Area*** was adopted on April 9, 1992, (e.i.f. January 17, 2000) replacing a previous convention that had been adopted in 1974 and entered into force in 1988. Intended to protect and enhance the marine environment of the Baltic Sea area, the convention prohibits incineration in this area and obligates Parties to: prevent and eliminate pollution caused by 'harmful substances' (technical criteria are specified in an annex to the convention along with several metals, industrial chemicals and pesticides); avoid causing transboundary pollution outside the Baltic Sea area; prevent pollution from ships and other vessels; promote the use of BEP for all sources and best available technology for point sources; apply the polluter-pays principle; and apply the precautionary principle (*i.e.,* "to take preventive measures when there is reason to assume that substances or energy introduced, directly or indirectly, into the marine environment may create hazards to human health, harm living resources and marine ecosystems, damage amenities or interfere with other legitimate uses of the sea even when there is no conclusive evidence of a causal relationship between inputs and their alleged effects"). This convention complements initiatives of many countries to the OSPAR Convention and the various regional and global conventions and protocols dealing with POPs and metals.

4.2.5 North American Commission On Environmental Cooperation (NACEC)

The ***North American Agreement on Environmental Cooperation*** came into effect on January 1, 1994. It was developed as a side agreement to the North American Free Trade Agreement to address public concerns of possible adverse impacts on environment and health that could accompany trade liberalization. The agreement led to creation of the NACEC, headed by a Council with Ministerial level representatives from the 3 countries. The NACEC programs for Air and the Sound Management of Chemicals both address chemicals issues.

In October 1995, Council adopted Resolution #95-5 on the Sound Management of Chemicals, committing the Parties to the sound management of chemicals of mutual concern. First priority was given to persistent toxic substances and this resulted in the development of North American Regional Action Plans (NARAPs) on PCBs, DDT, chlordane and mercury. Council also approved criteria and a process for selecting additional substances for NARAPs and this led to agreement to develop a NARAP for lindane and another for dioxins, furans and hexachlorobenzene. Council agreed to develop a NARAP on environmental monitoring and assessment and create a continental capacity to sample, analyze and compile data on priority toxic substances. This will enable the Parties to identify and address continental toxic chemicals issues by monitoring trends in environmental media and biota on persistent toxic substances, assessing effectiveness of implementation of NARAPs, and identifying substances of mutual concern that might warrant trinational action.

The NACEC Air Program is intended to improve cooperation between national agencies and develop strategies to address air quality issues of mutual concern. The program addresses general air issues and includes exchanges of information and staff, a North American air quality web site, and improving air quality impacted by transportation corridors. In 1997, an expert NACEC advisory panel issued the report *Continental Pollutant Pathways* and concluded that continental pollutants were affecting human health and the environment throughout North America and that significant emission reductions were needed to protect vulnerable populations in all three countries (children, pregnant women, the elderly, people with respiratory problems, and persons who rely on wild foods in their diet). The panel identified major sources of pollutants (electric power plants, transportation, fossil fuel combustion by certain industries, municipal and medical waste incinerators, and agricultural chemicals), noted that many emission reduction approaches were available, argued for North American collaborative action on common sources of pollutants, and indicated the need to work with other geographic regions to address sources of pollutants external to the continent.

4.3 INTERNATIONAL PROGRAMS AND INITIATIVES

4.3.1 Arctic Monitoring and Assessment Program (AMAP)

Established in 1991 by eight circumpolar nations (Canada, Denmark, Finland, Iceland, Norway, Sweden, Russia and the USA), the AMAP research program monitors levels and assesses effects of specified anthropogenic pollutants in environmental media in the Arctic. Activities address persistent organic pollutants, heavy metals, radioactive substances and oxides of sulphur and nitrogen and the sources of these substances both within and outside the Arctic region. This program has identified the long-range transport and deposition of these pollutants as a significant threat to the people and wildlife in the North and demonstrated the need for urgent action at the domestic and international levels to reduce and/or eliminate the releases and discharges of these substances to protect the Arctic environment from further deterioration. This research has contributed to the agenda of the Arctic Council of Ministers, which was established in 1996 to address common environmental concerns of Arctic governments and peoples. The Council reacted to the AMAP findings by recommending to the 2001 session of UNEP Governing Council that mercury be addressed on a global basis and, thus, contributed to the current UNEP global mercury initiative (section 4.3.12.1). The AMAP research program will continue to contribute to future efforts to identify and prioritize international air pollution issues.

4.3.2 European Union (EU) White Paper on Chemicals

The EU is an active player on toxics issues, in some cases leading in the development of chemicals policies and also pressing for the application of approaches that are 'precautionary' in nature and that involve substitution of materials which pose health and environmental problems with less hazardous ones. With up to twelve Eastern European countries preparing for entry, the present membership of 15 countries is expected to increase and the EU is likely to exert even greater influence in the future on international toxics issues. The EU countries already constitute the majority of the active participants in the OECD Environment Program and, therefore, there will likely be an increased influence on the OECD agenda of EU policies and priorities due to the increasing size of the EU. Recent proposals for an overhaul of EU chemicals policies are significant in the context of this report.

In April 1998, the Council of Environment Ministers expressed concern that sufficient protection was not being provided by current EU chemicals policy in the form of current programs for assessment of new and existing chemicals, and classification and labelling of hazardous products and formulations. On February 27, 2001, the EU released a report (*White Paper, Strategy for a Future Chemicals Policy*) reflecting consultations on EU chemicals policy that was followed by a Council Decision (June 7, 2001) and Parliamentary Resolution (November 15, 2001). On May 7, 2003,

the EU released, for consultation, draft legislation (1200 pages in length) to implement the White Paper proposals. The implementation of these proposals will have significant impacts on European industry as well as countries providing chemicals and finished goods to Europe. Furthermore, non-EU countries may be pressed into re-examining their own national policies for assessing and managing chemicals.

For the past 2 decades, the EU system has distinguished between new and existing chemicals, as is the case for all OECD and non-OECD countries with notification programs that require submission of information prior to introducing a new chemical to commerce. In the EU, most efforts to develop test information and conduct risk assessments were directed to the ~2700 new substances that were introduced to the market, in some cases in very small quantities (*e.g.,* 10 kg). An estimated 30,000 chemicals are in the EU market at quantities above 1 tonne and they account for about 99% of the volume of chemicals in the marketplace. Producers, importers and downstream users make available little or no information for the vast majority of these chemicals and little progress has been made on assessing risks of existing chemicals. The onus is on government to demonstrate the need for regulation or to compel industry to perform testing and the information is usually not available for government to make the case. The result is that only a small proportion of the chemicals in use could be addressed.

The recent EU proposal includes several dramatic changes, including combining new and existing chemicals assessment activities within a single system by 2012. The present obligations for new substances would be revised and extended to require the submission of an information dossier on all existing chemicals produced or imported above 1 tonne in order to register them in a single database. All submitted information would be made publicly available. The burden for generating data and conducting risk assessments would be shifted to producers, importers and downstream users of chemicals who would be required to place on the market only those products for which the intended uses are deemed "safe". A phased implementation process would be used with a target of completing registration by 2012. Priority would first be given to identifying chemicals that lead to high exposure situations or are of concern due to known or suspected physical, chemical and toxicological properties (*e.g.,* POPs, endocrine disrupting substances, etc.). Testing could be required, depending on the quantity of a chemical and its hazard profile, and this would be followed by risk assessment.

If implemented in its proposed form, the EU chemicals policy would significantly impact on the development of data and information and thus contribute to the hazard and risk assessment of thousands of commercial chemicals over the next decade. This in turn would impact on future demands for risk management, possibly at the international level, and place increased responsibility on industry to identify and implement risk management measures. The EU would be the first jurisdiction to implement such an approach and there is potential for impact on other countries' regulatory systems and, possibly, for consequences at the international level.

4.3.3 Food and Agriculture Organization (FAO)

Established in 1945, the FAO has a mandate for "international co-operation to raise levels of nutrition and standards of living, to improve agricultural productivity, and to better the condition of rural people". The governing body is the FAO Conference, which sets policy, makes recommendations to Member States and IGOs, and elects a Council to serve as an executive body and exercise powers delegated to it by the Conference. As the forum for discussion of food and agricultural issues, FAO provides development assistance, information, training, and policy and planning advice and is engaged in the following activities to assist member countries in the sound management and use of pesticides.

Since 1963, FAO has collaborated with WHO in developing **recommendations for additives, pesticides, veterinary drug residues and contaminants in food**. This is accomplished through the Joint Meeting of the FAO Panel of Experts on

Pesticide Residues in Food and the Environment and the WHO Expert Group on Pesticide Residues. The Joint Meeting makes recommendations for Acceptable Daily Intakes, Maximum Residue Limits and tolerable intakes for consideration and approval by the Codex Alimentarius Commission which is responsible for setting maximum levels for pesticide residues in food and feed in international trade.

Technical specifications have been published by FAO for more than 380 pesticides and related formulations to provide quality standards for pesticides, assist in the official approval and acceptance of pesticides, protect vendors against inferior products, and ensure biological efficacy. FAO and WHO were scheduled to begin jointly developing these specifications in 2002.

The **International Code of Conduct on the Distribution and Use of Pesticides** was adopted on November 28, 1985, and subsequently amended in November 1989 to include provisions for a voluntary Prior Informed Consent (PIC) procedure. This voluntary code was one of the first international standards on chemicals (*i.e.,* pesticides) to protect human health and the environment. It was developed "to increase international confidence in the availability, regulation, marketing and use of pesticides for the improvement of agriculture, public health and personal comfort". Intended to provide a practical framework for the control of pesticides, the code defined and clarified the responsibilities of all stakeholders (governments, IGOs, NGOs, industry, public) involved in the development, distribution and use of pesticides. All countries are expected to promote the use of the code and monitor its observance. While applicable to both developed and developing countries, its primary value is in countries lacking control procedures where it serves as a reference until adequate pesticide regulatory programs are established. More than 25 FAO technical guidelines support implementation of the code. Aspects of the code include: testing and analytical requirements; trade practices; safe handling practices; measures for safe, efficient and effective use; regulation of use; manufacture, advertising, and distribution; provision of technical advice; measures to protect health and the environment; treatment of poison victims; substitution of less hazardous products; packaging, labelling, storage and disposal of products; information exchange: and prior informed consent (PIC) procedures.

In the late 1990's, it was recognized that there remained several weaknesses in certain aspects of pesticide management, predominantly in developing countries (*e.g.,* lack of enforcement of national pesticide legislation due to lack of capacity; highly hazardous or sub-standard pesticide formulations were still widely available; and end-users were often insufficiently trained and protected to ensure that pesticides could be handled with minimum risk). In response, FAO consulted with stakeholders to produce an updated version of this code that was adopted on 1 November 2002. An objective of the new code is "to establish voluntary standards of conduct for all public and private entities engaged in or associated with the distribution and use of pesticides, particularly where there is inadequate or no national legislation to regulate pesticides".

The revised code represents an up-to-date standard for pesticide management. With the adoption of the Rotterdam Convention in 1998, the PIC provisions in the former version became redundant and have been removed. New elements were included to address: risk reduction; increased emphasis on training in all areas of pesticide management; adoption of the life-cycle concept for pesticide management; integration of relevant international agreements and undertakings;

Agricultural workers preparing to spray pesticides in Brazil.

Classet. © International Labour Organization

pesticide management within the context of chemicals management and sustainable agricultural development; pesticide application equipment standards and training as part of improving pesticide use; measures to prevent the occurrence of obsolete pesticides; monitoring implementation and compliance; strengthening Integrated Pest Management (IPM); and the prohibition of importation, sale and purchase of highly toxic pesticides. The revised code identifies new stakeholders (*e.g.,* application equipment and food industries) and strengthens its monitoring by explicitly inviting governments, the pesticide industry, NGOs and other interested parties to provide regular feedback on its implementation. This code comprises a comprehensive approach to the sound management of pesticides and it is interesting to note that *no comparable scheme exists for industrial chemicals.*

FAO and UNEP jointly provide secretariat support for the implementation of the voluntary interim **Prior Informed Consent (PIC) procedure**, pending entry into force of the *Rotterdam Convention for the application of the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade* (section 4.1.1) and for training countries in PIC procedures.

FAO conducts a wide range of **technical assistance programs** to enable countries to: develop and strengthen national pesticide management measures; promote the implementation of the code of conduct; establish plant protection programs; evaluate health and environmental hazards and risks of pesticides; improve pesticides risk management and reduction activities; strengthen government capabilities to address illegal traffic in pesticides; establish or strengthen laboratory infrastructure for pesticide analysis; harmonize pesticide management measures among countries; and establish national training centres.

FAO supports the establishment of **integrated pest management (IPM)** programs, including the use of biological control and weed management. In pursuit of a common approach, the FAO, World Bank, UNDP and UNEP are cosponsoring a Global IPM Facility to promote IPM field implementation.

In 1994, FAO initiated a project to address the large number of **stockpiles of obsolete and unwanted pesticides** in the developing world, with the aim of enabling countries to dispose of such materials and prevent further accumulation of stockpiles. Inventories of obsolete pesticides have been developed for more than 50 countries in Africa and Latin America (with UNEP) and surveys have been initiated in Asia. Guidelines and training materials have been developed (with UNEP and WHO) on preventing the accumulation of obsolete pesticide stocks, disposal of obsolete pesticides in developing countries, pesticide storage and stock control, and assessment methods for soil contamination. Donor agencies have been engaged on disposal operations and independent monitoring is conducted to ensure that such operations comply with international safety and environmental standards. In partnership with UNEP, WWF, the World Bank and other organizations, FAO was involved in the development of a project to identify and dispose of obsolete stockpiles of pesticides in Africa. This project was recently funded by the GEF and will span 10 years at an estimated cost of US$250 million.

4.3.4 Intergovernmental Forum On Chemical Safety (IFCS)

The IFCS was created in 1994 in response to a recommendation in Chapter 19 of *Agenda 21* (section 3.2). It is a non-institutional consensus-based arrangement that meets every three years to coordinate international activities on the sound management of chemicals and address the needs identified in the six UNCED priority program areas (please see box in section 3.2).

Representatives of governments, IGOs and NGOs address all aspects of assessing and managing chemicals and provide policy guidance and recommendations to governments, IGOs, NGOs and international associations that are involved in chemicals issues. IFCS has neither the mandate nor the resources to implement recommendations. Between IFCS meetings, a multi-stakeholder Forum Standing Committee acts as a planning and coordination group. National Focal Points coordinate at the national, regional and global levels on IFCS issues and meetings.

The IFCS played a role in the development of the Stockholm Convention on POPs by establishing an *ad hoc* Working Group in 1996 in response to a request from UNEP Governing Council to initiate an assessment process on POPs and develop recommendations and information related to international action. The Working Group completed this task and then cooperated with UNEP in planning, organizing and conducting a series of 8 regional and subregional awareness-raising workshops in 1997-98 to prepare representatives of governments and other stakeholder groups to take action on POPs and participate in the negotiation of the convention.

At its most recent meeting in Bahia, Brazil (October 15-20, 2000), IFCS developed the *Bahia Declaration on Chemical Safety* and the *Priorities for Action Beyond 2000*. These documents noted the progress that had been made since 1992 in addressing the needs included in the six UNCED priority program areas and reflected the view of IFCS stakeholders that the international community should consider the following as priorities for activities related to chemical safety.

"1. Promoting global cooperation for chemicals management; for pollution prevention; for sustainable agriculture; and for cleaner processes, materials and products;
2. Increasing the flow of information about the safe use of chemicals; the risks that can be involved in their manufacture, release into the environment and disposal; and the means to avoid or reduce risks;
3. Ensuring that all countries have the capacity for sound management of chemicals, particularly through coordinated national policies, legislation and infrastructure;
4. Ratifying and implementing chemicals conventions and agreements and ensuring efficient and effective coordination between all chemical safety-related organizations and activities;
5. Marshalling resources to remedy chemical safety problems warranting concerted international response and action, such as illegal trafficking in toxic and dangerous products; and
6. Increasing access to information, knowledge, and skills development in chemical safety, recognizing that communities have a right-to-know about chemicals in the environment and to participate meaningfully in decisions about chemical safety that affect them."

In addressing these priorities it was noted that: many countries lacked national coordinating mechanisms, essential infrastructure and chemical safety standards to protect health and the environment; insufficient resources were available to address the numerous stockpiles of obsolete pesticides and hazardous chemicals, particularly in developing countries; and the number of chemicals for which assessments had been completed was less than the targets set in 1994. The IFCS stakeholders committed to increased cooperation and the pursuit of increased and stable levels of resources to address these priorities and deficiencies. Twenty-one goals were specified for the period 2000-2005 relating to the six UNCED priority program areas including:

- Improved national and international information exchange, cooperation and coordination on the sound management of chemicals
- Adopting and bringing into force the Rotterdam Convention, the Stockholm Convention and the Globally Harmonized System for the Classification and Labeling of Chemicals
- Development of national systems for the prevention of major industrial accidents, emergency preparedness and response, and poison control
- Completion of hazard assessments for an additional 1000 chemicals
- The establishment of national Pollution Release and Transfer Registers or emissions inventories
- Measures to prevent illegal traffic in toxic and dangerous products
- Sound management options for acutely toxic pesticides and severely hazardous pesticide formulations
- Risk reduction initiatives on chemicals of major concern
- Common principles and harmonized approaches for risk methodologies on specific toxicological endpoints
- National ecologically sound pest and vector management strategies
- Action plans for safe management of obsolete

stocks of pesticides and other hazardous chemicals
- Development and implementation of national policies to improve the management of chemicals.

4.3.5 International Council Of Chemical Associations (ICCA)

ICCA is a council of trade associations that represent chemical manufacturers at the national or regional level. It is concerned with policy issues of international significance to the chemical manufacturing industry including those related to health, safety, and the environment. ICCA is active in relevant international fora that address health, safety and environmental protection and its initiatives on high production volume (HPV) chemicals, the *Responsible Care* program, and the capacity-building needs of developing countries are relevant to the current international chemicals agenda.

In October 1998, ICCA launched a global initiative on HPV chemicals with the goal of preparing harmonized, internationally agreed data sets and initial hazard assessments to improve the database for about 1000 HPV chemicals by the end of 2004. Companies producing HPV chemicals are responsible for collecting hazard information, conducting tests (where required to supplement available information) and periodically updating information. They may also provide additional information such as use and exposure data. The initial hazard assessment will be forwarded for further consideration under the OECD HPV program (section 4.3.10.1). This initiative focuses on initial hazard assessment, as this is essential input for both prioritizing chemicals for risk assessment and for performing the risk assessments. Where data indicate that health or the environment is at risk, companies are encouraged to initiate protective action on the basis of their own findings. This program involves 1291 chemicals, 801 of which had industry sponsors as of July 13, 2002. Public information is available on the ICCA HPV website (http://www.iccahpv.com/home.cfm) for each chemical, including the company sponsors, the tests undertaken, the proposed and actual dates for testing to begin, and the anticipated completion date(s) for testing.

The ICCA has also initiated an international long-range research initiative to fund work on emerging and existing health and environmental questions to enable industry to address future issues. Both industry and other scientists are involved in independent research to develop or further scientific understanding of the mechanisms by which chemicals impact on humans and the environment, and provide companies with the knowledge they need to manage their products. The Japanese, American and European Chemical Councils are implementing this initiative through separate but complementary programs.

ICCA operates an industry-managed *Responsible Care* program that was initiated in Canada in 1985 and which now includes 46 countries accounting for 85% of the global production of chemicals. This program is intended to contribute to the sustainable development of local communities and of society as a whole by focusing on improving the industry's performance, communication and accountability. This voluntary initiative commits companies, through their national associations, to a collective effort to: "continuously improve their company's and the chemical industry's performance in protecting people and the environment throughout the life cycle of their products and processes; contribute to the sustainable development of local communities and of society as a whole; inform their publics of the risks and benefits of what they make and do, and about their performance, achievements and challenges; dialogue and work with their stakeholders at the local, national and international level to understand and address their concerns and aspirations; cooperate with governments and organizations at all levels in the development and implementation of effective regulations and standards, and to meet or exceed those requirements; and extend Responsible Care to all those who manage chemicals". ICCA monitors eight fundamental features of national *Responsible Care* programs to ensure global consistency in implementing the initiative for both industry and its stakeholders. National chemical associations are required to develop credible verification processes to demonstrate that member companies meet *Responsible Care* expectations.

ICCA is currently cooperating with IGOs and other relevant stakeholders to identify areas where capacity-building should be increased to further the sound management of chemicals. ICCA is pursuing development of a global capacity-building action plan involving an overarching international approach, in cooperation with UNITAR, and national case studies and pilot projects in two developing countries, in partnership with relevant stakeholders. As part of its preparations for the World Summit on Sustainable Development in September 2002, ICCA provided funding to assist development of case studies in Brazil and South Africa which, together with experiences of other national chemical industry associations, IFCS, UNEP and UNITAR, were used to develop a broad capacity-building action plan as part of a partnership involving the chemicals industry and other stakeholders.

4.3.6 International Labour Organization (ILO)

Established in 1919, ILO is now the UN agency that promotes social justice and internationally recognized human and labour rights. Its policy body is the International Labour Conference which meets annually to establish and adopt international labour standards. An executive council serves as the governing body of ILO, taking decisions on policy and making program and budget proposals for adoption by the Conference. All ILO governing bodies are tripartite in nature, involving representatives of workers, employers and governments. The International Labour Office serves as the permanent ILO secretariat.

ILO sets minimum standards for basic labour rights and develops international labour conventions (7 chemicals-related conventions are summarized in section 4.1.2), recommendations (guidelines for action by countries), codes of practice (technical and practical information for applying standards), and manuals. The ILO provides technical assistance *inter alia* on chemicals-related occupational safety and health matters to enhance the capacity of governments, employers, workers (including their representative organizations) and NGOs to participate in developing, implementing and evaluating policies and programs to improve the work environment and reduce work-related accidents and disease. Chemical safety activities include providing technical guidance and assistance to relevant organizations of governments, employers and workers concerning the prevention of major industrial accidents and the identification, prevention and control of workplace hazards posed by chemicals and related hazardous wastes.

ILO also collaborates with other IGOs on chemical safety matters and, as a member of the IOMC, ILO took the lead in developing the *Globally Harmonized System of Classification and Labelling of Chemicals (GHS)*. This was accomplished in 2002 and the development of this system was a recommendation in Chapter 19 of *Agenda 21* (section 3.2). The GHS includes: harmonized criteria for classifying chemical substances and mixtures according to their health, environmental and physical hazards; and harmonized hazard communication elements, including requirements for labelling and safety data sheets. It provides countries with a universal classification and labelling system for hazardous chemicals and should ensure that coherent information will be provided globally on all imported and exported chemicals and products. Implementation of the GHS on a global basis will require a sustained effort and cooperation among countries, international organizations and all stakeholders.

The International Occupational Safety and Health Information Centre was established in 1959 to assist countries in formulating and implementing occupational safety and health policies and programs. A wide range of information is collected and disseminated through an international network of collaborating centres including an *Encyclopaedia of Occupational Health and Safety* that serves as a basic reference for establishing programs. It was designed to help all stakeholders improve workplace conditions and it contains a guide with information on more than 2,000 chemicals and on chemical hazards associated with specific industries.

ILO has conducted technical cooperation projects and regional training sessions for developing countries and

countries with economies in transition to establish and strengthen national capacities related to chemical safety. These programs address classification systems for the labelling and transport of dangerous goods, the use of chemical safety cards, dissemination of information on hazardous substances, development of legislation, strengthening of national institutions, and safety and health information centres.

4.3.7 International Maritime Organization (IMO)

This organization was established in 1948 by a convention and was originally called the Intergovernmental Maritime Consultative Organization. The Convention entered into force in 1958 and the name was changed to IMO in 1982. IMO is the UN specialized agency responsible for improving maritime safety and preventing pollution from ships. Its supreme body is the IMO Assembly, which adopts resolutions and recommendations prepared by subsidiary bodies and elects a Council. The latter acts as a governing body between Assembly meetings and coordinates the activities of subsidiary bodies including the Maritime Safety Committee and Marine Environment Protection Committee that conduct the main work on chemicals.

The objectives of IMO are: to foster governmental cooperation in regulating practices concerning shipping in international trade; to pursue the adoption of the highest practicable standards for maritime safety and efficiency of navigation; to encourage prevention and control of marine pollution from ships, other craft, ports and terminals; to encourage removal of hindrances to international shipping services; and to draft international maritime conventions. Concerning the latter, IMO has prepared some 40 conventions and protocols and over 700 codes, standards, guidelines and recommendations concerning maritime safety, pollution prevention and related matters. These instruments are meant to ensure that ships are built, equipped, and operated in a safe and environmentally sound manner to limit the damage to the marine environment should they be involved in collisions or other incidents.

Two IMO conventions relevant to chemical safety are summarized in section 4.1.3. Others of interest include the *International Convention for the Safety of Life at Sea* (1974) and the *Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter* (1972). In 1965, IMO adopted the ***International Maritime Dangerous Goods Code***, which applies to all aspects of the storage, handling, and transport of dangerous goods. This code is updated regularly, in many cases in response to changes to the *UN Recommendations on the Transport of Dangerous Goods* (section 4.3.11). Separate international codes were also developed for bulk shipments of dangerous chemicals and liquefied gases to provide international standards for their safe transport by sea. IMO cooperates with ILO in the harmonization of classification and labelling of chemicals (section 4.3.6) and with the UNEP Regional Seas Program (section 4.2.1) in developing regional arrangements for marine pollution emergencies that are likely to affect neighbouring states.

IMO contributes to improving maritime training by developing standards and regulations for adoption at national or international level, by providing practical assistance and advice to countries in need of technical knowledge and resources to operate a shipping industry successfully, and by helping States ratify and comply with its conventions. This is accomplished through publications on preparedness and response, including emergency procedures for ships carrying dangerous goods, and providing information, education, training, technical services, and assistance to governments using documents, videos, seminars, workshops and other means.

4.3.8 International Program on Chemical Safety (IPCS)

The IPCS was established in 1980 as a cooperative program of ILO, UNEP and WHO. Its objective is to provide internationally evaluated assessments of the health and environmental risks posed by chemicals (for use in developing national chemicals safety measures) and to strengthen national capabilities for preventing and addressing the harmful effects of chemicals, including the health impacts of chemicals emergencies. IPCS is implemented through the

WHO Program for the Promotion of Chemical Safety, using technical programs of ILO, UNEP and WHO. A Program Advisory Committee of appointed experts serves as an advisory body to the Executive Heads of ILO, UNEP and WHO on policy matters and priorities. An ILO/UNEP/WHO Inter-secretariat Coordination Committee determines which IPCS activities are undertaken. Subsidiary groups advise on specific technical and scientific matters and national and international governmental, IGO and NGO participating institutions provide resources or undertake scientific and technical activities. The IPCS undertakes activities in the following four areas to address its objectives.

Evaluating the risks of chemicals to human health and the environment: IPCS issues peer-reviewed evaluations of the potential effects of specific chemicals including: Environmental Health Criteria monographs (extensive reports, intended for experts that evaluate risks posed by chemicals); Concise International Chemical Assessment Documents (summaries of scientific information); Health and Safety Guides (information for decision-makers); International Chemical Safety Cards (summaries for use in the workplace); Data Sheets on Pesticides; and Poison Information Monographs and Antidote Monographs (advice on prevention and treatment of poisoning). All these documents are included in an IPCS database (INCHEM). IPCS also participates in evaluating food additives, contaminants and veterinary drug residues through the Joint WHO/FAO Expert Committee on Food Additives and in assessing pesticides through the WHO/FAO Joint Meeting on Pesticide Residues.

Methodologies for evaluating health and environmental hazards and risks: IPCS performs work in this area relating to exposure to chemicals in order to advance development of common methods. This includes: developing Environmental Health Criteria monographs on principles of risk assessment; evaluating information on emerging issues in health risk assessment (*e.g.,* endocrine disruptors); and harmonizing methodologies for assessing risk from exposure to chemicals (*e.g.,* reproductive and developmental toxicity, carcinogenicity, mutagenicity). IPCS is also collaborating with OECD on the harmonization of terminology for chemical hazard and risk assessment.

Prevention and management of toxic exposures and chemical emergencies: IPCS is involved in this area through its support to poison control programs. Under the INTOX Project, a worldwide network of poison centres operates on a 24-hour basis. IPCS provides information, guidance and training materials, networking arrangements and information management tools. IPCS has also published guidance for policy makers on the roles of health in chemical incident response and follow-up and is coordinating efforts to collect and analyse data on chemical accidents and harmonize formats for collecting such data.

Development of human resources: IPCS is assisting in the establishment of national poisons centres and organizing training courses on risk assessment and the sound management of chemicals.

4.3.9 Inter-Organization Program for the Sound Management of Chemicals (IOMC)

The IOMC was established in 1995 to serve as a mechanism for coordinating the efforts of IGOs involved in the assessment and management of chemicals. Its membership currently includes FAO, ILO, OECD, UNEP, UNIDO, UNITAR and WHO. Formed in response to a recommendation from the UNCED meeting in 1992 (section 3.2), the mandate of the IOMC is to coordinate the scientific and technical activities of IGOs that relate to the sound

Several international initiatives exist to address toxic wastes.

Courtesy of UNEP

management of chemicals, including the six priority program areas in Chapter 19 of *Agenda 21* (section 3.2). This coordination may include other organizations, institutes or programs involved in chemical safety.

Technical coordinating groups have been established to address 4 specific program areas: harmonisation of classification and labelling of chemicals; pollutant release and transfer registers (PRTRs); assessment of existing industrial chemicals and pollutants; and chemical accident prevention, preparedness and response. These groups include representatives of governments, other IGOs and NGOs and serve as consultation mechanisms to involve interested stakeholders in program planning and other activities. The groups identify issues, monitor progress and report on program areas to the IOMC.

An Inter-Organization Coordinating Committee (IOCC) was established to coordinate joint planning of IOMC activities: it includes representatives of the seven member IGOs. Through the IOCC, these organisations consult on the planning, programming, implementation and monitoring of their chemical safety activities with the aim of ensuring effective implementation and avoiding duplication. The IOCC identified capacity-building as a high priority and prepared an analysis of ongoing and planned capacity-building activities of the member IGOs in support of the six priority program areas of Chapter 19. The IOCC website (http://www.iomc.ch) includes an inventory of the chemical safety activities and a calendar of related meetings and events of the seven member IGOs.

4.3.10 Organisation for Economic Cooperation and Development (OECD)

The OECD was established in 1960 and now includes thirty member countries. The senior decision-making body is the Council of OECD ambassadors that can agree on Council Acts. These may include Decisions (which are legally binding) or Recommendations (which signify political will and commitment).

The Environment Policy Committee was created in 1971 to promote the integration of environmental and economic policies to assist member countries in protecting environmental resources and reducing the overall pollution burden, improving international comparative data and information on environmental issues, and assessing environmental performance. The programs on Environmental Health and Safety and on Wastes are relevant to this report.

4.3.10.1 Environmental Health and Safety (EHS) Program

OECD work on the safety of chemicals began in 1971, with the original focus on pesticides. The Chemicals Program was formed in 1978 and it grew over time to include a wide range of topics. It is currently called the EHS program and has proven to be the most important intergovernmental forum for supporting member countries in their management of chemicals, pesticides and novel biotechnology products by addressing relevant technical, scientific and policy issues. Advantages of this program include the ability to address issues in the context of cross-sectoral linkages, such as economic policy, trade, science, agriculture and technology, and the ability to conduct outreach and capacity-building initiatives with non-member countries.

Countries participate in the EHS program to assist in meeting domestic obligations to protect human health and the environment from the use and release of commercial chemicals, pesticides and biotechnology products by: sharing national experiences, approaches and policies on risk assessment and risk management; pursuing the international harmonization of policies and practices related to testing, hazard assessment, risk assessment and risk management; and engaging in international cooperative programs to share the burden of assessing the risks of substances.

Government and industry have benefited by harmonizing approaches to the notification of information on new chemicals, biotechnology products and pesticides, and by sharing the burden of developing information on new and existing chemicals and pesticides. Industry has benefited from the reduction

of non-tariff trade barriers, reduction in delays for marketing new chemicals and pesticides, creation of a level playing field in OECD countries, and by obtaining information about OECD member countries' policies and regulations. A few years ago, OECD estimated (using conservative assumptions) that annual savings to government and industry resulting from the EHS program amounted to more than USD $43M.

In addition to its work in the following nine distinct areas, the OECD is promoting the development of Pollutant Release and Transfer Registers (PRTRs) and undertaking work on Food Safety.

Test Guidelines: OECD Test Guidelines are recognized worldwide as the standard reference tools for methods used to assess the properties and hazards of chemicals and their preparations (*e.g.* pesticides, pharmaceuticals). Developed through a consensus process involving scientists from government, industry and academia, they include tests for physical and chemical properties, accumulation and degradation in the environment, and effects on human health and wildlife. First published in 1981, they are continuously updated and supplemented to reflect the latest scientific developments and ensure the availability of current and scientifically valid test protocols. Test guidelines are viewed as one of the most effective and important EHS outputs as they are applied by OECD (and non-OECD) countries for proposed new industrial chemicals and pesticides, thus reducing costs as tests only need to performed once and are acceptable to all OECD governments for evaluation purposes. This has led to greater efficiency and harmonization among both industry and governments in developing data and in sharing the work of assessing and managing chemicals.

This program also responds to high profile issues. For example, at the 1997 G-7 Summit Meeting, environment leaders recommended high priority be given to revising OECD test guidelines on developmental and reproductive toxicity testing with a view to improving the safety of children. In addition, the 1997 IFCS meeting noted the complexity of the endocrine disrupting substances issue and agreed to address it by involving cooperation among governments, IGOs and NGOs. Subsequently, a Working Group on Endocrine Modulators Testing and Assessment was set up to pursue international consensus on preferred approaches to identify and assess the risks of endocrine disrupting substances.

Good Laboratory Practice (GLP) Compliance Monitoring: The OECD Principles of GLP complement the Test Guidelines by setting standards for managing laboratories and for performing and reporting studies. Accepted worldwide as the quality standard for chemical testing, the GLP Principles were adopted in 1981, are updated periodically, and new procedures are added as needed. This work guides the development of national GLP programs that benefit from receiving compliance status information on all GLP test facilities inspected by member country monitoring authorities.

Risk Assessment: The Risk Assessment program focuses on developing and improving hazard and risk assessment methods, promoting harmonization of methods and terminology among countries, encouraging mutual use and acceptance of assessment outcomes as a basis for risk management, and promoting international cooperation in assessing the risks of specific chemicals. This program is particularly active in the areas of environmental exposure assessment, statistical analysis of data, hazard classification of substances that are difficult to test, good assessment practice and cooperation on notification programs for new industrial chemicals. The work has led to improved cooperation and information exchange on national programs, monitoring data and assessment methodologies.

Cooperation on Existing Chemicals: This program has coordinated collaborative efforts to assess the risks of high production volume (HPV) chemicals, wherein governments work with their industry to gather basic sets of data on selected chemicals and, where required, industry conducts tests to complete a data set. Consensus assessment reports are produced and these contribute to IFCS targets for completing international assessments on existing chemicals. Since 1988, a database (EXICHEM) has provided informa-

tion on current and planned assessment activities by OECD countries for thousands of existing chemicals.

Risk Management: In 1973, OECD adopted separate Council Acts to control the manufacture and use of PCBs and to reduce anthropogenic emissions of mercury to the environment. In 1987, another Council Act was adopted to strengthen controls on PCBs. In the early 1990's, work focused on reviewing collective approaches to managing the risks posed by specific substances (lead, mercury, cadmium, methylene chloride, and brominated flame retardants) and developing voluntary measures to address the risk management of some existing chemicals that were in international commerce. One output was a 1995 voluntary industry commitment to phase out the manufacture of brominated flame retardants from OECD countries and a 1996 Ministerial Declaration on risk reduction for lead, which called on member countries to take domestic and international action to reduce human exposure to lead from a variety of sources. The current focus of this program is on management approaches that emphasize non-regulatory strategies, the exploration of factors involved in decision-making (such as the use of socio-economics in risk management decision making in OECD countries) and developing approaches that encourage industry to develop chemicals that are more environmentally friendly (so-called "green chemicals" or "environmentally sustainable chemicals").

Harmonization of Classification and Labelling: One of the 1992 UNCED goals was the development of a globally harmonized classification and labelling system for hazardous chemicals by the year 2000. In collaboration with other IGOs, OECD developed harmonized classification criteria for health hazards and hazards to the aquatic environment.

Chemical Accidents: The Chemical Accidents program was initiated in response to the 1996 chemical warehouse fire in Basel. It focuses on the development of guidance on preventing, preparing for and responding to chemical accidents. This guidance is shared among OECD countries and with non-member countries and, thus, the outputs of this program are used worldwide. A network of experts can be called upon at any time to share expertise and experience on environmental emergencies solutions.

Harmonization of Regulatory Oversight in Biotechnology: OECD work on biotechnology is intended to harmonize member country regulatory approaches for novel biotechnology products that are used in agricultural and industrial applications. To establish a common technical foundation for national regulatory decisions, Consensus Information Documents were developed identifying the information needed to assess the risks of biotechnology products. This program includes an effective networking mechanism on biotechnology regulatory issues for OECD member countries. The *BioTrack On-Line* database was developed for key information related to the regulation and commercialization of novel biotechnology products and it provided a precedent to a broader clearing-house mechanism under the UNEP Biosafety Protocol. While this program focuses on biological issues, there are distinct chemicals aspects to it (e.g., the recent development of genetically modified plants that are resistant to specific pesticides (with concerns for increased uses of these pesticides) and the use of genetically modified field plants to "grow" polymers (with attendant concerns for the possible environmental pollution that could result from such practices, including the disposal of such plants).

Pesticides: Since 1992, this program has helped countries share risk assessment work and find new approaches to risk reduction on pesticides. Test guidelines were developed and applied internationally for proposed new chemical and biological pesticides and guidelines developed to harmonise formats for submission of industry data and for country data reviews for pesticides. The objective is the development of a single industry data submission (that will be acceptable to all countries) and a common format (to be used in preparing reviews of this data). This will facilitate opportunities for work sharing and joint reviews and allow countries and industry to make more efficient use of available resources. Countries are now performing co-operative multinational reviews of new pesticide submissions to reduce costs to governments and industry. Another step is the

development of common core data requirements for different pesticide product types, to facilitate the development and submission of a single database by industry as well as work sharing among countries.

4.3.10.2 Waste Program

The OECD waste management program has been ongoing since 1974. Work in three areas is relevant to the current report.

Transfrontier movement of wastes: Since 1982, eight Council Acts have been adopted that constitute a framework for addressing and controlling transfrontier movement of wastes, including the movement of recyclable or recoverable wastes between OECD countries. The early OECD work contributed significantly to development of the 1989 Basel Convention (section 4.1.5.2) and much of the OECD work contributes to its ongoing implementation. Future work will address the development of international guidelines for environmentally sound management of recoverable wastes in facilities receiving transboundary shipments.

Waste minimization: OECD has made considerable efforts since 1992 to minimize the generation of wastes. It was estimated that municipal wastes were going to double in the period from 1980 to 2020, demonstrating that various practices were resulting in an inefficient use of materials and energy. Guidance has recently been developed on strategic waste prevention and material flow accounting practices. Future work will address indicators to assess overall performance in waste prevention and an evaluation of the use of economic incentives in waste service contracts to support waste minimization.

Extended Producer Responsibility (EPR): Work in this area was initiated in 1994 and has included studies of member country legal and administrative issues relating to EPR policies and programs. It led to the development of a 1998 framework report on EPR, addressing policy and legal considerations related to sharing of responsibility, and resulted in the publication in 2001 of a *Guidance Manual for Governments*. Future work will focus on program implementation, costs and effectiveness of EPR programs.

4.3.11 United Nations Economic Commission for Europe (UNECE)

Established in 1947, the UNECE includes 55 countries from North America, Europe and Central Asia in one of five regional commissions of the UN: others exist for Africa, Western Asia, Asia and the Pacific, and Latin America and the Caribbean. As a regional UN body, it ensures that regional interests are addressed at global UN conferences and promotes economic cooperation, information sharing and joint action on activities such as economic analysis, environment and human settlements, statistics, sustainable energy, trade, industrial development, timber and transport. Outputs include policy analysis, technical assistance, and more than 30 conventions and protocols, including 5 conventions and 9 protocols that are relevant to chemicals (see section 4.2.2), and over 250 regulations and standards. These outputs are intended to protect and improve the environment, facilitate trade on a regional and global scale, provide consumer protection, and further integrate member States at the regional and international level. UNECE also provides technical assistance to countries in transition.

The UNECE Committee on Environmental Policy provides direction on environment and sustainable development issues, develops international environmental law, and supports regional international initiatives. Its objectives are to: assess country efforts in reducing overall pollution burdens and managing natural resources; integrate environmental and socioeconomic policies; strengthen cooperation with the international community; harmonize environmental conditions and policies throughout the region; and stimulate greater public involvement in environmental discussions and decision-making. This work involves the conduct of environmental performance reviews in Central and Eastern European countries, and improving overall effectiveness of relevant conventions and protocols. In June 1998, ministers agreed to strengthen support in environmental matters for newly independent States and some Central and

Eastern European countries, and endorsed a strategy to phase out the use of lead in gasoline.

The UNECE also provides Secretariat support for a committee that produces the ***Recommendations on the Transport of Dangerous Goods*** (often referred to as the "Orange Book"). These recommendations address principles for all aspects of classification, packaging, testing, labelling, etc. and provide guidance to governments and IGOs in developing national and international requirements, respectively, for traffic in dangerous goods. First issued in 1956, they are regularly updated and the most recent version (1999) includes ***Model Regulations on the Transport of Dangerous Goods*** that are suitable for use by authorities in developing national and international legislation. Several international instruments are now based on these recommendations (*e.g.,* the UNECE conventions described in sections 4.2.2.1 and 4.2.2.5). They have also been used for determining classes of wastes under the Basel Convention and in developing a global harmonized chemical hazard identification and classification system. The recommendations were developed, reviewed and updated by the UN Committee of Experts on the Transport of Dangerous Goods, a subsidiary body of the United Nations Economic and Social Council that adopts and publishes them. In 2001, the committee became the Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized System of Classification and Labelling of Chemicals (in response to the recommendation in Chapter 19 of *Agenda 21* for the development and implementation of a globally harmonized classification and labelling system).

4.3.12 United Nations Environment Programme (UNEP)

UNEP was established in 1972 as the principle UN body in the field of the environment. Its mission is "to provide leadership and encourage partnerships in caring for the environment by inspiring, informing and enabling nations and people to improve their quality of life without compromising that of future generations". UNEP's policy body is the Governing Council (UNEP GC) which reports to the General Assembly through ECOSOC, assesses the state of the world environment and promotes international cooperation on environmental issues. UNEP addresses a wide range of international environmental problems, harmonizes environmental policies and coordinates and integrates actions taken on environmental issues by the UN, IGOs, NGOs and at the regional and national levels. Current UNEP priorities include: environmental information, assessment and research; enhanced coordination of environmental conventions; development of policy instruments; fresh water; technology transfer and industry; and support to Africa. UNEP's broad environmental mandate includes the following chemicals-related activities in addition to three distinct activities that are described later in this section.

The **UNEP Chemicals Programme** was established in 1974 to address all chemicals-related issues and to promote sustainable development by catalysing global actions and building national capacities for the sound management of chemicals and the improvement of global chemical safety. This program is currently supported by a global network of POPs and PIC focal points designated by governments, IGOs and NGOs. The following activities to promote chemical safety are undertaken in cooperation with IGOs, NGOs, convention secretariats, regional offices and other organisations.

- Actions to reduce or eliminate global chemical risks include providing secretariat support for the development and implementation of the Rotterdam Convention (with FAO) and Stockholm Convention, supporting implementation of the voluntary PIC Procedure that is in operation pending entry into force of the Rotterdam Convention, and supporting implementation of agreed interim arrangements pending entry into force of the Stockholm Convention.
- Assistance is provided to governments in developing their capacity to achieve the sound management of chemicals and meet their commitments under international legally binding agreements. Thirty to fifty awareness-raising workshops are held each year at the regional, sub-regional, and national levels to address ratification and implementation of the Rotterdam and Stockholm Conventions, the

management of stocks of obsolete and unwanted pesticides, and the development of national information systems and chemicals legislation.

- Technical guidance materials are developed and distributed to assist governments and other stakeholders in identifying and reducing the risks posed by chemicals including information on Pollutant Release and Transfer Registers, the Stockholm and Rotterdam Conventions, lead in gasoline, chemical risk assessment, and OECD screening information data sets for high production volume chemicals.
- The exchange of information on chemicals is promoted by developing information systems and databases, providing guidance for accessing relevant sources of information, improving Internet access for chemical management officials in African countries, and maintaining a Master List of actions taken on POPs by over 100 countries and numerous IGOs and NGOs.
- Global and regional levels of chemicals are assessed to identify possible future interventions to protect human health and the environment and to monitor the success of existing programmes, including a global network for monitoring environmental levels of POPs and other persistent toxic chemicals.

The **Awareness and Preparedness for Emergencies at the Local Level (APELL) program** was developed by UNEP in 1988, in cooperation with representatives of governments and industry, to protect communities from health, environment or property damage that may result from industrial accidents involving chemicals. UNEP encourages decision-makers and technical personnel to create and/or increase public awareness of possible hazards within a community, develop emergency preparedness plans to respond to emergencies that might occur, train residents on how to act in the event of an accident, and take actions to prevent accidents. In 1992, the UNCED conference endorsed APELL and recommended that it be strengthened and implemented in all parts of the world. Recently it has been promoted as a mechanism for preparedness for earthquakes, floods and natural disasters.

The **Cleaner Production Program** was initiated in 1989 to promote the use of environmentally sound industrial production methods including pollution prevention strategies, making efficient use of raw materials and reducing health and environmental risks. UNEP assists governments and industries in finding sustainable solutions to the problems that accompany rapid industrialisation by providing information and training on cleaner technology products and services and environmental management systems.

The **OzonAction program** promotes the phasing out of ozone-depleting substances (ODS) in developing countries and countries with economies in transition to ensure compliance with the *Montreal Protocol on Substances that Deplete the Ozone Layer* (section 4.1.5.1). This is implemented by sharing experiences through an information clearinghouse and eight regional networks involving more than 100 national ozone units. Capacity building is accomplished through the development of training and management plans, *e.g.,* education and training for farmers, NGOs and agriculture institutes in developing countries to raise awareness on alternatives to such ODS as methyl bromide.

The **Regional Seas Program** advances protection of shared marine and water resources through regional conventions or action plans that include over 140 countries (see section 4.2.1).

The **Global Program of Action for the Protection of the Marine Environment from Land-Based Activities** was adopted by governments in November 1995 and is coordinated by UNEP. It was established to address the threats to the marine environment that are posed by land-based human activities that contribute to atmospheric deposition, physical changes of coastal zones, or municipal, industrial or agriculture wastes and run-off. The program is intended to guide national and regional authorities in developing and implementing actions to prevent, reduce, control and/or eliminate marine degradation from land-based sources and activities. Chemical contaminants such as POPs and heavy metals were given high priority for attention in the 1995 agreement.

4.3.12.1 International Action on Mercury and its Compounds

In response to UNEP GC Decision 21/5 (February 9, 2001), UNEP conducted a global assessment of mercury and its compounds that reviewed: the chemistry, global production and uses, natural and anthropogenic sources of releases, environmental transformation, toxicology, and impacts of mercury on human health and the environment; environmental long-range transport and the origin, pathways, deposition and transformation on a global scale; prevention and control technologies and practices, including the use of suitable substitutes, to reduce and/or eliminate releases of mercury, including their cost and effectiveness; ongoing and planned future actions at the national or regional level for controlling releases and limiting use and exposures, including waste management practices; and any scientific and technical data gaps identified in the assessment process. In September 2002, a multi-stakeholder working group conducted a technical review of and finalized the assessment report and developed options for addressing identified significant global adverse impacts of mercury. The final assessment and working group reports were submitted for GC consideration in February 2003.

As recorded in Decision 22/4.V (February 7, 2003), the GC accepted the key findings of the report, concluded that there is sufficient evidence of significant global adverse impacts from mercury and its compounds to warrant further international actions to reduce the risks to human health and the environment, and agreed on an action plan to assist all countries, especially developing countries and countries with economies in transition, to reduce their releases of mercury and its compounds to the environment.

The GC agreed to review progress on this initiative at its 2005 meeting, invited governments to submit their views on any further measures for addressing the global adverse impacts of mercury and its compounds, and agreed to consider any proposals for developing a legally binding instrument, a non-legally binding instrument or other measures or actions, in the light of progress in the further development of a strategic approach to international chemicals management (see section 4.3.12.3).

B. Lyons

High levels of mercury can be found in fish such as shark, swordfish, mackerel, and tuna.

The GC also invited Governments, IGO and other stakeholders to submit views on whether any further action might be taken with regard to other heavy metals (e.g., lead and cadmium).

4.3.12.2 Phasing Out the Use of Lead in Motor Gasoline

At its 21st meeting, UNEP GC adopted Decision 21/6 calling on governments who have not yet done so to eliminate the use of lead in gasoline and urged governments and other players in a position to do so, to assist national governments in this phase-out. This issue has been addressed over the past few decades and many countries have already taken action to phase out the use of leaded gasoline. However, as the Stockholm Convention on POPs identifies emissions from vehicles as a possible significant source of dioxins and furans, especially vehicles using leaded gasoline, increased attention may be brought to the issue in some countries.

4.3.12.3 Strategic Approach to International Chemicals Management (SAICM)

At its 21st meeting, UNEP GC adopted Decision 21/7 that requested an examination of the need for a strategic approach to international chemicals management (SAICM) for consideration at the 7th Special Session of UNEP Governing Council/Global Ministerial Environment Forum (GC/GMEF) in February 2002. Issues were raised concerning several aspects of international chemicals management, including the relationships between:

- Various global legal instruments (*e.g.,* Basel, Rotterdam and Stockholm Conventions, Montreal Protocol)
- Global and regional legal instruments (*e.g.,* UNECE Protocols, UNEP regional seas agreements)
- Bodies and institutions with chemicals programs (*e.g.,* UNEP, IFCS, IOMC)
- A proposed SAICM and the IFCS *Bahia Declaration on Chemical Safety* and *Priorities for Action Beyond 2000*
- Organizations that are responsible for chemicals policies and those responsible for development programs.

Governments, IGOs and other relevant stakeholders were subsequently asked by UNEP to provide their views on the need for a SAICM and to comment on the main issues, opportunities, needs and/or objectives that it might address. Almost all of the 45 governments, 6 IGOs, 9 NGOs and 2 others who responded agreed that there was a need for a SAICM and they identified several pertinent issues, including the following.

- **There is a link between sound chemicals management and sustainable development.** Chemicals play a key role in world social and economic development and it is vital for sustainable development that risks from chemicals be reduced or eliminated. Thus, a SAICM could assist countries in making the best use of available resources to protect the environment and human health within the context of sustainable development. Some respondents suggested raising the priority for chemical safety in national development strategies and Official Development Assistance programs and for coordination with international approaches to chemical safety, and proposed linking economic assistance for less developed countries to compliance with internationally agreed approaches to chemicals management.
- **There is a need for a *global* approach to address the *global* nature of chemicals issues and to reduce health and environmental risks.** Since chemicals are produced, traded and used globally, and once released into the environment they can cross international boundaries, the local, regional and global impacts of chemicals production, use and disposal require a SAICM.
- **The growth of global trade in chemicals is accompanied by rapid changes in the patterns of production and use in both developing and developed countries.** Thus, an increasingly global chemicals market, a growing use of and dependency on chemicals, and a corresponding growth in chemicals management and disposal problems all argue for a SAICM.
- **There is a need for priority setting and increased focus and coherence in international chemicals management**. As one example, in addressing the international priorities for action identified in October 2000 by the IFCS in its *Priorities for Action Beyond 2000* and the *Bahia Declaration on Chemical Safety* (section 4.3.4) it was noted that IFCS and IOMC recommendations were not necessarily endorsed by IOMC governing bodies, leading to a lack of mandate and resources for implementation in some cases.
- **There is a need for improved coordination at the global, regional and national levels to identify gaps, reduce duplication and maximize institutional efficiency and synergies.** Some respondents noted the need for harmonization of and increased coherence among conventions and proposed rationalizing relationships between the various global and regional legal instruments and between IGOs and other international bodies with chemicals programs. Other suggestions included the consolidation of reporting requirements, scheduling back-to-back meetings for related conventions and closer liaison, cooperation, joint budget and work planning and co-location of convention secretariats. Some argued that it was important to reduce overall costs for related chemical agreements and to address

common issues (*e.g.,* import, export, destruction issues, illegal traffic, non-compliance, dispute resolution, liability, institutional strengthening and financial assistance to developing countries) and address specific chemicals that might require global action (*e.g.,* endocrine disrupting chemicals, persistent non-organic pollutants).

É **There is a need for improved coordination with bodies outside the chemicals management arena**. Specifically, it was noted that relationships should be established or strengthened between regional and global organizations responsible for chemicals policies and programs and organizations responsible for other related activities, especially development programs.

· The development of a SAICM would be important in facilitating interaction among all stakeholders (governments, industry, academia, public, etc.) to identify appropriate priorities in chemicals management.

É **A SAICM would be an appropriate next phase of work on international chemicals management**. Recent agreements, such as the Rotterdam and Stockholm Conventions, have demonstrated the high relevance of global legal instruments on toxic and hazardous chemicals and some respondents argued that it was time to discuss 'next steps' in advancing the chemicals agenda. Several recent issues were identified as requiring a more general approach (*e.g.,* cooperation with industry, industry responsibility, liability, implementing the precautionary principle and the principle of substitution, risk reduction, articles and products as sources of environmental releases of chemicals, and broader approaches than focusing on individual substances).

É **A SAICM could produce guidelines and information on the sound management of chemicals for both international organizations and national authorities.** Such information could lead to improved national management of chemicals under internationally established criteria, benefiting countries that lack their own technical resources or legal framework. Given the lack of information on the environmental and health effects of the thousands of chemicals in use, international action is needed to complement national activities and ensure that all countries were privy to such information as it becomes available, enabling common approaches to the sound management of chemicals.

É **A SAICM would lead to increased transparency and public participation in chemicals management.** Development of a SAICM would lead to fuller public participation in the environmentally sound management of chemicals, improved accessibility to and dissemination of data on hazardous chemicals, and awareness raising for all sectors of society, including the "right to know" of workers and the public concerning the hazards of substances.

É **A SAICM could address the needs of developing countries and countries with economies in transition for capacity-building and technical and financial assistance to meet health and environmental protection requirements in the field of chemical safety.** Many developing countries lack the resources, legal framework, technical capacity and information needed for the sound management of chemicals and to prevent the dumping of pesticides and chemicals that are already banned in the country of origin or are suspected of causing health or environmental effects. As production of high volume chemicals shifts from developed to developing countries, international assistance may be needed for developing countries to implement appropriate measures for the sound management of chemicals. Small Island Developing States were seen as particularly vulnerable in addressing these issues.

É **A SAICM would help address the issue of illegal traffic and generally facilitate compliance with multilateral environmental agreements.**

É **A SAICM would improve global chemical safety while preserving the economic interests of States and the private sector.** Industry should find such a common global approach to be beneficial.

É **Industry has the potential to accept increased responsibility in the field of chemical safety.** Industry could improve implementation of

chemical safety initiatives, such as its *Responsible Care* program (section 4.3.5), and pursue cleaner production while at the same time not adversely affecting employment or competitiveness. Other concepts mentioned include product responsibility, the 'polluter pays' principle, development of international standards for placing chemicals on the market, setting ethical standards by chemical producing countries, and the need to shift more responsibility from government to industry.

- **A SAICM could address monitoring issues.** Concepts included establishing global systems and indicators to identify problems at the national and regional levels and to assess the effectiveness of implementing international actions.

Some respondents felt that aspects of a SAICM already existed (*e.g.,* the IFCS priorities for action) and that further work should focus on setting priorities, identifying gaps, improving coordination and avoiding duplication of effort. Others felt that it was unclear what would be entailed in a SAICM, noted the resource implications of enhancing international mechanisms, and welcomed initiatives such as the IFCS priorities and the UNEP GC review of international environmental governance. Other respondents indicated that additional measures were needed and that objectives and principles should be developed to define the possible scope of a SAICM, identify the range of chemicals to be addressed, build on established activities, enhance cooperation at national and international levels, and provide guidance for coherent and consistent approaches to chemicals management at national and international levels.

The following activities were identified as candidates for inclusion in a SAICM but it was noted that many were already included in ongoing work:

- "encouragement of waste minimization, minimization of residues at source, recycling, and recovery;
- cleaner production and a shift from highly toxic chemicals to those with lower toxicity or a shift to non-chemical alternatives;
- banning and phasing out of certain chemicals;
- disposal of obsolete and unwanted stocks of chemicals and pesticides and of waste by-products;
- illegal traffic, including strengthening regional cooperation on this, and prevention of dumping and smuggling;
- labeling and safe packaging;
- remedying the lack of scientific data on many chemicals;
- science-based decisions on future priorities and research to support these;
- developing assessment methodologies, especially regarding endocrine disruptors;
- better risk assessment and a harmonized strategy for risk assessment and notifications;
- elaboration of inventories, including accelerated development of Pollutant Release and Transfer Registers (PRTRs) and emissions inventories and reducing chemical releases;
- harmonization of generic and technical terms and of the chemical classification and labeling system;
- provisional technical guidelines on chemical management and on best techniques and best environmental practices;
- ratification and implementation of the Rotterdam and Stockholm Conventions, mechanisms to encourage cooperation among developed and developing countries in matters relating to imports and exports of chemicals in keeping with the Rotterdam Convention and other agreements;
- harmonization of notification and assessment schemes;
- use of economic instruments to promote good practices;
- the global assessment of mercury; and,
- ratification and implementation of Amendments to the Montreal Protocol."

Respondents noted that capacity building was a key element in implementing the sound management of chemicals, that capacity building for countries without effective regulatory systems was an overriding strategic need, and raised the following issues in this regard:

- "the need to recognize vast differences between developed and developing countries' chemicals management experience and technology transfer;
- financing schemes for specific environmental projects;
- strengthening of technical and management capabilities through training and technology transfer;

- capacity-building for activities such as strategic planning for chemicals management, risk assessment, infrastructure assessment, and priority-setting processes;
- the need to increase technical capacity in developing countries to ensure objective decision-making based on scientific evidence;
- a capacity-building strategy to upgrade the level of handling of chemicals beyond "cradle-to-grave", and to assist national coordination and compliance with MEAs;
- improving access to information available in other countries on chemical substances in order to build capabilities in developing countries, taking into account economic, social and environmental aspects;
- protection of Least Developed Countries with regard to production of dangerous chemicals, and the special situation of Small Island Developing Countries, including the threat of contamination of atolls, ground water and marine ecosystems;
- technical cooperation in respect of emergencies and industrial accidents, and community-level training in the APELL system (Awareness and Preparedness for Emergencies at the Local Level);
- access to cost-effective alternatives to dangerous chemicals, and to related technologies;
- assistance for developing countries in environmental protection against chemicals from developed countries, also taking account of the shift of some chemicals production from developed to developing countries;
- support for education and research on the development of environmentally friendly pesticides in developing countries, including non-chemical pest control products;
- environmental audits;
- removal of stockpiles of obsolete/unlabelled pesticides and other toxic wastes, and disposal of chemicals/pesticides and chemical containers;
- the lack of proper storage facilities and disposal sites;
- the importance of poison control centres and the health sector;
- the health impacts of chemicals, especially of pesticides on the reproductive systems of rural women; and,
- a multi-stakeholder approach and awareness-raising amongst chemical users such as workers and farmers."

It was also noted that to achieve the objectives of Chapter 19 of *Agenda 21*, increased and more stable flows of resources were needed and it was pointed out that the **early involvement of multilateral funding agencies in any future negotiations was key to achieving effective implementation of international agreements**.

Following discussion of this matter at the 7th Special Session of UNEP GC/GMEF (February 13-16, 2002), governments acknowledged:

- "the increasing need for effective capacity-building and technical assistance to assist developing countries and countries with economies in transition in implementing existing international legal instruments for management of chemicals and hazardous wastes and to meet future challenges in chemical safety, including the protection of human health and the environment," and
- "the need for all countries to have access to alternatives to hazardous chemicals that are safer, efficient and cost-effective as well as to related technology and to easy access to the latest developments and knowledge regarding hazardous substances and their alternatives."

Governments agreed to further develop a SAICM and endorsed the IFCS *Bahia Declaration on Chemical Safety* and *Priorities for Action Beyond 2000* (the "IFCS documents") as "the foundation of this approach". UNEP (in consultation with relevant organizations and stakeholders, including the IOMC, governments, IFCS, and the GEF and other major agencies responsible for the funding and delivery of international development cooperation) was mandated to identify:

- Actions currently underway or planned at the international, regional or national levels to advance the sound management of chemicals, with particular reference to the IFCS documents;
- Any gaps in the IFCS documents or in the implementation of these priorities and suggest remedies for any identified gaps; and

- Concrete projects and priorities in the context of a strategic approach to international chemicals management and convene: "an open-ended consultative meeting involving representatives of all stakeholder groups, subject to the availability of extra-budgetary resources, to contribute to the further development, based on these analyses" of a SAICM.

This decision emphasized that the SAICM should "promote the incorporation of chemical safety issues into the development agenda and identify concrete proposals for strengthening capacity for the sound management of chemicals and the related technologies in all countries, taking into account the vast difference in capabilities between developed and developing countries in this field."

In addition, the GC/GMEF invited the World Summit for Sustainable Development (WSSD) to:

- Endorse the further development of a SAICM and the IFCS documents as the foundation of this approach;
- Urge the active engagement of the major agencies responsible for the funding and delivery of international development cooperation and other relevant actors; and
- Call upon all governments and other relevant actors to take immediate action to implement the identified priority activities.

The WSSD, held in Johannesburg, South Africa (September 2002), adopted an overall plan of implementation and in response to the UNEP request:

- Set a goal that, by 2020, chemicals would be used and produced in ways that:
  - lead to the minimization of significant adverse effects on human health and the environment, using transparent science-based risk assessment procedures and science-based risk management procedures, taking into account the precautionary approach, as set out in principle 15 of the Rio Declaration on Environment and Development, and
  - support developing countries in strengthening their capacity for the sound management of chemicals and hazardous waste by providing technical and financial assistance.
- Endorsed the further development of a SAICM, based on the IFCS documents, by 2005 and urged that UNEP, IFCS, other international organizations dealing with chemical management and other relevant international organizations and actors closely cooperate in this regard, as appropriate.

At its twenty-second session in February 2003, UNEP Governing Council:

- Agreed to proceed with the further development of a SAICM and stressed that its scope should be clearly defined and take into account economic, social and environmental aspects of chemicals management, with a view to contributing to sustainable development;
- Decided that this approach should be regularly reviewed to assess progress on chemical safety, in the light of the targets set at WSSD, in cooperation with other relevant processes;
- Endorsed the concept of an open-ended consultative process involving representatives of all stakeholder groups, taking the form of preparatory meetings and the convening of an international conference;
- Invited the active collaboration of participating organizations in the IOMC, governments, IFCS, GEF and other major agencies responsible for the funding and delivery of international development cooperation, and other relevant organizations and stakeholders;
- Noted the importance of coordination between the development of the SAICM to international chemicals management and the work of the Vienna Convention and its Montreal Protocol and the Rotterdam, Stockholm and Basel Conventions, with due regard to their respective mandates;
- Requested UNEP to:
  - compile possible draft elements of such a SAICM for consideration at the first preparatory meeting and invited Governments, relevant international organizations and other actors to contribute to that compilation;
  - ensure that the process of further developing the SAICM remains open, transparent and inclusive, providing opportunities for all stakeholders to participate in the substantive work;

- ü report on progress at the eighth special session of the GC/GMEF (2004);
- ü report on progress and outcomes of the preparatory meetings to the twenty-third session of the Governing Council (2005); and
- ü propose to the co-conveners that they consider holding the international conference in conjunction with the ninth special session of the GC/GMEF in early 2006, with a view to the latter serving as a high-level segment of the conference that would consider adopting the completed SAICM document on behalf of UNEP and inviting the governing bodies of other relevant organizations also to endorse it.

In response to this decision, UNEP has contacted Governments, the IOMC, IFCS, UNDP, the World Bank and other relevant organizations seeking their contributions to a compilation of possible draft elements of a SAICM for consideration at the first preparatory meeting. Representatives of the seven IOMC organizations, IFCS, UNDP and the World Bank are serving as a steering committee to deal with practical preparations for the SAICM process. They held a stakeholder information and consultation meeting in Geneva, Switzerland (29 April 2003) and made practical arrangements for the first preparatory SAICM conference in Bangkok, Thailand (9-13 November 2003).

Thus there is a firm mandate to pursue the SAICM initiative, the link between the policy and development elements has been explicitly made, and interest has been demonstrated at the political level in shaping the future international chemicals agenda.

4.3.13 United Nations Industrial Development Organization (UNIDO)

Established in 1967, and made a specialized UN agency in 1985, UNIDO is dedicated to "promoting sustainable industrial development in developing countries and countries in economic transition". Its governing body is the General Conference, which provides a forum for representatives of government, industry and the private sector to address issues related to sustainable development including implementation of global principles and initiatives through technical cooperation programs. UNIDO is involved in two major areas: strengthening industrial capacities, and cleaner and sustainable industrial development. The latter area is relevant to the present discussion.

UNIDO has had a Chemical Industries program since its inception. In response to a major industrial accident in 1984 in Bhopal, India, efforts were augmented for chemical safety and technical cooperation. In 1998, a Cleaner Production and Environmental Management program was established that included most of the previous chemical safety activities. UNIDO is currently involved in strengthening the capacity of countries to implement measures for the sound management of chemicals and in promoting safety, health and environmental protection by providing technical assistance to countries in formulating national policies to encourage cleaner production programs. UNIDO has established 20 National Cleaner Production Centres and several Ecotoxicology Centres and is involved in work related to environmental management in various industrial sectors, toxic and hazardous chemical wastes, and remediation of contaminated sites. As an implementing agency of the Multilateral Fund for the Implementation of the Montreal Protocol, UNIDO promotes new technologies and processes to help developing countries phase-out the use of ozone-depleting substances. UNIDO has established a Regional Network on Safe Pesticide Production and Information for Asia and Pacific that includes 15 participating countries and coordinates a wide range of activities to reduce risks in the production and use of pesticides.

4.3.14 United Nations Institute for Training and Research (UNITAR)

UNITAR was established in 1965 as an autonomous body within the UN and is governed by a Board of Trustees appointed by the UN Secretary-General. It conducts research to explore innovative training and capacity-building approaches and forms partnerships with other UN agencies, governments and NGOs to develop and implement training and capacity-building

programs in developing countries and countries with economies in transition. A specific program has been established for training and capacity-building in chemicals and waste management that emphasizes cooperation among national stakeholders and international organisations to foster an integrated national approach to the sound management of chemicals. Activities on chemicals include implementing training and capacity-building projects, organizing workshops, providing information exchange services and developing technical training, guidance and resource materials.

UNITAR assists countries through initiatives aimed at developing an integrated and coordinated national approach to manage chemicals through a variety of programs, many of which are based on IFCS recommendations. In implementing these initiatives, UNITAR provides guidance, training and technical support to countries in developing their *National Chemicals Management Profiles* through an assessment of existing legal, institutional, administrative and technical infrastructures for the sound management of chemicals. In this activity, countries are assisted in a multi-stakeholder process involving NGOs and all ministries concerned with chemicals management and countries are encouraged to establish a policy-level coordinating committee involving all relevant ministries, as recommended by the IFCS. To date, about 85 countries have prepared such profiles and many others are interested in doing so. Following preparation of a national profile, capacity building priorities are established for strengthening specific aspects of chemicals management through a *National Priority Setting Workshop* in preparation for initiating an integrated national program for the sound management of chemicals. Identified priorities for action may include risk reduction activities for individual chemicals or groups of chemicals, an infrastructure issue (*e.g.,* legislation), specific chemical management topics (*e.g.,* accident prevention), or implementation of an international convention. Action plans are then developed that outline precise goals, planned activities, indicators of success, suggested implementation mechanisms and financial and human resource needs. A guidance document entitled *Developing and Sustaining an Integrated National Programme for the Sound Management of Chemicals* serves as an overall framework document for this program.

UNITAR develops detailed guidance materials and conducts workshops and programs to assist countries in developing sound action plans for specialized topics of chemicals management including: the development of a national pollutant release and transfer register (PRTR) system; the implementation of national risk management decision-making processes; action plan development for priority chemicals; and the development of effective chemical hazard communication systems. Electronic access is provided to guidance, training materials and country National Profiles. One current effort is the development of an Information Exchange Network on Capacity Building for the Sound Management of Chemicals to improve information exchange on capacity-building activities.

4.3.15 World Health Organization (WHO)

The WHO was established in 1945 as a specialized agency of the UN. Its policy body is the World Health Assembly (WHA), which is supported by an Executive Board responsible for providing advice and implementing decisions and policies of the WHA. The WHO objective is "the attainment by all people of the highest levels of health, defined to include physical, mental and social well-being (not just the absence of disease or infirmity)". The main activities of the WHO to achieve this objective are: "to give worldwide guidance in the field of health; to set global standards for health; to cooperate with governments in strengthening national health programs; and to develop and transfer appropriate health technology, information and standards".

The primary WHO focus for chemicals programs is the International Program on Chemical Safety (IPCS), a joint program with ILO and UNEP that is coordinated by WHO (section 4.3.8). WHO also has a program for the Protection of the Human Environment that has projects related to chemicals in the following five areas.

Pesticides: Since 1960, the WHO has involved governments, academia and industry in promoting

and coordinating the testing and evaluation of new pesticides proposed for public health use through assessment of alternative and existing pesticides for their safety, efficacy, acceptability and cost-effectiveness, and standard setting to assure product quality. WHO and FAO also established the Codex Alimentarius Commission to implement the Joint FAO/WHO Food Standards Programme.

Management of hazardous wastes: WHO provides technical and capacity building support for the management of hazardous wastes (emphasizing wastes from pesticides and industrial and health care sectors) and provides information on related health hazards and guidance and training on treatment technologies and best available practices.

Risk assessment: Activities in this area include: developing methodologies to assess human exposures and the health effects of environmental hazards; developing methodologies on specific preventive interventions and environmental management approaches; encouraging application of food science research to environmental health issues; and developing assessments of health impacts of climate change and ozone layer depletion.

Emergencies: In this area, WHO provides technical assistance for developing national emergency preparation and response programs to mitigate the health consequences of such events.

Improving access to information: Activities in this area include: the Global Environmental Epidemiology Network, which increases the capacity of developing countries to secure environmental health by strengthening education, training and applied research in environmental epidemiology; the Global Health and Environment Library Network, which provides information on health and environment; the Health and Environment Analysis for Decision-Making Project, which provides data and information on health impacts of environmental hazards for decision-makers, environmental health professionals and communities; and the Documentation Centre of the Program for the Promotion of Environmental Health, which collects and organizes health and environmental information.

5 The World Bank and International Chemicals Issues

IN THE PREVIOUS SECTIONS OF THIS REPORT, information was provided concerning: what a chemical is; the fate of chemicals once they are released into the environment; the processes followed in assessing the health and the environmental risks posed by chemicals and in managing toxic chemicals; the many uses of chemicals in societies today; the nature of the chemicals industry; and the dozens of international agreements, programs and initiatives that exist to address the risks posed by chemicals. This section includes a summary of the key points in the preceding sections, an analysis and overview of the many international agreements, programs and initiatives in section 4, and highlights some issues for consideration by the World Bank as it determines its role in the global quest for the sound management of chemicals.

5.1 BACKGROUND ON CHEMICALS ISSUES

All living and inanimate matter is made up of chemicals. A chemical may be either an element or a compound that is formed by a combination of some of the more than 100 elements that make up our world.

Virtually every man-made product involves the use of intentionally produced chemicals in some manner. Tens of thousands of chemicals are currently produced for commercial purposes and new chemicals are developed every year in response to the constant demands for new and improved materials, plastics, drugs, etc.

Some chemicals are unintentionally produced as unwanted by-products in manufacturing, industrial and combustion processes. These may be collected and disposed of as hazardous wastes, released in emissions and effluents from industrial sites, or distributed as contaminants in products, articles and formulations and subsequently released into the environment during their use or disposal.

Once released into the environment, a chemical undergoes short- or long-range transport as a result of natural environmental processes, is transformed into other chemicals, and becomes distributed between air, water, soil, sediment and living organisms. Because the specific properties, release conditions and environmental fate are unique to each substance, chemicals need to be assessed systematically to ascertain the nature and extent of local, regional and global impacts of chemicals in the environment. Thus, the full life-cycle of the chemical must be assessed including activities during manufacturing, processing, handling, transportation, accidents, the use of products, articles and formulations, and the disposal of wastes from manufacturing and the end-of-life stage of products.

The release to the environment of chemicals has caused local, regional and global contamination of the environment, resulting in exposure of humans and wildlife and, in some cases, toxic effects. Some chemicals exert acute or chronic toxic effects directly on organisms: others cause changes in the environment that create hazards to humans or wildlife. In recent decades, particular

C. Carnemark

A factory in Estonia.

concern has been demonstrated for those chemicals that degrade very slowly once they are released into the environment (*i.e.,* are persistent), accumulate in wildlife and humans above background levels (*i.e.,* are bioaccumulative) and cause toxic effects.

All industry sectors contribute to the loadings of chemicals to the environment. This is due to the release of chemicals as a result of: their use or intentional or unintentional production at industrial sites; waste disposal practices; and distribution of products and articles that eventually lead to the release of chemicals to the environment. The chemicals industry is frequently regarded as a prime contributor and, while it is among the most highly regulated in the world, concerns remain that the release of chemicals by this sector or its products may be causing contamination of the environment and damage to wildlife or humans. For this reason, information is included in this report on the global chemicals industry.

Chemicals serve in a wide variety of roles that establish and/or preserve an elevated standard of living in countries at all stages of development and are viewed as an essential component of modern life. Many current uses of chemicals are obvious to the public: however, many are not.

Policies for the sound management of chemicals are now recognized as essential components of overall public policy in countries at all stages of development and should be reflected in national sustainable development plans. While some chemicals issues are seen as highly technical in nature, public concerns about chemicals policies are now as mainstream as other highly visible technology-based issues such as telecommunications and transportation. Chemicals contribute to resolving many modern issues (*e.g.,* health care, food production, telecommunications) but their use has created problems relating to waste generation, environmental contamination and human and wildlife exposure as a result of the production, use and release of the thousands of formulations and products in today's marketplace. Thus, countries must address measures for the sound management of chemicals.

5.2 THE GLOBAL CHEMICALS INDUSTRY

The chemicals industry, considered by some to be the first high-technology industry, has played a central role in enabling technological change in all sectors of society since the middle of the nineteenth century. This industry transforms raw materials into commodity and specialty chemicals to make possible the development of countless products, many of which have become commonplace and are now viewed as essential in elevating and/or maintaining the quality of life in modern society in both developed and developing countries. This research-intensive industry has evolved for over 150 years and will continue to do so as it responds to the never-ending demands for innovation to meet the constantly changing needs of the global community.

The global chemicals industry is highly diversified in terms of the nature, size and geographic location of the companies involved. It employs more than 10 million people and accounts for 7% of global income, 9% of international trade and an estimated US$ 1.5 trillion in sales in 1998, more than twice the size of the global market for telecommunications equipment and services. The top 10 companies in 2000 had revenues of US$ 10-30 billion, employed tens of thousands of workers at numerous sites around the globe and produced very large amounts of chemicals. However, most chemical producers have less

than 50 employees (many have less than 10) and produce the largest number of substances, albeit in relatively small accounts.

This industry is also highly diversified in terms of the number, types and volume of products produced. Primary producers convert basic materials into bulk commodity chemicals, which are sold to downstream producers and processors for conversion into other chemicals, formulations, products or articles. Many manufacturing stages may be involved between the primary producer and the final industrial or public consumer of a chemical or product. Tens of thousands of chemicals are in commercial use at any time and this mix is constantly changing as older chemicals are withdrawn from use and a few hundred new ones are introduced annually. Current global production, distribution, transformation and formulation of chemicals results in hundreds of thousands of products, articles and formulations in the marketplace at any time, most of which are produced in relatively small amounts.

Over the past 30 years, the global chemicals industry has experienced steady growth in production, consumption and trade. The value of chemical shipments increased almost 9-fold from 1970 to 1998 and there is now a genuine global chemicals industry, with 16 countries accounting for about 80% of global production. In some countries, this industry accounts for 10-30% of manufacturing and is now a significant economic sector. Global expansion was aided by: the emergence of multinational chemical companies as OECD-based companies invested in non-OECD countries, a trend that is expected to continue; increased investments in many domestic chemical industries, leading to some countries becoming major suppliers of specialty and bulk chemicals; development of truly global markets for chemicals; decreased tariffs and other trade barriers; and significant advances in telecommunications and transportation.

The chemicals industry is undergoing changes in terms of what is being produced and where it takes place. The production for all chemical sectors is currently higher in OECD countries than in non-OECD countries and the *per capita* consumption of chemicals in the developed world is also far greater than in the developing world. This suggests that there is considerable scope for increased consumption of chemicals in the developing world. While the global output of chemicals in 2020 is expected to increase by 85% over 1995 levels, the OECD countries' majority share of global output (78% in 1998) will decrease by about 10%, due to stronger growth in non-OECD countries, and the developing world share will increase from 23% of global demand and 21% of production in 1995 to 33% and 31%, respectively. Thus, the total demand for chemicals is predicted to increase more rapidly in developing than in developed regions. It is also expected that production of high volume basic chemicals will shift to non-OECD countries as OECD countries shift to speciality and life science chemicals. There will likely be fewer and larger multinationals due to: increasing scale and growth of the industry; continuing globalization; increased market openness

C. Carnemark

A worker in China employed in the chemicals industry.

and competition; and regulatory requirements to protect health and the environment that will lead to company mergers and alliances to achieve efficiencies and economies of scale.

This industry is responding to the concerns of governments and the public about the release of chemicals to the environment during manufacturing, processing, transportation, waste disposal, accidents and the use and disposal of products, articles and formulations. In many countries, the chemicals industry has instituted the *Responsible Care* program and/or taken actions to reduce, reuse and recycle materials, decrease releases to the environment, and prevent or minimize the generation or release of unwanted by-products. However, concerns remain about the impacts of the remaining releases and those of products produced by the chemicals industry when they are used and/or released to the environment by industrial consumers or the public. Concerning greenhouse gases (GHG), the chemicals industry accounted for only a small proportion of the emissions from all OECD sources in 1997. However, this could change over the next 20 years if the predicted growth in the chemicals industry takes place. Predicted growth could become especially important in non-OECD countries that rely on coal and other fuels that contribute more to GHG (and toxic chemicals) emissions, given their growth in energy usage from 20% of the chemicals sector in 1971 to 43% in 1998, and the prediction of stronger growth in these countries by 2020.

5.3 HISTORICAL PERSPECTIVE ON CHEMICAL SAFETY ISSUES

Many measures have been taken to manage chemicals since their large-scale production began in Europe over 150 years ago. Early recognition of health and environmental impacts led to actions being taken at the national, regional and international levels to address the risks posed by industrial chemicals, pesticides, by-products, narcotics, warfare agents, pharmaceuticals, food additives, etc.. Attempts to manage environmental risks were first directed at problems involving relatively high levels of pollutants, with actions triggered by releases of 'bulk' pollutants from stacks and industrial sites (*e.g.,* odours, soot, smoke, etc.). As progress was made in reducing these releases, attention turned to the problems caused by long-term low-level exposures to chemicals. This led to national programs and legislation being developed in the 1970's and 1980's, especially in OECD countries. As more experience and knowledge were gained, attention turned to the toxic effects that were attributable to even lower concentrations of chemicals in the environment. Measures were developed to address aspects of food safety, poisoning, occupational health and the transportation and handling of dangerous chemicals. This was accompanied by the development of dozens of legal agreements, programs and initiatives over the past 30 years, and activity still continues in this area at present. **Despite the progress made over many years, concerns persist that population level effects may be occurring in present or future generations of wildlife and/or humans as a result of the widespread presence in the environment of complex mixtures of pesticides, industrial chemicals and by-products, especially substances that are persistent, toxic and bioaccumulative.**

Concerns about the risks of environmental contamination were evident in 1992 and helped set the stage for discussions at the United Nations Conference on Environment and Development (UNCED). UNCED heightened interest and activity in the sound management of chemicals and significantly impacted on national and international developments by acknowledging the importance of the adverse impacts of chemicals on the environment, especially the long-range effects of such pollution. UNCED also highlighted: the need for increased national and international efforts to achieve environmentally sound management of chemicals; that a broad awareness of chemical safety issues is a prerequisite for achieving chemical safety; the lack of scientific information needed to assess the risks posed by the generation, use and release of the thousands of chemicals in use; the need for increased coordination of UN bodies and other IGOs involved in assessing and managing chemicals; the 'right to know' of the public and workers concerning the risks posed by

chemicals generated, used and/or released in their communities and workplaces; the role that industry could play in promoting adequate operating standards in all countries to protect health and the environment; and the damage to health and environment caused by illegal trade in toxic and dangerous products, particularly in developing countries.

The UNCED meeting report (*Agenda 21*) devoted Chapter 19 to chemicals issues and identified six program areas with objectives to address the global problems posed by chemicals (please see box in section 3.2). These have influenced the international chemicals agenda since 1992.

In the 11 years since UNCED, dozens of global and regional agreements and programs on chemicals have been initiated, strengthened or completed. Many of these are described in section 4 of this report. In addition, the IFCS and IOMC were established and have contributed to coordinating the efforts of international stakeholders to advance the sound management of chemicals and achieve progress on the UNCED goals. Risk assessments have been produced on several hundred chemicals and initiatives are underway to generate data and assessments on thousands of high production volume chemicals. In terms of managing the risks of toxic chemicals, several conventions and protocols were adopted at the global level (*e.g.,* climate change, Stockholm Convention on POPs, Rotterdam Convention on PIC) and regional level (*e.g.,* UNECE Protocols on POPs, heavy metals and emission of sulphur and volatile organic substances; UNEP regional seas conventions) and a globally harmonized system for classification and labelling of chemicals has been developed.

As progress continues to be made in addressing recognized problems, new issues continue to appear. The presence of endocrine disrupting chemicals in the environment is a recent example. Even at very low levels in the environment, some chemicals have the ability to interfere with the functioning of the endocrine systems of fish and wildlife, in some cases causing changes in the organs or sex of species. It is accepted that endocrine disruption has occurred in fish and wildlife: whether environmental contaminants are interfering with the human endocrine system is currently a hotly debated topic and the subject of intense research efforts. Other toxic substances issues will be discovered as scientists continue to improve their abilities to analyze environmental contaminants in increasingly smaller amounts and detect new and more sensitive toxicological endpoints.

As preparations were being made for the World Summit on Sustainable Development (WSSD) in August 2002, there remained concern that, despite the considerable progress made in international approaches to the sound management of chemicals, much more needed to be done. As discussed in section 5.4, recent support by WSSD and all stakeholders for a UNEP-led initiative to develop a strategic approach to international chemicals management will likely sustain interest in advancing the sound management of chemicals for years to come.

5.4 INTERNATIONAL AGREEMENTS, PROGRAMS AND INITIATIVES ON CHEMICALS

A model was introduced in section 1 of this report to represent the four main processes involved in addressing the risks posed by toxic chemicals. Referred to in this report as the "toxics cycle," this model was used as a reference for the analysis of the chemicals agreements, programs and initiatives. It comprises four distinct stages: problem identification and priority setting, risk assessment, risk management, and monitoring and evaluation. This model represents the sequence followed in countries with well-established risk assessment and management programs, such as in most developed countries. Countries with economies in transition and developing countries may not have sufficient scientific and technical resources to follow all four stages, at least not in all cases.

In evaluating the manner in which agreements, programs and initiatives may impact on the international toxic chemicals agenda, it is necessary to understand which stage of the cycle that a program or

issue represents, as well as other relevant considerations such as the basis for common concern for an issue and/or transboundary aspects that demonstrate the need for intergovernmental action. As difficult as it is to take a chemical through the four stages of the toxics cycle on a national level, it is much more difficult to go through these stages at the regional or global level due to the different political, legal and social factors involved and the need to develop the consensus which is required to make a decision to take action and sustain the necessary effort to implement action over time.

The agreements, programs and initiatives reviewed in section 4 are listed in Tables 1–3, along with information on relevant adoption or implementation dates and an indication of which stages of the toxics cycle are addressed by each item. It is important to keep the different stages in mind while considering the various agreements, programs and initiatives as one cannot expect a risk assessment program to accomplish risk management goals, and the performance of risk management actions will not necessarily inform on the state of the environment. The discussion of the tables is presented in two parts: regional and global agreements, and international programs and initiatives.

One note of caution: the assignments made in the tables concerning the cycle stages are those of the author who must admit to less familiarity with some items than others. The assignments denoted by a solid circle (●) indicate the author's understanding of the agreements, etc. and may not fully reflect the actual range of activities pertinent to each case. Thus, judgements made in this exercise are more likely to fail to include an activity than to mistakenly include one (*i.e.,* false negatives are more likely than false positives). For the purpose of the present discussion, errors of this type should not interfere with providing a general overview of the international chemicals area and shaping issues for consideration by the World Bank in section 5.5.

The following observations address the 22 global and 27 regional agreements in Tables 1 and 2.

Forty-seven of the 49 agreements were adopted within the last 30 years. Seven agreements were adopted in the 1970's, 13 in the 1980's, and 27 since 1990. This parallels the increasing concerns during this period of all stakeholders about the need to manage various aspects of chemicals. There has obviously been a very strong increase in the rate of development of these instruments and it will be interesting to see what the future holds in this regard.

Almost all the agreements represent risk management (stage 3) commitments. Some agreements include provisions to add new substances, a form of risk assessment (stage 2), and to monitor human health and/or the environment to assess the effectiveness of the agreements (stage 4). A few agreements involve research programs that serve primarily to identify new problems (stage 1) and/or monitor the impacts of implemented risk management measures (stage 4). Only a few agreements address all four stages.

The agreements address several aspects of chemicals safety. The following are some of the topics addressed (note that some agreements address more than one aspect):

- Protection of water (18 agreements: Helsinki, IMO, OSPAR and UNEP regional seas conventions and UNECE convention and protocol);
- Protection of air (13 agreements: UNEP conventions and protocols on climate change and ozone depleting substances, and UNECE LRTAP convention and protocols);
- Occupational health (seven ILO conventions);
- Production and/or release of intentionally and unintentionally produced chemicals that cause health and environmental risks (seven agreements: Stockholm, Rotterdam, Vienna and chemical weapons conventions, Montreal Protocol, IMO convention on antifouling agents, NACEC agreement);
- Transportation of dangerous goods (two agreements: UNECE agreements on land and water transportation);
- Industrial accidents prevention and response (two agreements: ILO convention and UNECE Agreement);
- Waste transportation and disposal (two agreements: Basel Convention and Protocol); and

Global Agreements and Stages of the Toxics Cycle

Section	Organization and agreement	Stage 1	2	3	4
4.1.1	**FAO & UNEP**				
	Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (1998)		•	•	
4.1.2	**ILO**				
4.1.2.1	Convention 13: Use of White Lead in Painting (1921)			•	•
4.1.2.2	Convention 136: Protection Against Hazards of Poisoning Arising from Benzene (1971)			•	•
4.1.2.3	Convention 139: Prevention and Control of Occupational Hazards caused by Carcinogenic Substances and Agents (1974)			•	•
4.1.2.4	Convention 148: Protection of Workers against Occupational Hazards in the Working Environment Due to Air Pollution, Noise and Vibration (1977)			•	•
4.1.2.5	Convention 162: Safety in the Use of Asbestos (1986)			•	•
4.1.2.6	Convention 170: Safety in the Use of Chemicals at Work (1990)			•	
4.1.2.7	Convention 174: Prevention of Major Industrial Accidents (1993)			•	
4.1.3	**IMO**				
4.1.3.1	Convention for the Prevention of Pollution from Ships (1973, 1978)			•	
4.1.3.2	Convention on Oil Pollution Preparedness, Response & Cooperation (1990)			•	
	Protocol on Preparedness, Response and Cooperation to Pollution Incidents by Hazardous and Noxious Substances (2000)			•	
4.1.3.3	Convention on the Control of Harmful Anti-fouling Systems on Ships (2001)		•	•	
4.1.4	**OPCW**				
	Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and Their Destruction (1992)			•	
4.1.5	**UNEP**				
4.1.5.1	Vienna Convention on the Protection of the Ozone Layer (1985)	•			•
	Montreal Protocol on Substances That Deplete the Ozone Layer (1987)		•	•	
4.1.5.2	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (1989)			•	
	Protocol on Liability and Compensation for Damage Resulting from Transboundary Movement of Hazardous Wastes and their Disposal (1999)			•	
4.1.5.3	United Nations Framework Convention on Climate Change (1992)	•	•	•	•
	Kyoto Protocol (1997)		•	•	
4.1.5.4	Convention on Biological Diversity (1992)			•	
	Cartagena Protocol on Biosafety (1999)			•	
4.1.5.5	Stockholm Convention on Persistent Organic Pollutants (2001)		•	•	•

Regional Agreements and Stages of the Toxics Cycle

Section	Organization and agreement	Stage 1	2	3	4
4.2.1	**UNEP**				
4.2.1.1	Barcelona Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (1976)			•	•
4.2.1.2	Kuwait Regional Convention for Cooperation on the Protection of the Marine Environment from Pollution (1978)			•	•
4.2.1.3	Convention for Cooperation in the Protection and Development of the Marine and Coastal Environment of the West and Central African Region (1981)			•	•
4.2.1.4	Lima Convention for the Protection of the Marine Environment and Coastal Area of the South-East Pacific (1981)			•	•
4.2.1.5	Regional Convention for the Conservation of the Red Sea and Gulf of Aden Environment (1982)			•	•
4.2.1.6	Cartagena Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region (1983)			•	•
	Protocol Concerning Pollution from Land-Based Sources and Activities (1999)			•	
4.2.1.7	Convention for the Protection, Management, and Development of the Marine and Coastal Environment of the Eastern African Region (1985)			•	
4.2.1.8	Noumea Convention for the Protection of the Natural Resources and Environment of the South Pacific Region (1986)			•	
4.2.1.9	Bucharest Convention on the Protection of the Black Sea against Pollution (1992)			•	
4.2.2	**UNECE**				
4.2.2.1	European Agreement Concerning the International Carriage of Dangerous Goods by Road (1957)			•	
4.2.2.2	Convention on Long Range Transboundary Air Pollution (1979)			•	•
	Protocol on Long-term Financing of the Cooperative Program for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (1984)				•
	Protocol on the Reduction of Sulphur Emissions or their Transboundary Fluxes by at Least 30 Per Cent (1985)	•		•	
	Protocol on Control of the Emissions of Nitrogen Oxides or their Transboundary Fluxes (1988)	•		•	•
	Protocol on Control of Emissions of Volatile Organic Compounds or their Transboundary Fluxes (1991)	•		•	•
	Protocol on Further Reduction of Sulphur Emissions (1994)			•	•
	Protocol on Heavy Metals (1998)		•	•	•
	Protocol on Persistent Organic Pollutants (POPs) (1998)		•	•	•
	Protocol to Abate Acidification, Eutrophication and Ground-level Ozone (1999)			•	
4.2.2.3	Convention on the Protection and Use of Transboundary Watercourses and International Lakes (1992)			•	•
	Protocol on Water and Health (1999)			•	•
4.2.2.4	Convention on the Transboundary Effects of Industrial Accidents (2000)			•	
4.2.2.5	European Agreement Concerning the International Carriage of Dangerous Goods by Inland Waterways (2000)			•	
4.2.3	**OSPAR Commission**				
	Convention for the Protection of the Marine Environment of the Northeast Atlantic (OSPAR Convention) (1992)			•	
4.2.4	**Helsinki Commission**				
	Helsinki Convention on the Protection of the Marine Environment of the Baltic Sea Area (1992)			•	
4.2.5	**NACEC**				
	North American Agreement on Environmental Cooperation (1994)	•	•	•	•