PRACTICES IN THE SOUND MANAGEMENT OF CHEMICALS

UNDESA

STOCKHOLM CONVENTION

UNEP

Table of Contents

ANNEXES

FIGURES

TABLES

ACRONYMS AND ABBREVIATIONS

APEC	Asia-Pacific Economic Cooperation
ASEAN	Association of Southeast Asian Nations
ASP	Africa Stockpiles Programme
AusAID	Australian Agency for International Development
BAT	best available techniques
BEP	best environmental practices
BRIICS	Brazil, Russia, India, Indonesia, China and South Africa
CIEN	Chemicals Information Exchange Network
CILSS	Permanent Interstate Committee for Drought Control in the Sahel
CEGESTI	Centro de Gestión Tecnológica e Informática Industrial
CFCs	Chlorofluorocarbons
COPD	chronic obstructive pulmonary disease
CSA	Centre for Sustainable Agriculture
CSCL	Chemical Substances Control Law
CSD	Commission on Sustainable Development
CSIR	Centre for Scientific and Industrial Research
CWS	Centre for World Solidarity
DDD	1,1-dichloro-2,2-bis(p-chlorophenyl)ethane
DDE	1,1-dichloro-2,2-bis(p-chlorophenyl)ethylene
DDT	1,1,1-trichloro-2,2-bis(p-chlorophenyl)ethane
DecaBDE	Decabromodiphenyl ether
ECZ	Environment Council of Zambia
EDCIF	Environmental Defence and Consumer Interest Forum
EMG	Environmental Management Group
ESTIS	Environmentally Sound Technology Information System
FAO	United Nations Food and Agriculture Organization
FSCI	Foundation to Support Civil Initiatives
GAP	Good Agricultural Practice
GEF	Global Environment Facility
GHS	Globally Harmonized System of Classification and Labelling of Chemicals
GLP	Good Laboratory Practice
GPS	Global Product Strategy
HPV	High Production Volume

IARC	International Agency for Research on Cancer
ICCA	International Council of Chemicals Associations
ICCM	International Conference on Chemicals Management
ICM	Inter-agency Coordinating Mechanism
IETC	International Environmental Technology Centre
IFCS	Intergovernmental Forum on Chemicals Safety
IGOs	inter-governmental organizations
ILO	International Labour Organization
IOMC	Inter-Organization Programme for the Sound Management of Chemicals
IPEN	International POPs Elimination Network
IPM	integrated pest management
LRI	Long-range Research Initiative
MDGs	Millennium Development Goals
MEAs	Multilateral Environmental Agreements
MENR	Ministry of Ecology and Natural Resources
Mercosur	Mercado Común del Sur (Southern Common Market)
MOFA	Ministry of Food and Agriculture
MRL	maximum residue limit
NACEC	North American Commission for Environmental Cooperation
NAFTA	North American Free Trade Agreement
NARAPs	North American Regional Action Plans
NEMA	National Environmental Management Agency
NGOs	non-governmental organizations
NIP	National Implementation Plan
NPM	Non Pesticidal Management
OctaBDE	Octabromodiphenyl ether
ODS	ozone-depleting substances
OECD	Organization for Economic Cooperation and Development
ORRChem	Ordinance on Risk Reduction related to Chemical Products
PBT	persistent, bioaccumulating and toxic
PCBs	polychlorinated biphenyls
PCDDs	polychlorinated dibenzo-p-dioxins
PCDFs	polychlorinated dibenzofurans
PEAP	Poverty Eradication Action Plan
PentaBDE	Pentabromodiphenyl ether
PFAS	perfluoroalkyl sulfonate
PFCs	perfluorinated chemicals
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonate
PFOSF	perfluorooctane sulfonyl fluoride

PICs	Pacific Island countries
POCs	persistent organochlorine compounds
POPRC	POPs Review Committee
POPs	Persistent Organic Pollutants
PRTR	Pollutant Release and Transfer Register
REACH	Registration, Evaluation, Authorization and Restriction of Chemicals
RC	Responsible Care
RCGC	Responsible Care Global Charter
SAARC	South Asian Association for Regional Cooperation
SADC	Southern Africa Development Community
SAICM	Strategic Approach to International Chemicals Management
SERP	Society for Elimination of Rural Poverty
SMOC	Sound Management of Chemicals
SPREP	South Pacific Regional Environment Programme
SPREP	Secretariat of the Pacific Regional Environment Programme
SMEs	small and medium sized enterprises
SNURs	Significant New Use Rules
TBBPA	Tetrabromobisphenol A
TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
UNCED	United Nations Conference on Environment and Development
UNDESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNIDO	United Nations Industrial Development Organization
UNITAR	United Nations Institute for Training and Research
U.S. EPA	United States Environmental Protection Agency
WHO	World Health Organization
WSSD	World Summit on Sustainable Development
WWF	World Wildlife Fund

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Foreword

The current cycle of the Commission on Sustainable Development (CSD) in its 18th and 19th sessions (2010 and 2011) will address the themes of chemicals, transport, waste management, mining, and the ten-year framework of programmes on sustainable consumption and production patterns. The goal is to for these discussions to lead to the development of policy actions and measures to accelerate implementation in these thematic areas. In the area of chemicals, the Commission's work will specifically focus on reviewing progress and identifying policy actions in achieving the World Summit on Sustainable Development (WSSD) 2020 goal on sound management of chemicals. This publication aims to support the Commission in the achievement of this objective.

This volume presents successful practices and experiences in the sound management of chemicals worldwide, in both developed and developing countries. Nearly all case studies included were developed by individuals directly involved in the projects selected. The cases encompass information about the history of the projects as well as challenges, implementation experiences, lessons learned and future plans. It should, however, be noted that these case studies are but a small sample of the body of knowledge that is available in this area.

In addition to assessing current trends in chemicals management, this publication makes a case for scaling up the experiences presented to realize a larger scale impact. Towards this aim, some emerging issues and priority areas which require Commission's attention have been identified.

This publication notes that significant progress has been made on the sound management of chemicals, and that many best practices and successful experiences in reducing and preventing chemical risks and hazards through better practices in production, storage, transport, use and disposal of chemicals have emerged all around the world. Additionally, many programmes and projects for strengthening of information sharing, risk assessment, reduction and prevention, capacity building and awareness raising, as well as on the development of indicators and monitoring have been initiated. Despite these achievements, however, the fact remains that chemicals continue to have a significant negative impact both on human health and the environment.

While efforts to improve the management of chemicals are needed in all parts of the world, this publication focuses on the challenges that developing countries and countries with economies in transition face, where the need is urgent and greatest. It is hoped that this volume will enhance the readers' understanding about the challenges and issues confronting chemicals management, as well as about the policy options available to address them.

This publication was jointly prepared by the Division for Sustainable Development, United Nations Department of Economic and Social Affairs (UNDESA), the Secretariat of the Stockholm Convention on Persistent Organic Pollutants (POPs), and the United Nations Environment Programme (UNEP).

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CHEMIC

Overview

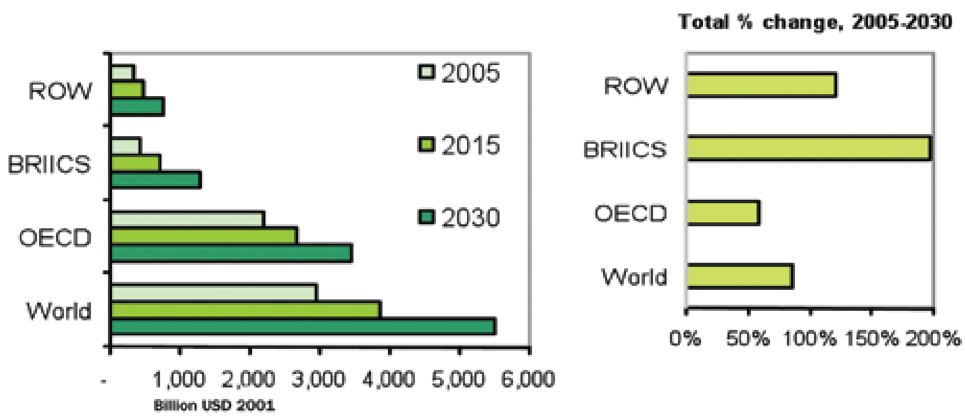
Chemicals in society

The chemical industry is one of the largest sectors of the world economy; nearly every manufactured product contains one or more of the thousands of chemicals produced by it. The production of chemicals is increasing at a rate of 3-4 per cent per year, with more and more of this production happening in developing countries (*see figures I.1 and I.2 below*). The share of chemical production in industrialized countries is decreasing—from 84 per cent in 1970 to 75 per cent at present and is expected to decrease further to about 63 per cent by 2030.[1] (*See chapter on Trends*).

Chemicals are very diverse in their properties, the quantities manufactured and their use (*see figure I.3*). Some chemicals are produced in very large quantities and have widespread use in the production of other chemicals and consumer products. Others, including pesticides and pharmaceuticals, are manufactured in much smaller amounts and for very specialised uses,.

The physical, chemical, and toxic properties of chemicals also vary greatly—while many are not hazardous, others are very persistent in the environment, travel large distances from where they are released, and are harmful to human health and the environment even in small amounts. Chemicals of international concern include persistent organic pollutants, ozone depleting substances, and heavy metals such as mercury, lead and cadmium. (*For more information, see annexes 1 and 2*).

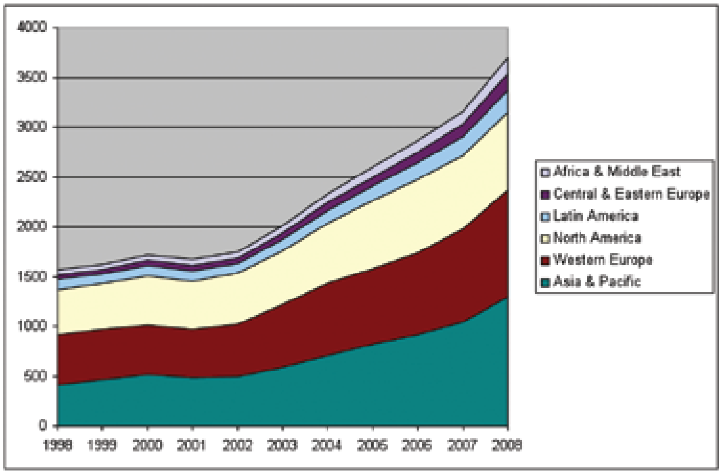
Figure I.1. Chemical production 2005-2030



Note: BRIICS include Brazil, Russia, India, Indonesia, China and South Africa.
Source: OECD Environmental Outlo ok to 2030, 2008

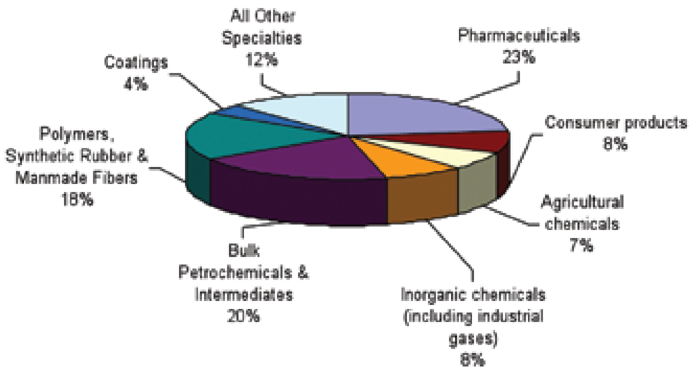
1 OECD: OECD Environmental Outlook to 2030, 2008 and OECD Environmental Outlook, 2001.

Figure I.2. Global chemical production by region in billion USD



Source: American Chemistry Council: Guide to the business of chemistry, 2009

Figure I.3. World chemical production by category in 2008



Source: American Chemistry Council: Guide to the business of chemistry, 2009

Emerging issues

Recently there has been a growing interest and concern over the spread of, and potential exposure to, chemicals contained in products, such as personal computers, textiles and costume jewellery. During the second session of the International Conference on Chemicals Management (ICCM) in May 2009, the need for chemicals information in consumer articles was identified as an emerging policy issue for consideration. (*see table I.2*). Information exchange and effective communication throughout the product chain are key to enable users to avoid hazardous chemicals; these factors are also key to manage risks to users and the environment.

Another emerging challenge is nanotechnology. Nanotechnology is a field of applied science concerned with the control of matter at dimensions of roughly 1 to 100 nanometres—one nanometre being one-billionth of a meter. Nanotechnology has enormous potential for social, economic and environmental benefits—from innovative medical techniques to savings on materials and energy, as well as advances in pollution detection and remediation. However, with their impacts on human health and the environment as yet largely unknown and public controls largely absent, more systematic research and sector-specific policies are necessary. While in 2005 more than USD 10 billion was spent on nanotechnology research, only about USD 39 million per year are spent by the United States and the European Union on research on the effects of nanoparticles on human health and the environment.[2]

Millennium Development Goals

Chemicals touch on many aspects of development and affect drinking water, air, and food quality. The health of people, environments and ecosystems in general depends upon their sound management. As such, the sound management of chemicals is central to sustainable development and, as described in table I.1, is closely linked to the achievement of the United Nations Millennium Development Goals (MDGs).

Table I.1. Link between sound management of chemicals and the Millennium Development Goals

Millennium Development Goal	Sound chemicals management's contribution towards achieve the Millennium Development Goals
 ***N°1: Eradicate extreme poverty and hunger***	*The poor are at higher risk of exposure to toxic and hazardous chemicals because of their occupations, living conditions and lack of knowledge about handling chemicals. Sound management of chemicals can improve the living environment and work conditions of the poor and thus their health, while at the same time proper use of chemicals such as pesticides and chemical fertilizers can boost crop yields, protect the productivity of freshwater and marine fisheries and ecosystems on which poor communities depend.*
 ***N°2: Achieve universal primary education***	*Raising awareness about chemical safety issues at the primary education level can contribute to reducing the occurrence of chemical-related accidents at home, in the community, or at work. Sound management of chemicals also helps to protect children's mental and physical development, enabling them to attend school and pursue education.*

2 UNEP: GEO Yearbook 2007

Millennium Development Goal	Sound chemicals management's contribution towards achieve the Millennium Development Goals
N°3: Promote gender equality and empower women	*Women and girls are disproportionately affected by indoor air pollution, water and food pollution and the negative effects of household chemicals, as they tend to assume the bulk of household and food preparation responsibilities. Occupational factors, such as the gender division of labour, further expose women to certain chemicals used in, for example, agriculture, the solvents industry, and health care. Biases in educational systems may result in the fact that women are less well-equipped to understand, cope with, and anticipate the implications of chemicals exposure, and environmental degradation. Sound manage-ment of chemicals can improve women's working and living conditions, increase their knowledge on the handling and health implications of chemicals and help protect them and their families.*
N°4: Reduce child mortality	*Improper labelling, storage and use of chemicals are significant causes of poisoning in developing countries. Yearly, many children die as a result of chemical at home or at work through involvement in activities such as agriculture and mining. In addition to acute poisonings, chemical pollution of air, soils, water, and food increase the incidence, prevalence, rate of mortality, and costs of certain paediatric diseases. Sound management of chemicals, combined with better nutrition can improve children's living conditions, decrease their sensitivity to chemicals and reduce child mortality.*
N°5: Improve maternal health	*Certain types of chemicals (such as POPs) can build up to dangerous levels in humans causing adverse reproductive, developmental, immunological, hormonal, and carcinogenic effects. Women who have accumulated these kinds of chemicals in their lipids or body fat can pass as much as one third of their toxic burden to their infant children, both prenatally and after birth (through breastfeeding). Sound management of chemicals can lower a women's risk of contamination, improve maternal health, and therefore, the health of future generations.*
N°6: Combat HIV/AIDS, Malaria and other diseases	*Proper use of medications and other chemical medical products (such as treated mosquito bed nets) play a major role in disease prevention and treatment. Chemicals are also used for effective control of vector-borne diseases, such as malaria, kala-azar, dengue fever and chagas disease and help prevent millions of deaths worldwide. Sound management of chemicals promotes safe handling and disposal of expired medications and health care waste and encourages the use of environmentally friendly vector disease control practices.*

Millennium Development Goal	Sound chemicals management's contribution towards achieve the Millennium Development Goals
N°7: Ensure environmental sustainability	*Chemicals can contribute to global warming, ozone depletion and climate change, can cause severe environmental degradation and disrupt ecosystems through the contamination of water, soil, air and flora and fauna. Sound management of chemicals can help prevent and/or minimize harmful chemicals from entering the environment and reduce the need for difficult and costly environmental remediation.*
N°8: Global partnership for development	*International co-ordination and co-operation efforts towards improved chemicals management, such as through the Strategic Approach to International Chemicals Management (SAICM) adopted in 2006, and chemicals-related Multilateral Environmental Agreements (MEAs), create global partnerships and initiatives. Global partnerships and initiatives help countries integrate objectives for the sound management of chemicals into national and local development policies and plans, while simultaneously identifying options to catalyze the necessary supporting financing.*

Source: UNDP/GEF: Managing Chemicals for Sustainable Development, 2007

Sound management and sustainable production and use of chemicals

The sound management of chemicals, including hazardous wastes, aims to prevent and, where this is not feasible, to reduce or minimize the potential for exposure of people and the environment to toxic and hazardous chemicals as well as chemicals suspected of having such properties. It includes prevention, reduction, remediation, minimization and elimination of risks during the life cycle of the chemicals: production, storage, transport, use and disposal, including the risks from chemicals found in products and articles. It involves the application of the best managerial practices to chemicals, which requires strengthened governance and improved techniques and technologies at each stage of the life cycle.[3] Additional research and development that focuses on clean production and green/sustainable chemistry is crucial to achieve sustainable consumption and production.

The sound management of chemicals and their wastes is strengthened by:

- *Adequate legislation and risk management policy framework*
- *Information gathering and dissemination*
- *Effective education programmes*
- *Awareness of alternatives, best available techniques and best environmental practices (BAT/BEP)*
- *Capacity for biological and environmental monitoring, data interpretation and risk assessment*
- *Capacity for implementation and enforcement of risk management*
- *Capacity for rehabilitation of contaminated sites*
- *Capacity to respond to emergencies and poisoning*
- *Recognition of the gender dimension of exposures*
- *Adequate resources*

The application of sound management of chemicals is based on the following principles:

POLLUTION PREVENTION: Rather than rely on treatment and control technology to prevent the release or exposure to chemicals, it looks at ways to prevent the use of hazardous chemicals and the production of pollutants, including wastes[4].

THE PRECAUTIONARY APPROACH: It encourages the use of cost-effective measures to prevent potential negative health and environmental impacts even if there is lack of full scientific certainty.

INTERNALIZATION OF ENVIRONMENTAL AND HUMAN HEALTH COSTS: This can be achieved through the use of economic instruments such as the "polluter pays" or the facilitated "extended producer responsibility".

RIGHT-TO-KNOW: This encourages access to information on chemicals, their safe use and releases to the environment in a timely fashion to workers and the public, including vulnerable groups.

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3 UNDP 2009 Managing Chemicals for Sustainable Development, UNDP 2009 Technical Guide

4 Integrated Pest Management to reduce reliance on pesticides is an example of this; refer also to Sixth Session of the Intergovernmental Forum on Chemical Safety Dakar, Senegal 15 – 19 September 2008: 13-14. http://www.who.int/ifcs/documents/forums/forum6/report/en/index.html

USE OF BEST AVAILABLE SCIENTIFIC INFORMATION AND ASSESSMENTS: This principle ensures that decisions are based on the most up-to-date understanding of the chemicals, their impacts on health and the environment, the best available techniques and environmental practices and the benefits achieved from the use of alternative approaches or substitutes.[5] Finding cost-effective and locally-appropriate alternatives for industrial and household chemicals can be a technological and financial challenge for developing countries. For agricultural chemicals, however, several developing countries have made integrated pest management a key element of their crop protection strategies.

Box I.1. Key components of a sound management of chemicals governance framework

- *Constitutional provision (health; quality of life; environment; sustainable development, etc.)*
- *Enabling policy and legislative framework*
- *Mechanism for national coordination*
- *National plans and priorities*
- *Stakeholder participation, including women, indigenous communities, workers, and other vulnerable groups*
- *National infrastructure and government institutional capacity for risk assessment and management including:*
- *National waste management strategy for toxic and hazardous wastes*
- *Site remediation*
- *Emergency prevention, preparedness and response*
- *Diagnosis and treatment of intoxication*
- *Basic information for risk management, to inform decision-making and for tracking progress such as:*
- *Information on chemicals imported, manufactured, formulated, in transit, and traded*
- *Clinical, epidemiological, and environmental data*
- *Toxicity, fate, distribution, and pathways of exposure*
- *National monitoring strategy to support assessment and basic information for decision-making and monitoring of human populations, food (including animal feeds) and the environment (including air, water, soil, sediment, flora, and fauna)*
- *Risk communication strategies for awareness raising and outreach and education to support risk prevention and reduction (accessible, timely, and appropriate information, including as applicable to vulnerable groups)*
- *Support for research*
- *Financial resources*

Source: UNDP Technical Guide for Integrating the Sound Management of Chemicals in MDG-Based Policies & Plans, 2009

International initiatives on the sound management of chemicals

Many of the international efforts to address chemicals since 1992 have occurred as a result of the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro where a first global consensus emerged on the concept of sound chemicals management. Chapter 19 of Agenda 21 entitled "Environmentally Sound Management of Toxic Chemicals, Including Prevention of Illegal International Traffic in Toxic and Dangerous Products" recognized the crucial importance of sound chemicals management throughout their life cycle to achieve social and economic development. Chapter 19 addresses chemicals issues in six programme areas:[6]

- *Expanding and accelerating international assessment of chemical risks*
- *Harmonization of classification and labelling of chemicals*
- *Information exchange on toxic chemicals and chemical risks*

5 Sound and Sustainable Management of Chemicals: A Training Manual for Workers and Trade Unions, UNEP, 2008.

6 UNDP: UNDP Technical Guide for Integrating the Sound Management of Chemicals in MDG-Based Policies & Plans, 2006 and Chapter 19 of Agenda 21.

- *Establishment of risk reduction programmes*
- *Strengthening of national capabilities and capacities for the management of chemicals*
- *Prevention of illegal international traffic in toxic and dangerous products*

In 2002, during the WSSD in Johannesburg, governments renewed their commitment to sound management of chemicals throughout their life cycle for the protection of human health and the environment by setting the goal that, by 2020, chemicals are used and produced in ways that lead to the minimization of significant adverse effects on human health and the environment.

Significant progress has been made on the implementation of Chapter 19 of Agenda 21 and toward the achievement of the WSSD 2020 goal. Over the years, a series of measures have been adopted to deal with the risks chemicals pose for both people and the environment. Responses to the problem of contaminants now include 17 multilateral agreements and numerous intergovernmental organizations and coordination mechanisms. Among them is the 1989 Basel Convention on the Control of Transboundary Movements of Hazardous Waste and Their Disposal, the 1998 Rotterdam Convention on Prior Informed Consent Procedure for Certain Hazardous Chemicals, the 2001 Stockholm Convention on Persistent Organic Pollutants, and the 2006 Strategic Approach to International Chemicals Management (SAICM). More recently, at the 25th meeting of UNEP Governing Council in 2009, Governments agreed to produce a legally binding instrument on mercury and requested the establishment of an intergovernmental negotiating committee to carry out this endeavour in 2013.

Table I.2. Some major international instruments on chemicals

Entry into force	MEA	Objective
1986	**International Code of Conduct on the Distribution and Use of Pesticides**	*Voluntary instrument unanimously adopted by FAO Member States with an aim to set forth responsibilities and establish voluntary standards of conduct for all entities involved in the distribution and use of pesticides*
1989	**Montreal Protocol on Substances that Deplete the Ozone Layer**	*Protect the ozone layer by phasing out the production of substances that deplete it*
1990	**International Labour Organization (ILO) Convention No.170**	*Protect workers but also the general public and the environment from the harmful effects of chemicals*
1992	**Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal**	*To establish strict controls on the transboundary movements of hazardous and other wastes and require that they are managed in an environmentally sound manner to ensure that human health and the environment are protected*
2004	**Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade**	*Promote international efforts to protect human health and the environment from hazardous chemicals by enabling countries to take informed decisions on the import of hazardous chemicals and pesticides listed in the Convention*

Entry into force	MEA	Objective
2004	**Stockholm Convention on Persistent Organic Pollutants (POPs)**	*Protect human health and the environment from POPs by restricting and ultimately eliminating their production, use, trade, release and storage*
2006	**Strategic Approach to International Chemicals Management (SAICM)**	*Strengthen sound chemicals management across all relevant sectors in order to achieve the WSSD 2020 goal. SAICM addresses all the phases and elements of chemicals safety, taking into account a range of environmental and public health concerns throughout the life-cycle of chemicals. SAICM was adopted by the International Conference on Chemicals Management (ICCM) in 2006.*

Note: For more information, see annex 3.

In order to promote a coordinated framework of action at the international level, the Inter-Organization Programme for the Sound Management of Chemicals (IOMC) was established in 1995. The seven participating organizations are the UNEP, the International Labour Organisation (ILO), the United Nations Food and Agriculture Organisation (FAO), the World Health Organisation (WHO), the United Nations Industrial Development Organisation (UNIDO), the United Nations Institute for Training and Research (UNITAR) and the Organisation of Economic Cooperation and Development (OECD). In addition, United Nations Development Programme (UNDP) and the World Bank are participating as observer organizations. Members consult on the planning, programming, implementation and monitoring of activities undertaken jointly, or individually, and help ensure that programmes are mutually supportive, complementary, and avoid duplication of efforts.

The Environmental Management Group (EMG) is another mechanism at the international level to promote sound management of chemicals through inter-agency cooperation. Its membership consists of the specialized agencies, programmes and organs of the United Nations including the secretariats of the Multilateral Environmental Agreements. It is chaired by the Executive Director of UNEP and supported by a secretariat provided by the same organization.

The coordination of sound management of chemicals can also take place at the regional level, where governments, especially those whose economies are—or strive to be—closely integrated, to co-operate, and can share the often resource-intensive burden of a variety of chemicals issues, including data collection and sharing; basic research; evaluation; and even approvals and other regulatory actions. Such groupings span a wide spectrum from organizations that are relatively well integrated, such as the European Union, to less closely integrated fora for cooperation, such as SADC (Southern Africa Development Community), CILSS (Permanent Interstate Committee for Drought Control in the Sahel), Mercosur (Mercado Común del Sur (Southern Common Market)), ASEAN (Association of Southeast Asian Nations), SPREP (South Pacific Regional Environment Programme), APEC (Asia-Pacific Economic Cooperation), SAARC (South Asian Association for Regional Cooperation) and NAFTA (North American Free Trade Agreement) and its associated body, the North American Commission for Environmental Cooperation (NACEC).[7] Regional agreements on chemicals and wastes management include inter alia the Bamako Convention, the Waigani Convention and the European Union's REACH.

Under pressure from international and regional agreements, there has been a significant reduction in the use of some toxic chemicals, and safer alternatives are being identified. Voluntary initiatives, such as the chemical industry's Responsible Care programme encourage companies to work towards continuous improvement of their health, safety and environmental performance.

However, harmful and persistent pollutants, such as heavy metals and organic chemicals, are still being released to the land, air, water from various sources including manufacturing, use of agrochemicals and from leaking stockpiles. The shift of industry to newly-industrialized countries and the limited management capacities in developing countries over chemicals use and disposal still represent important challenges to be addressed in order to achieve acceptable levels of protection of human health and the environment towards the risks posed by chemicals.

Special challenges of developing countries in the sound management of chemicals

It is often the world's poorest people, including women and children, who have the highest risk of exposure to toxic and hazardous chemicals. Their occupations, living conditions, lack of knowledge about safe handling practices, and limited access to sources of uncontaminated food and drinking water are among the factors that increase this risk. Living in countries where regulatory, health and education systems are weak exacerbates this problem.

Some of the main challenges in developing countries include:

INSTITUTIONAL AND TECHNICAL CAPACITY: Developing countries often do not have the institutional, technical and financial capacities to implement adequate control and protection mechanisms or to enforce legislation on sound chemicals management.

WORKER KNOWLEDGE: In many developing countries poor people work in close proximity to toxic chemicals. These workers are often unaware of the high risk that poor working conditions and lack of safety requirements exposes them to.

PUBLIC AWARENESS: Most of the population is usually unaware of the hazards associated with exposure to toxic chemicals and the risks of chemical-related incidents. In agriculture, for example, poor knowledge of safe pesticide use, excessive use of pesticides, lack of facilities for personal hygiene, and inappropriate storing and disposal conditions lead to human toxic exposure.

INFORMAL SECTOR: The informal and the agricultural sectors are the main sources of human exposure to toxic pollutants in developing countries. Activities such as small-scale smelting, mining and waste disposal pose particularly high risks to exposure to toxic chemicals for workers and the community.

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7 From Developing and Sustaining an Integrated National Programme for Sound Chemicals Management; UNITAR, 2004.

AVAILABILITY OF BEST AVAILABLE TECHNIQUES (BAT) AND BEST ENVIRONMENTAL PRACTICES (BEP): The production of the most toxic chemicals is often readily transferred to developing countries, where cleaner technologies and BAT/BEP are not available or affordable. Even when the risks posed to human health caused by certain chemicals are known, it is sometimes difficult for developing countries to replace them as they are highly effective and accessible at a low cost. Finding cost-effective and locally-appropriate alternatives is a technological and financial challenge for developing countries.

6
100mM Tris pH
750mM KCl
15mM MgCl2
1

Trends in the production and consumption of chemicals

Trends in the global chemical industry have been described in various industry sources. These reports focus on the producers and formulators of chemicals and chemical products, and do not include the mining, petroleum and manufacturing sectors. The OECD Environmental Outlook for the Chemicals Industry, published in 2001, considered trends in the chemical industry with a focus on its member countries. In 2008, the OECD also published the OECD Environmental Outlook to 2030, which included a chapter on chemicals with updated data. The International Council of Chemical Associations (ICCA) publishes reports on the industry such as the ICCA Review 2007-2008.[8] The data presented here has been extracted from these reports, thus most of it relates to OECD countries. There is little reliable data from developing countries, and even less regarding issues such as illegal trade of chemicals or hazardous wastes.

Most data on the size of the chemical industry is based on sales. The size, however, is not a direct measure of quantities, since high-value chemicals which account for a large proportion of the value of sales are usually produced in small amounts. The 2001 OECD Outlook indicates that since 1970, global sales in chemicals have grown almost nine-fold. In 1998 the chemicals industry accounted for 7 per cent of global income and 9 per cent of international trade, with an estimated USD 1,500 billion in sales.

Total sales have increased significantly within a decade—ICCA estimates that in 2007, the turnover for the global chemical industry was USD 3,180 billion. Pharmaceuticals accounted for about one third of this total. The globalization of the chemical industry is also evident in the increase in trade. ICCA estimates that between 1998 and 2007, world trade in chemicals almost tripled to USD 1,380 billion. This is about 45 per cent of the value of the global chemical industry; over 35 per cent of this world trade is intra-company in nature.

Other trends of the industry include the following:

- *The chemicals industry is expected to continue to grow over the next 20 years, at a rate of 3-4 per cent per year.*
- *Most production and trade in chemicals occurs in and among OECD countries and will continue to do so for the foreseeable future.*
- *Growth in production and consumption will grow much faster in non-OECD countries than OECD ones, reducing the overall share of the OECD countries in this sector.*
- *The main growth centres of chemical sales and production are in Asian emerging economies.*
- *Trade in chemicals is expected to continue to increase.*
- *Almost 80 per cent of the global chemicals production is located in 15 countries: United States, Japan, Germany, China (including Taiwan Province), France, United Kingdom, Italy, Republic of Korea, Brazil, Belgium/Luxembourg, Spain, the Netherlands, Switzerland and Russian Federation.*
- *Non-OECD countries with important chemical manufacturing include the BRIICS countries—Brazil, Russia, India, Indonesia, China and South Africa; other countries with a rapidly growing chemical sector include Argentina, Malaysia, Saudi Arabia, Singapore and the Philippines (see table II.1).*

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8 International Council of Chemical Associations (ICCA), ICCA Review 2007-2008. Available at http://www.icca-chem.org/ICCADocs/01_icca_review2007_2008.pdf.

- *Chemical companies in OECD countries will concentrate more and more on life-science and speciality chemicals.*
- *Chemical producers are likely to merge, which qwqwill result in larger and fewer multinational companies.*

The shift in production from OECD countries to developing countries is related to many factors including the increase in manufacturing and other industrial production that is occurring in developing countries, the need to be closer to major users, and the lower costs of operations.

Table II.1. Growth of the chemicals industry in BRIICS Countries (Sales in millions of Euros)

BRIICS COUNTRIES	2000	2001	2002	2003	2004	2005	2006	2007
Brazil	38,096	35,606	30,297	31,602	37,009	48,773	56,721	62,865
Russia	9,458	10,909	8,021	15,731	16,630	17,926	20,595	22,939
India	30,547	28,602	27,757	26,314	29,230	35,275	39,329	46,553
Indonesia	6,700	7,489	6,627	5,789	5,793	5,911	8,224	10,866
China	91,450	98,823	102,198	114,244	134,761	185,926	236,352	274,591
South Africa	7,012	6,675	6,372	7,293	8,215	9,062	9,448	9,797
Total	183,263	188,104	181,272	200,973	231,638	302,873	370,669	427,611

Source: International Council of Chemical Associations (ICCA)

Health and environmental effects of chemicals

Impact of chemicals on health

The overall burden of death and disease from chemicals is not well known. However, the WHO is currently preparing a publication on this topic. This section reflects previously published information. The 2002 WHO World Health Report and the various Global Burden of Disease reports have examined environmental contributions to mortality and disease in the world population. These reports highlight large and preventable exposures such as contaminated drinking water and poor sanitation, urban air pollution and indoor pollution from cooking stoves.

While some chemicals have been linked to adverse health effects, data limitations have prevented the quantification of the total burden of disease due to exposure for all but a few agents such as asbestos and lead. Data are more readily available and reliable for acute illnesses and deaths due to massive or extremely toxic exposures, such as chemical plant explosions or pesticide ingestion leading to death. It is estimated that one to five million deaths occur each year due to pesticide poisoning.[9] This range reflects the well-known problem of underreporting for both acute non-fatal pesticide poisoning and deaths due to pesticide ingestion. Moreover, children face higher risks from pesticides than adults and need greater protection against these chemicals, particularly in developing countries.[10]

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9 Jeyaratnam, J. 1990. Acute pesticide poisoning: a major global health problem.

10 The revised questionnaire on "Transmission of Information", the annual report submitted by Parties to the Basel Convention, includes a request for information on studies health and environmental effects of the generation, transportation and disposal of hazardous and other wastes (http://www.basel.int/natreporting/index.html), which is a potential source of documentation.

The WHO 2002 report provides an indication of the contribution of chemical exposure to the incidence of certain diseases (*see table II.2*). Where better data are available (*poisonings and suicide*) the contribution of chemical exposure is significant. It is likely that current data underestimates the overall contribution of chemicals to adverse health impacts. While not all occupational diseases result from exposure to chemicals, the highest exposures to chemicals occur in the workplace and thus chemicals are contributors to the health outcomes in this sector. The burden of illness from outdoor air pollution is estimated from exposure to particles and some major pollutants such as ground-level ozone. It is also likely that some of the impacts seen are related to exposures to toxic chemicals.

Table II.2. Indicative fraction of certain diseases related to selected environmental factors

	Outdoor airpollution	Chemical	Occupational
Perinatal conditions	●	●	●
Congenital anomalies	●	●	●
Cancer	●	●	▲
Neurospychiatric disorders		●	▲
Cardiovascular diseases	●	●	▲
COPD	●		▲
Asthma	●		▲
Poisonings		■	●
Suicide		▲	●

● less than 5% ▲ 5-25% ■ more than 25%

Source: WHO, 2006[11]

The WHO 2006 report estimates that:

- *42 per cent of chronic obstructive pulmonary disease (COPD), a gradual loss of lung function, is attributable to environmental risk factors such as occupational exposures to dust and chemicals, as well as indoor air pollution from household solid fuel use.*
- *5 per cent (2-10 per cent) of all congenital anomalies are attributable to environmental causes.*
- *About 9 per cent of the disease burden of lung cancer is ascribed to occupational exposure.*
- *2 per cent of the leukaemia disease burden is related to occupational exposures to chemicals.*
- *19 per cent (12-29 per cent) of all cancers are attributable to the environment.*
- *2 per cent of the ischaemic heart disease burden and 3 per cent of the cerebrovascular disease burden could be related to lead exposure.*

11 Prüss-Üstün A, and Corvalán C. 2006. Preventing disease through healthy environments. Towards an estimate of the environmental burden of disease. World Health Organisation, Geneva. http://www.who.int/quantifying_ehimpacts/publications/preventingdisease.pdf

- *68 per cent (46-84 per cent) of poisonings in adults are attributable to occupational or environmental exposure.*
- *85 per cent (60-98 per cent) of poisonings in children are related to exposure to chemicals, including pharmaceuticals, often because they are not stored properly.*

Infant health problems, such as increased mortality from low-birth-weight and preterm infants, and congenital anomalies could be related to environmental exposure to toxic chemicals as well. While the links between many health conditions to the environment or occupation is usually considered small-to-moderate, there is uncertainty surrounding these estimates since evidence linking specific environmental and occupational exposures to various cancers is incomplete. In addition, available data only allow for a limited number of cancers to be addressed.

Data on environmental effects

The adverse effect of chemicals on the environment has been widely documented.12 The present report discusses the effects of chemicals on some components of the environment, namely the atmosphere, water, soil and biodiversity which have a negative impact on ecosystem services that are valuable to people and society.

ATMOSPHERE: Chemicals affect the atmosphere in significant ways: they can act as air pollutants; contribute to acid rain formation; and function as greenhouse gases and ozone depleters. Additional chemicals continue to be identified as ozone depleters. The significant ozone depleting potential of nitrous oxide, for example, was not understood until recently. Hazardous air pollutants enter the atmosphere from industrial emissions, the use and disposal of products that contain them, and at other points in the chemical life cycle.

Information on the atmospheric impacts of chemicals is available from a variety of sources. Air pollution data are available for many regions. Sales volume data for chemicals categorized as hazardous air pollutants could also serve as proxy for estimating of the magnitude of certain types of air pollution from chemicals.

WATER RESOURCES: Chemical contamination of water resources is a world-wide problem that has been documented extensively. Environmental impacts include cancers and endocrine disruption in aquatic animals and loss of invertebrate biodiversity amongst others. Small amounts of some individual chemicals (for example, lindane, now listed in the Stockholm Convention) have the potential to contaminate vast amounts of water. Plastic waste has become a major contaminant in oceans.[13]

SOIL RESOURCES: Industrial chemicals contaminate soil in urban as well as industrial settings. For example, metals, solvents, and other toxic substances contaminate many operating and abandoned industrial sites. Case in point: "Soils contaminated with cadmium are a serious problem in many Asian countries, where cadmium enters the food supply, especially rice; more than 10 per

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12 The Millennium Ecosystem Assessment is one important source for broadly synthesized information on environmental factors. This study considers the relationship between ecosystem services and human well-being. It does not, however, focus specifically on the role of chemicals in affecting ecosystems. The most recent edition of the Global Environmental Outlook (GEO 4) may also provide additional guidance regarding possible structure for an examination of chemical impacts on the environment.

13 For one recent discussion in the popular press, see: "Scientists uncover new ocean threat from plastics," London Independent, http://www.independent.co.uk/news/science/scientists-uncover-new-ocean-threat-from-plastics-1774337.html

cent of China's arable land is contaminated with cadmium." [14] Agricultural chemicals, on the other hand, deplete soil resources. For example, insecticides and fungicides kill beneficial microorganisms, decreasing ecosystem resilience and reducing soil fertility.

BIODIVERSITY: Persistent and bioaccumulative chemicals are found as widespread contaminants in wildlife organisms, especially those individuals high on the food chain. These chemicals cause cancers, immune dysfunction and reproductive disorders which can contribute to species extinction.[15]

AGRICULTURE: Chemical fertilizers and pesticides used to boost agricultural productivity are also associated with agricultural losses. For example, pesticide use can lead to severe pest outbreaks by damaging natural predator populations. Studies have documented a pattern in which pesticide use initially leads to an increase in productivity, followed by a pest outbreak that lowers productivity below the initial level that preceded the use of the chemical. Over time, productivity rises again but does not usually reach the original level. Intensive pesticide use can also lead to the emergence of resistance among the pest population. Farmers frequently become trapped in a "vicious cycle" in which they must use increasing amounts of agricultural chemicals to counteract ecosystem imbalances created by using them. The use of agricultural chemicals can also deplete soil fertility by reducing populations of beneficial soil micro-organisms.

In addition to these ecosystem effects, studies have found that farming populations in developing countries sometimes experience diminished productivity due to illnesses resulting from pesticide exposures. Other impacts of pesticides include "erosion of biodiversity, reduction of populations of pollinators and other beneficial insects, and contaminated fish, birds and wildlife. Many environmental goods, such as bees, bush-meat, or fish, are of critical economic or food security value to poor communities."[16]

FISHERIES: Fisheries, an important source of protein and of income for populations around the world, can be severely affected by chemicals. Persistent organic pollutants can accumulate in fish, especially those high in the food chain. As a result, the value of this otherwise excellent protein source is diminished or lost completely.

Chemical contamination is associated with disease in fish populations, including cancers and increased vulnerability to infectious agents. Chemicals can also destroy fish populations.

Industrial and agricultural run-off can lead to large-scale fish kills, and lower-level chemical contamination of water bodies can decimate fish populations over time. Pesticides, for example, are cited as a major threat to the continued survival of some salmon populations. Given the economic value of fisheries worldwide, significant economic losses may result from chemical-related reductions in the size or quality of fishery resources.

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14 "International Transport of Lead and Cadmium via Trade: an International Concern?" Thought starter prepared by the Center for International Environmental Law (CIEL) in consultation with the FSC Working Group and on behalf of the Government of Germany. Presented at the Sixth Session of the Intergovernmental Forum on Chemical Safety, Dakar, Senegal, September 2008. (http://www.ciel.org/Publications/PbCd_ThoughtStarter_Mar08.pdf).

15 A compilation of recent articles of endocrine disrupting effects in wildlife can be found at: http://www.ourstolenfuture.org/NewScience/wildlife/wildlife.htm.

16 http://www.africastockpiles.net/about/poverty


KEEP OUT
NO SWIMMING
NO BOATING
NO FISHING
CONTAMINATED WATER
BY ORDER OF DEPT. OF HEALTH

Multiple Challenges; Multiple Solutions

Poverty and chemicals management

Trends and global policies

Chemicals are an integral part of the daily life with over 100,000 different substances in use. The continued growth pattern of global production, trade and use of chemicals is exerting an increasing chemicals management burden on developing countries and countries with economies in transition and these countries have the least capacity to deal with such complex challenge. By 2020, developing countries are expected to lead the world in growth rate for high volume industrial chemicals, increasing their share of world chemicals production to 31 per cent. Chemical consumption in developing countries is likewise growing much faster than in developed countries and could account for a third of global consumption by 2020.

The contributions that the sound management of chemicals makes to the achievement of the Millennium Development Goals (MDGs) adopted at the 2005 World Summit are explicitly recognized within the Dubai Declaration on the Strategic Approach to International Chemicals Management (SAICM) adopted in 2006 at the first International Conference on Chemicals Management. SAICM observed that, "the sound management of chemicals is essential if we are to achieve sustainable development, including the eradication of poverty and disease, the improvement of human health and the environment and the elevation and maintenance of the standard of living in countries at all levels of development."

Improper production, transport, use and disposal together with inadequate storage and control, can lead to environmental damage, serious illness, sick and absent labour forces and death while obsolete stockpile clean-up operations can be very expensive. This is particularly relevant to developing countries where are higher levels of poverty as there is an established link between poverty and increased risks of exposure to toxic and hazardous chemicals.

A key challenge for countries is to balance risks and benefits when making national decisions on chemicals. Many developing countries are confronted with the challenge of becoming recipients of an increasing amount of outdated technologies and chemicals. One of the key barriers to progress on this fundamental problem is the lack of global consensus on the costs of inaction on the sound management of chemicals. Reporting on the costs of poor chemicals management occurs virtually every day somewhere in the world, but these events (chemical accidents or when especially vulnerable populations have received acute or chronic exposures, etc.) typically receive inadequate attention. This is due in great part to the fact that the story line has not been explained in the economic language of key financial decision makers, has not been aggregated into a meaningful national, regional and global picture, and has not been adequately linked to sustainable development in a form that is manageable to grasp at the political level.

Multiple elements

Due to the widespread use of chemicals in society and industry, there are no simple solutions to achieve sound management of chemicals. Evidently, a solution would require multiple elements, including:

- *Methodologies to collect relevant information.*
- *Risk assessment based on the scientific information.*
- *Governance structures to manage chemicals, including products containing hazardous chemicals, through legal actions, economic instruments, voluntary agreements and substitution with less hazardous chemicals amongst others together with the necessary institutional infrastructures and coordination mechanisms.*
- *Capacity building activities in developing countries and countries with economies in transition*
- *Awareness raising on the potential negative effects of hazardous chemicals at the political decision-making level and among producers of, traders in, and users of chemicals.*

Major challenges to the sound management of chemicals

As indicated in the overview chapter, there are a number of major challenges in achieving sound management of chemicals. These challenges are related to a number of interrelated issues, including:

- *Lack of financial resources for chemicals management.*
- *Lack of coherent legislation and lack of coordination between ministries.*
- *Lack of institutional, technical and legal capacities for development, implementation and enforcement of legislation.*
- *Lack of information and awareness of the impacts of chemicals on the environment and health.*

Lack of financial resources for chemicals management

Financial resources are the foundation for all activities geared toward the achievement of sound management of chemicals. However, it is widely recognized that the resources available to address chemical safety issues at national, regional and global levels are inadequate.

Most of the chemicals management related Multilateral Environmental Agreements (MEAs) are scientifically justified, but are generally confronted with insufficient financial and/or market based mechanisms for their implementation.

In a number of developing countries and countries with economies in transition chemicals management relies on resources from bilateral donors and multilateral funds such as the Global Environment Facility (GEF) for Persistent Organic Pollutant (POPs) and the SAICM Quick Start Programme for enabling activities. However, the existing windows in GEF are limited to specific issues and themes such as land degradation, climate change, international waters and POPs and even though the POPs window covers an important aspect of sound management of chemicals, it does not cover most of the issues outlined in SAICM.

The largest available funds for the sound management of chemicals that developing countries might tap into lie within the development aid from donor countries, regional development banks and national budgets. However, this source is only being used by developing countries and countries with economies in transition to a limited degree. This is partly explained by the fact that most Poverty Reduction Strategies in developing countries and countries with economies in transition do not acknowledge the connection between sound management of chemicals and sustainable development as stated in the Dubai Declaration of SAICM. In any case, these bilateral and multilateral funding mechanisms would not ensure the long-term sustainable funding of the necessary activities for sound management of chemicals.

Finally, competition between the ministries for the scarce funds available for sound management of chemicals constitutes an institutional barrier for the cooperation between the ministries.

Lack of coherent legislation and inter-ministerial coordination

Due to its cross-sectoral nature, the responsibility for management of chemicals in most countries is spread over a number of ministries such as those for agriculture, industry, labour, environment and health. Even within one ministry, activities related to chemicals are often the responsibility of different agencies. For developing countries and countries with economies in transition, this has in many cases led to a fragmented approach that leaves some chemicals insufficiently covered by legislation. Furthermore, an uncoordinated approach to chemicals management causes an inefficient use of the limited resources available.

It has been observed within international coordinating mechanisms such as the IOMC and the United Nations EMG that the growing number of international agreements and related capacity building programmes creates a challenge for countries to link and integrate them to national frameworks or programmes for the sound management of chemicals. There is no process in place to manage the multiple conventions' obligations or facilitate inter-ministerial cooperation.

A consolidated and coordinated international approach to assist developing countries in building the necessary infrastructures (legislation, coordination mechanisms, etc.) to deal with increasing number of industrial chemicals in their countries is needed. UNEP has a role in coordinating this new area, in cooperation with different MEAs and other stakeholders.

Many of the agreements contain similar provisions related to core capacity elements such as adequate legislation, information gathering and dissemination. There may, therefore, be opportunities for countries, ministries and other stakeholders to collaborate and ensure coordinated and coherent approaches. Other potential areas for coordinated or synergetic approaches to capacity building include public participation and stakeholder involvement, integrated import control, or technology transfer, to name just a few. A particular challenge for coordination is that several international organizations have regional offices which are actively, and sometimes independently, involved in chemicals management capacity building.

Lack of institutional, technical and legal capacities for development, implementation and enforcement of legislation

To achieve the WSSD 2020 goal on sound management of chemicals, it is essential to bridge the widening gap in capacities between developed countries and developing countries and countries with economies in transition. This entails the strengthening of institutional, technical and legal capacities for development, implementation and enforcement of measures for sound management of chemicals in these countries through legal actions, economic instruments, voluntary agreements, substitution with less hazardous chemicals, etc., together with the necessary institutional infrastructures and coordinating mechanisms.

The implementation of legislation on chemicals management needs to be supported by institutional capacity in a coherent way. In general, two different types of institutions are needed for successful implementation of the legislation. Firstly, there is a need for the central ministerial institutions responsible for the technical and legal work on government policies on chemicals. This includes the assessment of chemicals, issuing authorizations, running registers on chemicals, participating in international negotiations, and implementing MEAs relevant for chemicals, amongst others. Secondly, there is a need for enforcement institutions dealing with the protection of human health and safety, and the protection of the environment.

Apart from lacking the legal and technical personnel capacities to perform the necessary tasks to achieve the sound management of chemicals, developing countries lack adequate laboratory capacities to carry out the analysis of chemicals in different media, such as soil, water, air, etc. This further limits their capacity to monitor chemicals in the environment and particularly to fulfil their obligations under the Stockholm Convention. At the subregional level, developing countries might consider sharing these burdens in a similar way to how it is done in the SAHEL region in Africa.

Many developing countries and countries with economies in transition have yet to recognize that the main responsibility for providing information for risk assessment and risk management lies with the industries producing and marketing chemicals. The legislative and regulatory system needs strengthen the responsibility of industry for providing this information.

Finally, the lack of institutional capacity and structures for enforcement of the legislation of chemicals, including MEAs, is one of the causes for the illegal trafficking in chemicals, albeit not the only one. The root of this problem is mainly related to the lack of financial resources to develop the institutional capacities for inspection services and customs control.

Lack of information and awareness of the impacts of chemicals on the environment and health

The negative impacts of chemicals on health and the environment are often insufficiently known—this includes both their extent and their mode. At the same time, these impacts are not emphasized enough in the government priorities of developing countries and countries with economies in transition. Sound management of chemicals competes for scarce resources with other environmental and health issues, such as climate change, sanitation and ecosystem degradation, whose effects are widely recognized. The negative impacts of chemicals are not as visible as other environmental and health effects. Moreover, the lack of financial resources makes it almost impossible to monitor these negative effects of chemicals, making more difficult the enforcement of existing legislation.

Many people still do not recognize that chemicals management intersects with other important national and international objectives related to sustainable development, including protection of vulnerable groups, protection of water supplies and drinking water and poverty eradication. Decisions and activities taken regarding the sound management of chemicals and hazardous waste should be viewed within these broader issues.

The need to reconcile chemicals and waste management strategies and plans with macro-economic policies and other sectoral policies that drive chemicals production and use has never been so great. However, in many countries chemicals management is unfortunately considered a "luxury" issue which will have to wait until the country has developed further. This is predominantly caused by lack of information and awareness by the political decision-makers on the importance of the sound management of chemicals for sustainable development. A related limitation is the lack of knowledge about cost effective alternatives, best available techniques and best available practices (BAT/BEP), including integrated pest management and integrated vector management approaches to reduce reliance on pesticides. This can be rectified.

The lack of information on the impacts of chemicals is not limited to developing countries. For this reason, a number of OECD countries are working on initiatives to increase the available information on this area. This information will be of relevance for developing countries and countries with economies in transition too. In addition, in response to the request by the WSSD to improve the availability of hazard data on chemicals, the OECD initiated the development of a global portal of information on chemical substances (eChemPortal) in 2004 which provides free access to information on the properties and hazards of chemicals. There is, however, a need to raise awareness about and improve access to this information for developing countries and countries with economies in transition.

What can we learn from the case studies?

The case studies provide some insights into factors that support the sound management of chemicals and their wastes. While the cases illustrate only a subset of the experience gained through the years, and address only some of the different challenges faced, they convey useful lessons that can be used to improve the sound management of chemicals in general. The lessons derived from the 18 case studies contained in this volume have been grouped as follows:

- *Priority setting at the national level*
- *Stakeholder involvement*
- *Multi-sectoral and integrated programmes*
- *Legislation*
- *International harmonization and cooperation*
- *Information and knowledge*
- *Life cycle analysis*
- *Alternatives*

Priority setting at the national level

The integration (mainstreaming) of the sound management of chemicals into national development planning processes has been recognized by SAICM as an important element for national resource mobilization for the sound management of chemicals and to address the adverse impacts of chemicals on health and the environment.

The experience illustrated by the case studies stresses that to effectively participate in the development planning processes, the environment and health sectors need to improve their economic analysis. It also shows that officials from environment and health ministries in developing countries need to increase their capacity so as to understand the development planning processes, which can in part be addressed through training in the process and language of development planners and finance ministries.

The lessons learned from the Africa Stockpile Programme stresses that mainstreaming the pest and pesticide management in a country's broader development agenda and ensuring that adequate funding is available helps guarantee the continuity of work started and also helps prevent the recurrence of build-up of unwanted stocks of pesticides.

Stakeholder involvement

Many international chemicals agreements, such as the Stockholm Convention and SAICM, recognize that the involvement of all stakeholders at the local, national, regional and global levels is key to achieving the objectives of the sound management of chemicals. A transparent and open implementation process as well as public participation in decision-making featuring in particular a strengthened role for women is also crucial.

The Dubai declaration of SAICM recognizes that the private sector has made considerable efforts to promote the sound management of chemicals through voluntary programmes and initiatives such as product stewardship and the chemicals industry's responsible care programme. The declaration further recognizes that non-governmental public health and environmental organizations, trade unions and other civil society organizations have made important contributions to the promotion of chemical safety. Many of the case studies support these assertions and show the advantages of stakeholder involvement.

The experience from Japan shows that participation of stakeholders, especially industry, is critical to national policy development and the adoption of successful programmes for the management of chemicals. This is echoed in the 2010/15 PFOA Stewardship Program in the United States. In Moldova, the involvement of local stakeholders was an important factor in improving the management of POPs. A wide group of local stakeholders, including governments, NGOs and local communities affected by POPs pollution was involved and the consensus reached through the consultation process resulted in a National Action Plan supported by all.

The project to eliminate POPs from Pacific Island countries confirm that attaining political endorsement at the Ministerial level for work at the ground level is crucial. In addition it shows the significance of engaging key contacts and involving local populations in all phases of the project. Furthermore, communication between the project team and the local citizens has to be regular and in a language and form easily understood by all. Finally, the experience shows the importance of training before implementing key activities to make sure all stakeholders are effectively engaged.

The case study on illegal traffic of DDT in Tajikistan exemplified the creation of successful partnerships of government authorities, representatives from ministries, businesses, the scientific community, NGOs, the general public and others. In the same way, the success of the Africa Stockpile Programme is the result of cooperation among from government, NGO and industry stakeholders.

The case study in Ghana shows that NGOs and community-based organizations can make significant contributions to programme implementation and reporting because they have the trust of the community. Similarly, in Cameroon, the use of NGOs in service delivery has enabled municipal authorities to engage communities that are out of reach through the formal sector, achieving environmental objectives and contributing to employment. The impact of NGOs can be increased through greater government recognition of their potential contribution, improved access to technical, financial, training and policy support and strengthened coordination, collaboration and communication between researchers, academia and policy makers.

The Responsible Care Global Charter and the Global Product Strategy developed by the International Council of Chemicals Associations (ICCA) are examples of private sector driven contributions to fulfil the goal of WSSD and SAICM. Lessons learned from the implementation of these programmes are that there developing countries lack the capacity to effectively manage chemicals and that there is a need to promote transparent, science-based and cost effective regulatory regimes around the world. This has led ICCA to develop a set of principles for chemicals management systems based on a combination of regulation and industry-led initiatives.

Multi-sectoral and integrated programmes

SAICM stresses the need for a multi-sectoral approach to ensure sound management of chemicals. The Global Plan of Action in SAICM recommends the implementation of integrated national programmes in a flexible manner. The case studies illustrate such flexibility.

The experience from Mexico shows that effective and coordinated efforts that include active participation from all sectors are needed when deciding to phase out a chemical. Not only did this initiative propose a coordinated programme to reduce the adverse effects of chemicals and their wastes, this successful partnership improved the collaboration between government and industry on other chemicals management issues.

The PCB management and disposal demonstration project in China shows a successful integrated programme that includes the development of regulation, strengthening of technical capacity, increased awareness and clean-up activities that can be used as a model for other provinces in the country.

Legislation

The experience from Japan indicates that hazard-based regulation can be a starting point for more comprehensive chemicals management. As well, the case study from the United States shows how regulations can complement voluntary measures. The experience from Peru highlights that it is not enough to have legal controls in place, but that an enforcement programme to ensure standards are being met is also needed.

International harmonization and cooperation

SAICMs objective on Knowledge and Information underlines the need to make the existing risk reduction and other tools for the sound management of chemicals from various participating organizations of the IOMC more widely available so that they can be considered and used in all countries. Several of the case studies highlight the benefits of such exchange.

The experience of Japan indicates that international harmonization is an important element of policy development. It also highlights that participation in international hazard and risk assessment programmes and recommendations from the international community can contribute to effective and efficient chemicals management at the national and international levels.

The case study of lindane in Mexico shows the benefits that can be gained from collaboration with other countries to improve national level programmes. It also shows that national initiatives can contribute to regional and global efforts to improve the management of chemicals.

Information and knowledge

Access to sufficient knowledge and information to adequately evaluate and manage chemicals throughout their life cycle has long been recognized by international chemicals agreements as the cornerstone of sound chemicals management. However, technical information, the results of hazard and risk assessments, socio-economic methodologies and the tools to develop and apply science-based standards are not available to all stakeholders. Several of the case studies highlight the importance of access to information to help guide decision-making and the implementation of programmes.

The Dubai Declaration of SAICM states that it is the responsibility of industry to make data and information on the health and environmental effects of chemicals needed to use chemicals and the products made from them safely available to stakeholders.

The case of lindane in Mexico is an example of a successful initiative which demonstrates that synergies can result from the close cooperation among government agencies such as information exchange, communication and public participation. The Africa Stockpiles Programme shows that good information is crucial when planning programmes. In this case, the lapse in time between initial inventory taking and disposal operations as well as incomplete identification of stocks resulted in a significantly larger implementation cost than initially estimated.

The Chemicals Information Exchange Network (CIEN) illustrates the profound ‘digital divide’ that exists between developed countries and countries on the path to development. However it shows that, given the opportunity, those who would use, gather and share this information are eager, dedicated and enthusiastic to do so. CIEN training sessions are universally judged to be an eye-opening experience to participants and to be inspiring in revealing the wealth of accessible information which countries need and simply have not yet discovered.

CIEN training also shows that on-going support is needed to fully make use of the available information so that it can be used effectively for decision-making and to institutionalize exchange of information at the national level. As the experience of developed countries has shown, sound management of chemicals is a long-term goal and requires sustained efforts. CIEN-ESTIS as a dedicated communications tool is a solid first step which contributes to achieving this chemicals management capacity.

Life cycle approach

The life cycle approach is an important element in achieving the objective of SAICM. The case study on Crop Protection Stewardship is an example of a life cycle approach that follows a chemical from the research stage, transport and distribution, use and finally to the disposal of obsolete stocks. The case study underlines that the role of industry, government and other stakeholders is of a dynamic nature and changes throughout the life cycle of a chemical.

In the example on polybrominated flame retardants in Switzerland, information on the contribution of various stages of the life cycle to environmental releases helped the development of the most effective measures to reduce them. However, the analysis stressed that globalization of markets made it extremely difficult to trace the flow of substances in products from production, to consumption and disposal. This case study also points to the need for an international effort to improve the availability of data through better recording, reporting and monitoring of substance flows.

Alternatives

The Global Plan of Action of SAICM identifies the need for alternatives to toxic chemicals and underlines that better agricultural methods should be promoted.

This compilation includes two agricultural examples that deal specifically with alternatives. The case studies from India and Ghana show that small holders can increase their income when they adopt agricultural practices such as integrated pest management (IPM) or "non-pesticidal management" that reduce the need for pesticides. However, to move these initiatives beyond demonstration projects, agricultural extension efforts that provide farmers with the skills to effectively deal with pests using alternative methods have to be deployed more widely and consistently.[17] If access to markets for organic and pesticide free produce and products were better developed, and production standards and certification strengthened, farmers could benefit from the price advantage for these commodities. This would then facilitate wider adoption of such practices.

Summary of main challenges and strategies to achieve sound management of chemicals throughout life cycle

This section offers an overview of the main challenges that are experienced by countries and the management tools available to promote sound management of chemicals throughout their life cycle. Table III.1 illustrates, either directly or indirectly, the different case studies presented in the document and as

17 Examples of efforts to extend IPM more widely can be found at http://www.fao.org/agriculture/crops/core-themes/theme/pests/ipm/en/ and http://communityipm.org/.

such could be useful to countries in their efforts to achieve sound chemicals management by 2020. In an attempt to facilitate the readers' understanding, the life cycle approach presented here is simplified and does not exhaustively identify all challenges and strategies nor reflect possible interrelations and overlaps between different steps of life cycle.

Table III.1: Main issues and possible management strategies to achieve sound management of chemicals throughout the life cycle

Lifecycle steps	Main challenges	Management strategies	Case studies
Production (including formulation)	*- Evaluate hazardous properties of chemicals and risks associated including conditions for safe use*	*- International harmonization on classification and labelling of hazards and testing methods (OECD test guidelines and good laboratories practices; GHS)* *- Pre-evaluation and registration system to assess risks of chemicals before allowing them on market (e.g. REACH in EU, OECD High Production Volume Programme)*	*1, 3, 17 and 18*
	- Control quality of production and formulations, in particular enforce ban in production of certain prohibited substances	*- Product stewardship, especially from mother companies to formulators; and strong involvement of industry (voluntary approach)* *- Phase in safer alternatives*	
	- Control generation of polluting waste and releases into the environment	*- Establish license system for polluting industries, establish monitoring of releases and request phasing in cleaner production standards, such as use of best available techniques and best environmental practices* *- Chemicals Leasing[1]*	
	- Control exposure of workers in chemical production industry	*- Establish national inspection systems and implementation of adequate occupational health and safety standards, such as risk communication programmes within companies on safety use/handling*	

<table>
<tr><th colspan="2">Lifecycle steps</th><th>Main challenges</th><th>Management strategies</th><th>Case studies</th></tr>
<tr><td rowspan="5">Use</td><td>Distribution</td><td>- Monitor chemicals available in market
- Ensure safe transportation of chemicals
- Improve knowledge transfer to distribution chain (retailers)
- Disseminate relevant information to end-users</td><td>- Develop authorization mechanisms and registers of chemicals to be sold in markets
- Strengthen customs control to identify prohibited substances and products that contain them
- Enhance emergency prevention, preparedness and response
- Increase awareness on potential hazards and exposure of chemicals and implementing sound labelling of chemicals such as GHS</td><td>1, 3, 6, 7, 12, 14, 17 and 18</td></tr>
<tr><td rowspan="3">Manufacture of consumer products</td><td>- Control toxicity of consumer products/articles containing chemicals</td><td>- Establish inspection systems (and/or voluntary programmes) and implement adequate standards of chemicals content in products/articles</td><td rowspan="3">3, 17 and 18</td></tr>
<tr><td>- Control polluting releases during manufacturing process</td><td>- Establish licensing system for polluting industries, establish monitoring of releases into the environment and phase in cleaner production standards, such as use of best available techniques and best environmental practices</td></tr>
<tr><td>- Control exposure of workers to chemicals</td><td>- Establish national inspection systems and implementation of adequate occupational health and safety standards in companies, such as risk communication programmes on safety use/handling</td></tr>
<tr><td>Consumers use</td><td>- Control appropriate use of chemicals</td><td>- Increase awareness on potential hazards and exposure to chemicals and appropriate use through promotion of safe practices and sound labelling of products in local languages
- Enhance emergency prevention, preparedness and response that includes diagnosis and treatment of intoxication
- Manage left-over and packaging</td><td>13, 17 and 18</td></tr>
</table>

Lifecycle steps		Main challenges	Management strategies	Case studies
End-of-life	**Recycle**	*- Low awareness of possible negative effects of recycling practices of products containing hazardous substances* *- Control informal recycling practices*	*- Inventory of recycling practices* *- Legal and regulatory measures to prohibit and strictly control recycling operations (e.g. licensing system)* *- Establish recycling facilities and promote a market for recycled items* *- Raise awareness among the public of the benefits of minimizing and recycling wastes*	*15*
	Disposal	*- Incomplete data on toxicity and quantity of hazardous wastes* *- Insufficient waste management infrastructures and facilities, in particular for hazardous wastes* *- Lack of awareness of possible negative effects of improper disposal practices*	*- Establish national systems to make an inventory of hazardous wastes and their toxicity* *- Establish licensing systems with standards on collection, packaging, labelling, transportation and storage of hazardous wastes at the national level* *- Set up environmentally sound and sustainable hazardous waste disposal facilities* *- Establish national monitoring systems of contaminated sites* *- Raise awareness among the public of positive effects of sound disposal of hazardous wastes* *- Set up arrangements for hazardous wastes transfer to countries with adequate disposal technologies* *- Promote product stewardship through lifecycle (cradle to grave) approaches.*	*5, 8, 9, 10, 11 and 18*

In addition to the corrective strategies described in the matrix, there are a number of key strategies and/or activities that encompass all steps of the life cycle of chemicals. These include:

- *Sound planning and coordination, when decision-making at the national level is based on inter-ministerial and inter-sectoral processes and takes into account economic benefits of implementing sound management of chemicals (e.g. mainstreaming).*
- *Information collection through continuous monitoring of chemicals contamination in human beings and the environment.*
- *Mechanisms for effective enforcement.*

Case Examples

1. Practical approach in chemicals legislation—The experience of Japan

Introduction

Defining a universally applicable best practice of chemicals legislation would be difficult, if not impossible. The regulation of chemicals in Europe is enforced through REACH (Registration, Evaluation, Authorization and Restriction of Chemicals). In the United States, chemicals are regulated through the Toxic Chemicals Control Act; in Japan, through the Chemical Substances Control Law. Chosen by the respective legislators to suit their country's idiosyncrasies, these and most other national regulatory systems vary in scope, coverage, obligation of industry, organizational arrangement for enforcement, etc.,

This chapter describes the development of the Japanese chemicals management legislation. Without making a value judgment, its purpose is to offer an example of the development of a national chemicals regulation system.

Hazard-based control as a crisis management

The rapid economic growth in Japan that started in the late 1950s had serious side effects on human health and the environment, exemplified by the recurrent occurrence of methyl mercury poisoning and respiratory diseases. One such case was the result of food contamination by PCBs (polychlorinated biphenyls) in the late 1960s. PCB-contaminated rice bran oil caused a severe form of acne, fatigue, nausea and liver disorders as well as an increase in liver cancer mortality among people who consumed it. Monitoring by local governments and the Environment Agency (established in 1971) confirmed the widespread environmental contamination by PCBs.

Responding to a health and environmental crisis that included the PCB contamination, Japan enacted many laws aiming at environmental protection. One of these laws was the Chemical Substances Control Law (CSCL) enacted in 1973. It prohibited the production, import and use of persistent, bioaccumulating and toxic (PBT) chemicals such as PCBs, and introduced a pre-marketing evaluation of new industrial chemicals. It is worth noting that this pre-evaluation system for industrial chemicals was the first one adopted in the world.

The original CSCL was purely hazard-based—the Japanese Government was to designate prohibited chemicals solely based on the hazardous properties of chemicals, irrespective of their production volume or potential for exposure. The National Diet also requested the government to investigate the safety of about another 20,000 existing chemicals, regardless of their production volume.

Shift to risk-based management

The hazard-based approach was not as functional as the focus shifted to less hazardous chemicals and to the vast number of existing chemicals. The first major amendment to CSCL in 1981 introduced a regulation to limit the production volume of persistent but non-bioaccumulating chemicals. This was the start of a shift to a risk-based approach, which considers the risk of chemicals on human health and the environment, as determined by the hazardous properties of the chemical and the potential for exposure. However, the Japanese Government did not explicitly use the word "risk" at that time.

The First Basic Environment Plan, approved by Cabinet in 1994, introduced the notion of risk reduction for the first time in Japanese chemical management policy. More attention started to be paid to production volumes and environmental emissions of chemicals. In 1999, the Pollutant Release and Transfer Register (PRTR) Law was enacted to enhance the management of chemical releases. The second major amendment to CSCL, in 2003, introduced a consideration of exposure potential in the pre-marketing evaluation of new chemicals, as well as regulation based on eco-toxicity. The Japan High Production Volume (HPV) Chemicals Challenge Program, in which chemical producers and importers sponsor the safety assessment of chemicals produced in a volume greater than 1000 tons per year, started in 2005.

In 2009, the third major amendment to the CSCL introduced a comprehensive risk assessment and management framework covering all new and existing industrial chemicals. In the amended law, manufacturers and importers are now obliged to report the annual production and import volume of all chemicals with a volume greater than 1 ton per year. In addition, the Japanese Government was empowered to request information on hazardous properties of existing chemicals and their use patterns when deemed necessary judging from production and/or import volume and other available information.

International harmonization and cooperation

Japan benefited from initiatives of international organizations and from the experience of other countries in the development of chemicals legislation. In the early 1970s, OECD and WHO started to work on environmental pollution by hazardous chemicals. Their first focus was on PBT chemicals such as PCBs and mercury. The enactment of CSCL was influenced by the scientific work done by, and information exchange with, these organizations. The latest amendment in 2009 was likely motivated by the global challenge of achieving the sound management of chemicals by 2020.

The work of the OECD on harmonization and burden sharing of chemical assessment and management has also been essential. Japan abides by the OECD Agreement on Mutual Acceptance of Data, which consists of harmonized Test Guidelines and Good Laboratory Practice (GLP) Principles. Japan HPV Challenge Program was also inspired on the OECD HPV Program and the HPV Challenge Program in the United States. The enactment of PRTR Law and the second amendment of CSCL were also encouraged by recommendations from the OECD Council.

Lessons learned

Several lessons can be drawn from the development of chemicals legislation in Japan, especially with regard to planning for regulation in developing countries and countries with economies in transition:

1. *Hazard-based regulation could be a starting point for more comprehensive chemicals management. Japan experienced a real health crisis episode, but now that the Stockholm Convention globally regulates PBT chemicals, countries could first establish regulations responding to the Stockholm Convention, and then further develop workable chemicals management legislation in accordance with their national idiosyncrasy.*

2. *Participation of stakeholders, especially industry, is critical to national policy development and successful chemicals management. In Japan, the PRTR law was based on pilot programs in local governments and voluntary industry Responsible Care initiatives. Voluntary participation in Japan HPV Challenge Program laid the groundwork for the third amendment to CSCL in 2009.*

3. *International harmonization and cooperation are important elements of policy development. Tools such as the OECD Test Guidelines and GLP Principles are already available for use by any country. Participation in international hazard and risk assessment programmes, and recommendations from the international community can give impetus to effective and efficient chemicals management*

Box IV.1.1. REACH

On 1 July 2007 a new regulation by the European Community on chemicals and their safe use called "REACH" entered into force. It deals with the Registration, Evaluation, Authorization and Restriction of Chemical substances.

The REACH Regulation has introduced a new authorization procedure for chemicals, which requires manufacturers and importers of chemicals to provide information on the properties, uses, and on the classification of a substance, as well as guidance on its safe use upon its registration. New chemicals and chemicals that already exist on the market have to be registered with the newly established European Chemicals Agency (ECHA). The aim is to improve the protection of human health and the environment through the better and earlier identification of the intrinsic properties of chemical substances.

Substances that pose a potential risks to human health and the environment, are evaluated by ECHA in co-ordination with the Competent Authorities of the Member States to determine restrictions on the production and use of the substances.

The Regulation also calls for the progressive substitution of the most dangerous chemicals when suitable alternatives have been identified and promotes the sharing of information on chemicals and their safe use within the supply chain and with costumers.

Box IV.1.2. The Canadian Chemicals Management Plan

In many countries, registration procedures that include risk assessment are in place for new chemicals. Chemicals that have been on the market for years are often not included in such assessments. The government of Canada did a rapid assessment of about 23,000 existing chemicals listed on its Domestic Substances List, which had been introduced on the market without undergoing a pre-market assessment. The aim of categorizing these substances was to set priorities for further action.

In 2006 the government concluded its categorization and identified 4300 substances that met the criteria of posing a potential threat to human health and the environment. The Chemicals Management Plan identifies five categories of substances requiring immediate regulatory actions as they are harmful to human health and the environment. The remaining substances are scheduled for risk assessment starting with 500 priority substances. Control measures might be introduced after consultations with industry and other stakeholders. Chemicals identified as lower risk substances will be screened more rapidly.

The Chemicals Management Plan includes:

- *regulations and enforcement of substances of concern*
- *challenge to industry to provide information*
- *restrictions on re-introduction and new uses*
- *rapid screening of lower risk chemical substances*
- *accelerated re-evaluation of older pesticides*
- *mandatory ingredient labelling of cosmetics*
- *regulations to address environmental risks posed by pharmaceuticals and personal care products*
- *enhanced management of environmental contaminants in food*
- *health monitoring, surveillance and research*
- *good stewardship of chemical substances*

2. The UNDP-UNEP Partnership Initiative for the Integration of Sound Management of Chemicals into Development Planning Processes: Maximizing Return on Investment

The Strategic Approach to International Chemicals Management (SAICM) recognized as a priority the integration of sound management of chemicals into national development planning processes in order to support sustainable development in developing countries and countries with economies in transition.

The approach

To help developing countries and countries with economies in transition, the United Nations Development Programme (UNDP) and United Nations Environment Programme (UNEP) have developed a Partnership Initiative for the Integration of Sound Management of Chemicals (SMC) into development planning processes. The partnership aims to help countries secure support for the development of national capacities for the sound management of chemicals from multilateral and bilateral donors.

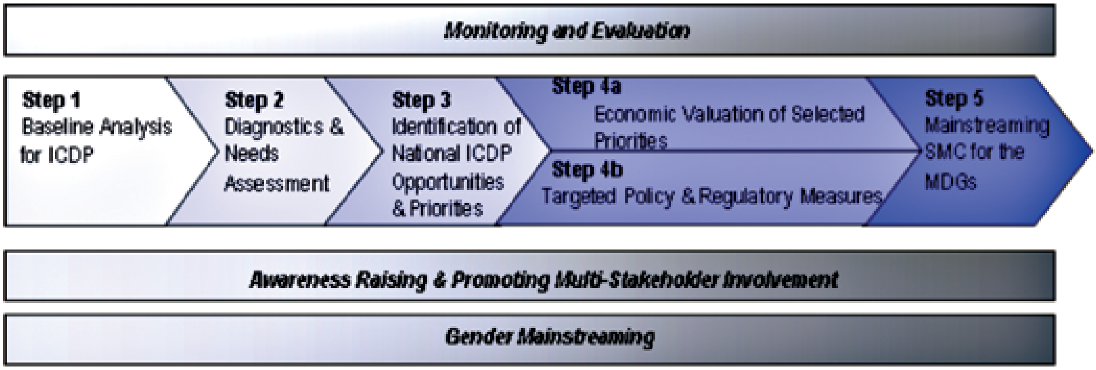
The partnership helps countries:

1. *Identify specific areas of chemicals management that are likely to result in concrete environmental, health and economic benefits as a result of sound management practices, and to put in place a plan to begin addressing identified national priorities.*
2. *Assess the adequacy of national development strategies in terms of protecting the environment and human health, and determine to what extent identified national chemical management priorities could be integrated into national development planning.*
3. *Improve the integration of chemicals management priorities into national discussions, development processes, policies and plans.*

The proposed approach[18] for mainstreaming comprises five steps (*see figure IV.2.1*) that allow for a systematic methodology to develop national capacity and to mainstream the sound management of chemicals into development planning.

18 More information on this methodology/approach can be found in the "UNDP Technical Guide for Mainstreaming the Sound Management of Chemicals (SMC) in MDG-Based Policies and Plans"

Figure IV.2.1. Steps in the UNDP-UNEP Partnership Initiative methodology



With the support of funding secured through the SAICM Quick Start Programme Trust Fund and the Swedish Government, the Partnership Initiative was launched in Uganda and Zambia in November 2007, in Macedonia in March 2008, and in Cambodia in June 2008. In the near future, the process will be initiated in an additional six countries (Ecuador, Belize, Honduras, Liberia, Mauritania and Belarus). In addition, Regional Workshops for facilitating communication between officials responsible for development planning and officials responsible for chemicals management have been held in Africa (Uganda, September 2008), Asia Pacific (Cambodia, December 2008), Central and Eastern Europe (Macedonia, February 2009) and Latin America and the Caribbean (Belize, March 2009) with the support of the Government of Norway.

What has been achieved?

Uganda

The "Uganda/UNDP/UNEP Initiative for the implementation of SAICM" project was officially launched by the Ugandan Minister of State for Environment, Mrs. Jessica Eriyo at the Inception Workshop (7-8 November 2007, Kampala). Seventy six representatives from various Ministries, including Health, Environment, Planning and Finance, industry associations, non-governmental organisations, universities and chemicals-related institutions responded to the invitation of the Ugandan National Environmental Management Agency (NEMA) to support the project and to work towards the main objectives of the Partnership Initiative.

Uganda's Poverty Eradication Action Plan (PEAP), which is its comprehensive development framework, was expiring in 2008. The expiry of the PEAP offered an opportunity to review the gains realized, address the challenges and constraints faced during its implementation, and to identify emerging issues, opportunities and new challenges. The revised PEAP will inform and eventually be transformed into the New Five Year National Development Plan. The revision process will be guided by several sector working papers and consultations around the contents of the draft plan. One of the working papers to inform the new plan is a sector paper on Environment, Natural Resources and Climate Change.

During the inception workshop, participating stakeholders recognized and agreed that it would be extremely important for this project to contribute to the review process of the PEAP and to try to mainstream known national chemicals management priorities into the revised PEAP in order to influence the national development plan and meet SAICM objectives. The project's stakeholders agreed to two parallel processes:

"**FAST-TRACK**": In order to incorporate chemicals management issues into the revised PEAP, a paper to guide the development of the Environment, Natural Resource and Climate Change sectors which will then inform the national development plan, was prepared. The project team also provided detailed comments on priorities related to sound chemicals management in the environment sector paper.

"NORMAL-SPEED": The National sector team agreed to prepare Uganda's chemicals national situation report under the guidance of an economist, an environmental health expert and a NEMA environmental expert. This analysis identified high priority chemicals issues relevant to Uganda's national development objectives, which were presented to the Inter-agency Coordinating Mechanism (ICM) in the first quarter of 2009. Pre-meetings with the finance and planning ministries have been held.

Phase 2 of the project has begun with an economic cost-benefit analysis of the need to restructure legislative and institutional governance mechanisms to improve effectiveness and efficiencies for the sound management of chemicals in Uganda.

Zambia

The Zambian Minister of Tourism, Environment and Natural Resources, Honourable Michael L. Kaingu officially launched the project "UNDP-UNEP Case Study in Partnership with Zambia: Mainstreaming Sound Management of Chemicals Issues into MDG based National Development Planning" at the Inception Workshop held 14-15 November 2007 in Lusaka. A wide diversity of ministries was represented—20 government ministries and agencies—as well as the private sector, academia and NGOs. The workshop reinforced the cross-sectoral relevance of chemicals management and its economic significance. Active involvement and commitment of the Ministry of Finance and National Planning was a clear sign of the strategic value of the project.

Sector teams were established to contribute to the national chemicals management situation report, which was completed at the end of 2008. The core analytical group—an economist, an environment health expert and an Environment Council of Zambia (ECZ) environmental expert—then used this report to identify national priorities in the context of the national development plan. The result of this exercise was presented to the Interagency Coordinating Mechanism for the national development plan, which was approved in December 2008. Various additional meetings have been held with the Ministry of Finance and National Planning to secure their "buy-in" to the process of integrating the sound management of chemicals into the planning process of Zambia's national development.

An economic cost-benefit analysis of the social and financial costs of relevant interventions in the Kafue River basin was started in the first quarter of 2009. Options and interventions related to chemicals management to foster development while improving health and environmental conditions in the basin are to be developed.

The Zambian Fifth National Development Plan is currently undergoing a mid-term review that engages national planning authorities. This involvement will help ensure that linkages between the MDGs and sound chemicals management are clear to planning officials and will help gain their commitment to integrating key chemicals management priorities into the national development plan.

To further enhance Zambia's capacity in environmental economics, the Government of Norway is providing additional resources to train a junior environmental economist, who now works with the senior economist, as part of the core analytical group.

Lessons learned and recommendations

The economic analysis of the negative impacts of poor practices and of benefits of the sound management of chemicals needs to improve for the environmental and health sectors to have an impact in the outcome of the development planning process. This entails a need for improved assessments and for tools to quantify health and environment impacts. Assessment processes also need to include monetary valuations of various health and environment benefits as these are powerful ways to communicate with decision makers. Inter-sectoral dialogue can also improve understanding among various actors of the importance of the sound management of chemicals in attaining development goals.

Officials from environment and health ministries also need to understand the planning process and language of development planners and finance ministries to be able to influence development decisions. This entails the need to improve the capacity of staff in planning, in linking the sound management of chemicals to development goals, and in providing economic analysis to support their proposals. Intergovernmental organizations can assist through the development of guiding tools. Networking and exchange of information on mainstreaming of sound management of chemicals among countries can also help environment and health officials learn from each other.

3. Efforts to manage perfluorinated chemicals in the United States

Introduction

Perfluorinated chemicals (PFCs) have been produced since the 1950s. They have many applications, including as protective coatings for fabrics, carpet and paper to repel water and oil. In the late 1990's, the United States Environmental Protection Agency (U.S. EPA) received information indicating that perfluorooctane sulfonate (PFOS) was widespread in the blood of the general U.S. population and in the environment, and presented concerns for persistence, bioaccumulation and toxicity. Following discussions between U.S. EPA and 3M, the sole U.S. manufacturer of PFOS, the company terminated production of perfluoroalkyl sulfonate (PFAS), the class of chemicals to which PFOS belongs. Following the voluntary phase-out, the U.S. EPA issued regulations to restrict the reintroduction of perfluoroalkyl sulfonate into the U.S. market, with final rules to limit any future manufacture or importation of these chemicals published in 2002 and 2007. In the mean time, another perfluorinated chemical, perfluorooctanoic acid (PFOA) was also found to pose similar concerns.

Data on PFOS, PFOA and related long-chain perfluorinated chemicals prompted the U.S. EPA, together with eight major companies in the industry, to launch the 2010/15 PFOA Stewardship Program in 2006. In this voluntary program, participating companies committed to achieve a 95 per cent reduction in production of PFOA, PFOA-precursors and related higher homologues by 2010, and to work toward the elimination of these chemicals from emissions and products globally by 2015. U.S. EPA's efforts have resulted in reduced emissions and reduced content in products, which is expected to result in lower concentrations in human blood in the future.

Problem that was addressed

PFOS and PFOA are persistent, are widely present in humans and the environment, have long half-lives in humans and can cause adverse effects in laboratory animals, including cancer, developmental effects and systemic toxicity. PFOS and PFOA precursors, chemicals which degrade or may degrade into PFOS and/or PFOA, are also present worldwide in humans and the environment. Higher homologues are perfluorinated chemicals with carbon chain lengths longer than PFOA and PFOS. Available evidence suggests that toxicity and bioaccumulation increases with increasing carbon chain length.

How the problem was addressed

U.S. EPA is using both voluntary and regulatory approaches to manage PFCs. Close coordination with industry and other countries is an integral part of U.S. EPA's efforts to reduce exposures to these chemicals and identify alternatives.

The approach

PHASEOUT OF PFOS

In the late 1990's, the U.S. EPA received information indicating that PFOS was widespread in the blood of the general U.S. population and presented concerns for persistence, bioaccumulation and toxicity. Following discussions between the U.S. EPA and 3M, the sole U.S. manufacturer of PFOS, the company terminated production of PFAS. Following this voluntary phase-out, the U.S. EPA issued Significant New Use Rules (SNURs) to restrict the reintroduction of these chemicals into the U.S. market. Final rules were published on 11 March 2002[19] and 9 December 2002,[20] to limit any future manufacture or importation of 88 PFAS chemicals specifically included in that phaseout. On 9 October 2007,[21] the U.S. EPA published another Significant New Use Rule on 183 additional PFAS chemicals.

FILLING DATA GAPS ON PFOA

Findings on PFOS prompted the U.S. EPA to review similar chemicals to determine whether they might also present concerns. In the 1990s, investigations of PFOA showed that it, too, is very persistent and widely spread in the environment and in the blood of the general U.S. population, and that it caused developmental and other adverse effects in laboratory animals. The U.S. EPA summarized its concerns, data gaps and uncertainties about PFOA in the 16 April 2003 Federal Register notice.[22] Beginning in 2003, the U.S. EPA negotiated with multiple parties to produce missing information on PFOA.

2010/15 PFOA STEWARDSHIP PROGRAM

In January 2006, the U.S. EPA invited eight major fluoropolymer and telomer manufacturers to commit to the 2010/15 PFOA Stewardship Program,[23] a voluntary global stewardship program on PFOA and related chemicals. The eight participants in the PFOA Stewardship Program made voluntary corporate commitments to two goals:

1. *Achieve, no later than 2010, a 95 per cent reduction, measured from a year 2000 baseline, in both: facility emissions to all media and product content of PFOA and related chemicals.*
2. *Work toward the elimination of PFOA and related chemicals from emissions and products by five years thereafter, or no later than 2015.*

Companies participating in the PFOA Stewardship Program submitted their baseline numbers for emissions and product content to the U.S. EPA by 31 October 2006. To ensure transparency, companies submit annual public reports to U.S. EPA on their progress toward the goals in October of each year, expressing their progress in terms of company-wide percentage achievements both for U.S. operations and for the company's global business. Companies also provide U.S. EPA with detailed information on their progress in support of their public reports. The public reports are available on the

19 Federal Register, 11 March 2002 http://www.epa.gov/fedrgstr/EPA-TOX/2002/March/Day-11/t5746.pdf
20 Federal Register, 9 December 2002 http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=2002_register&docid=fr09de02-8.pdf
21 Federal Register, 9 October 2007 http://www.epa.gov/fedrgstr/EPA-TOX/2007/October/Day-09/t19828.pdf
22 Federal Register, 16 April 2003 http://www.epa.gov/fedrgstr/EPA-MEETINGS/2003/April/Day-16/m9418.htm
23 2010/15 PFOA Stewardship Program http://www.epa.gov/oppt/pfoa/pubs/stewardship/index.html

U.S. EPA's website.[24] Detailed information may be claimed as confidential business information where appropriate, but the program encourages companies to minimize confidentiality claims.

The voluntary PFOA Stewardship Program does not preclude regulatory action being taken on these chemicals by U.S. EPA if ongoing assessment activities indicate that additional action is warranted. A similar approach is being taken in Canada and this approach may also be of value to other countries.

LOOKING FOR ALTERNATIVES

U.S. EPA is reviewing substitutes for PFOA, PFOS and other long-chain perfluorinated chemicals as part of its review process for new chemicals under U.S. EPA's New Chemicals Program.[25] U.S. EPA's review of alternatives to PFCs has been ongoing since 2000 and is consistent with the approaches to alternatives encouraged under the PFOA Stewardship Program. Through September 2009, over 150 alternatives of various types have been received and reviewed by U.S. EPA. The U.S. EPA reviews the new chemicals against the range of toxicity, fate and bioaccumulation issues that have caused past concerns with PFCs, as well as issues that may also be presented by new chemistries. The U.S. EPA is also requiring testing of the possible ultimate degradation products. The total cost of such testing is expected to exceed USD 25 million.

INTERNATIONAL COOPERATION ON PFCS

Following the launch of the PFOA Stewardship Program, the United States invited member countries of the Organisation for Economic Cooperation and Development (OECD) to contemplate initiating similar action. In November 2006, Sweden hosted an OECD Workshop on PFCAs and Precursors[26], where one of the recommendations was for "wider establishment of Stewardship Programs within the OECD and beyond to minimize the potential impact of PFCs," while recognizing differences in implementing risk reduction measures in member countries.

In February 2009, the United Nations Environment Programme (UNEP) and U.S. EPA hosted an International Workshop on Managing Perfluorinated Chemicals (PFCs) and Transitioning to Safer Alternatives[27] in Geneva, Switzerland. The 2009 PFCs Workshop had similar recommendations to those expressed at the 2006 OECD Workshop on PFCs. The overarching proposed cooperative actions were to:

1. *Support development of and participation in voluntary national and international PFC stewardship programs to reduce and work toward elimination of emissions and product content of relevant PFCs of concern.*

2. *Promote information exchange on more acceptable, economically viable alternatives and their use, as called for by Strategic Approach to International Chemicals Management (SAICM) Overarching Policy Strategy Article 15(g). This includes PFCs with shorter carbon chain lengths.*

This Article also indicates that information exchange should include progress on and examples of regulatory actions, voluntary programs, monitoring, emissions, exposure, environmental fate and transport, as well as potential effects on human health and the environment.

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24 See 2010/2015 PFOA Stewardship Program at http://epa.gov/oppt/pfoa/pubs/stewardship/index.html

25 See US EPA's New Chemicals Program at http://www.epa.gov/oppt/newchems/

26 See Report of an OECD Workshop on perfluorocarboxylic acids (PFCAs) and Precursors at http://www.olis.oecd.org/olis/2007doc.nsf/LinkTo/NT00002AB6/$FILE/JT03229256.PDF

27 For 2009 PFCs Workshop see http://www.chem.unep.ch/unepsaicm/cheminprod_dec08/PFCWorkshop/default.htm

In May 2009, the Second Session of the International Conference on Chemicals Management adopted Resolution II/5, "Managing Perfluorinated Chemicals and the Transition to Safer Alternatives."[28] This supports the development of national and international stewardship programs and regulatory approaches to reduce emissions and the content of relevant perfluorinated chemicals of concern in products and to work toward global elimination, where appropriate and technically feasible.

In May 2009, parties to the Stockholm Convention on Persistent Organic Pollutants agreed to add PFOS, its salts and perfluorooctane sulfonyl fluoride (PFOSF) to Annex B of the convention, subjecting it to restrictions on production and use.

In June 2009, the Persistent Organic Pollutants Review Committee of the Stockholm Convention established an inter-sessional working group on substitution and alternatives with the mandate to develop a description of the issues relating to alternatives and to indicate considerations related to persistence, bioaccumulation, long-range transport and toxicity that should be taken into account when dealing with possible alternative chemicals to persistent organic pollutants.

In the summer of 2009, OECD distributed a PFC survey to companies in the member countries to report product content and environmental release information on PFOS and PFOA and other related PFCs. The results of the survey will help provide an international picture of the production of these PFCs.

Outcomes

Major accomplishments of U.S. EPA's efforts to manage PFCs include the phase-out of PFAS chemicals in the United States, except for very few essential uses with limited exposures, as well as work toward elimination of PFOA, precursors and higher homologues under the PFOA Stewardship Program and internationally. To date, many participants of the PFOA Stewardship Program are meeting initial targets ahead of schedule. Program participants have reported significant decreases in the release of PFOA and related chemicals, putting industry on target to meet the 95 per cent reduction goal in PFOA emissions and product content by 2010. In addition, many new alternatives to longer-chain PFCs have been developed as a result of the PFOA Stewardship Program, leading to a review of over 150 alternatives of various types by U.S. EPA. The program appears to be on track to achieve its 2015 elimination goal.

The success of U.S. EPA's voluntary and regulatory efforts to manage PFCs is also demonstrated in a U.S. Centers for Disease Control study published in 2007[29] that reported 32 per cent and 25 per cent reduction of PFOS and PFOA, respectively, in human blood concentrations in samples collected 2003-2004 from levels found in samples collected 1999-2000. The report concluded that these reductions were most likely related to changes brought about by U.S. EPA's and other related efforts by government and industry.

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28 See Resolution II/5 in Report of the International Conference on Chemicals Management on the work of its second session http://www.saicm.org/documents/iccm/ICCM2/Meeting Report/ICCM2 report advance Eng 23 Jun 09.doc

29 U.S. Centers for Disease Control, Polyfluoroalkyl Chemicals in the U.S. Population http://www.cdc.gov/exposurereport/perfluorinated_compounds2.htm

Lessons learned

U.S. EPA's work on PFCs has shown that a combination of voluntary and regulatory approaches can be useful in reaching successful outcomes. It is important to partner with industry to evaluate existing chemicals, and to develop and evaluate alternatives to chemicals of concern.

In addition, since the expertise on chemicals typically lies with the companies that manufacture them, those companies can play a major role in the development of analytical methods for these chemicals. In the case of PFCs, a new class of chemicals for which analytical methods were still in their infancy or nonexistent when they were first detected in the environment and human blood, industry was the key catalyst in developing the new technology to measure various PFCs in various media at lower concentrations than ever before.

Coordination with other countries is also critical, especially in managing chemicals like PFCs that have potential for long-range transport and are present in products sold internationally.

Next steps

The U.S. EPA will continue to work with industry partners and other stakeholders toward the elimination of PFOA, precursors and higher homologues by 2015, and to evaluate alternatives to these PFCs.

U.S. EPA will also continue the ongoing research on biodegradation of polymers, releases from consumer articles, development and refinement of various analytical methods, and other important research to determine sources and pathways of exposure to these chemicals and better understand the hazard. Additional national risk management actions might be taken as new data is developed that will help better determine the risks posed by these chemicals, including whether they present a risk at their current levels in the environment and people, or whether we would be confronting a risk in the future if the chemicals continued to be produced and released.

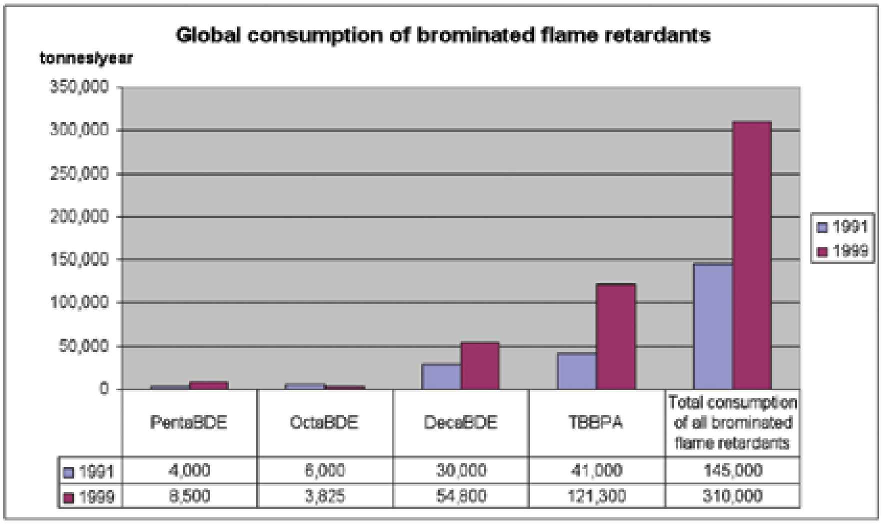
The U.S. EPA will also continue to work collaboratively with other countries on the many international initiatives on PFCs, including SAICM participants, the OECD and enhanced engagement countries and through the Stockholm Convention, as appropriate, to reduce emissions and product content of PFCs internationally, and to share information on existing PFCs and new alternatives.

4. Substance flow analysis of selected polybrominated flame retardants in Switzerland

Introduction

Brominated flame retardants are additives mainly used in electrical and electronic appliances and in construction materials to reduce flammability. Global consumption of four commonly used flame retardants has nearly doubled from 100,000 tons per year in 1991 to 190,000 tons per year in 1999 (*see figure IV.4.1*). This is mainly due to the increasing use of plastics and stricter fire regulations. These flame retardants have become a concern because they are persistent, accumulate in the food-chain, behave like hormones and might cause cancer. The present case study summarizes the results of an analysis of brominated flame retardants carried out in Switzerland.

Figure IV.4.1. Global consumption of brominated flame retardants



	PentaBDE	OctaBDE	DecaBDE	TBBPA	Total consumption of all brominated flame retardants
1991	4,000	6,000	30,000	41,000	145,000
1999	8,500	3,825	54,800	121,300	310,000

The problem

Flame retardants are being found in many parts of the environment. To effectively control their release into the environment, it is useful to better understand at what stage of their life cycle and in what quantities they are released.

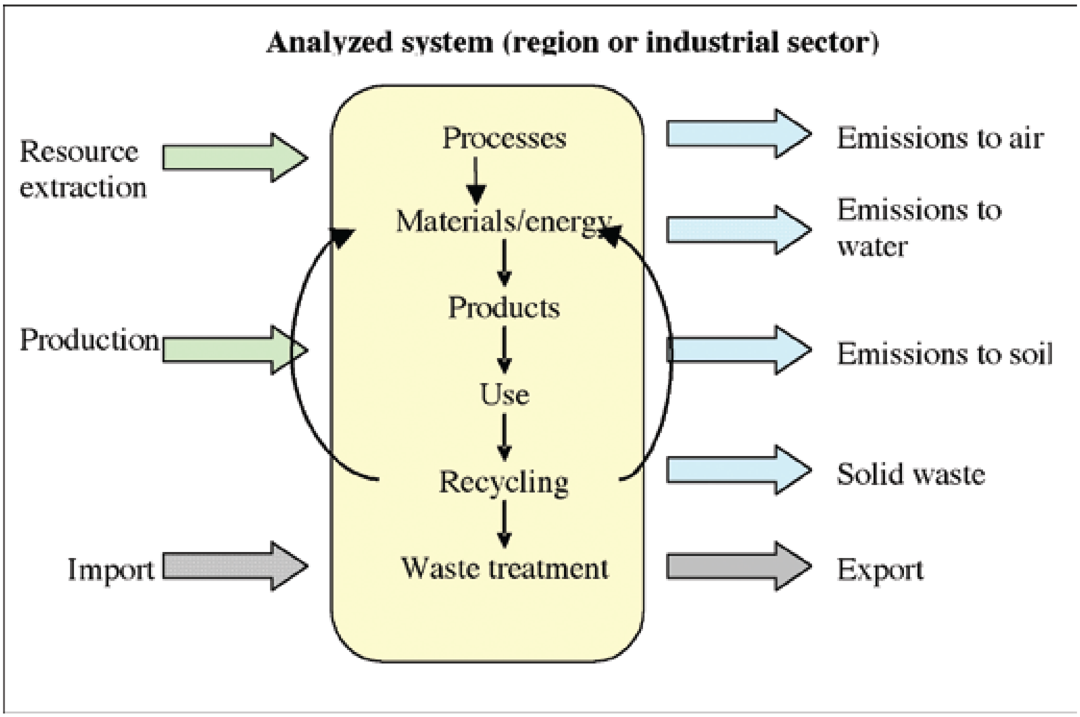
Approach taken

A substance flow analysis is a way to examine what happens to a chemical at different stages of its life cycle. It describes how much chemical is produced and how much is distributed to various compartments at every stage—extraction, production, transformation, consumption, recycling and disposal as waste or emissions to air or water (*see figure IV.4.2*). Highlighting the stages or uses that result in the most releases into the environment, can help detect problems and provide the basis for risk assessments or a starting point for the introduction of effective measures.

In 2001, the Swiss Agency for the Environment Forests and Landscapes (SAEFL) (now the Federal Office for the Environment, FOEN) decided to study the use of brominated flame retardants in Switzerland in detail. SAEFL commissioned a substance flow analysis[30] for four brominated flame retardants, which represent two-thirds of the world production of brominated flame retardants:

- *Pentabromodiphenyl ether (PentaBDE)*
- *Octabromodiphenyl ether (OctaBDE)*
- *Decabromodiphenyl ether (DecaBDE)*
- *Tetrabromobisphenol A (TBBPA)*

Figure IV.4.2. Substance flow analysis



Source: http://wwwa.vito.be/english/environment/environmentalstudy1b.htm

30 Leo Morf and Ruedi Taverna, Geo Partner AG, Zurich, Switzerland; Hans Daxbeck and Roman Smutny, Ressourcen Management Agentur RMA, Vienna, Austria: Selected polybrominated flame retardants - PBDEs and TBBPA - Substance flow analysis, published by the Swiss Agency for the Environment, Forests and Landscape SAEFL, Berne, 2003

Implementation

The substance flow analysis includes the following steps:

1. *Determining areas of application and occurrences in processes*
2. *Identifying products that contain the substance*
3. *Defining the "system" (that is, company, country) to be analyzed*
4. *Dividing the system into sub-systems to be analyzed separately*
5. *Collecting data for the sub-systems*

Aggregating data for the full system

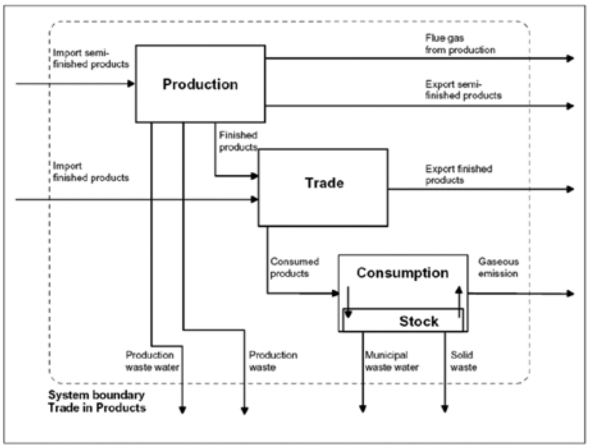
The Swiss analysis collected data in three sub-systems: trade in products, waste management and environment.

Trade in products

For the trade in products subsystem, the analysis looked at the import of raw materials, and semi-finished and finished goods. It then traced the different stages (production, trade and consumption) and estimated the quantities of inputs (for example materials used in the production of an item) and outputs (for example amount of flame retardants in the product, amount emitted into the air and found in the manufacturing waste) (*see figure IV.4.3*). Data available from the literature were used to estimate the amounts of inputs and outputs, for example:

- *Market analyses and customs statistics for Switzerland and other European countries to estimate the quantities of products imported and manufactured.*
- *Manufacturers' data for concentrations of fire retardants in various types of uses.*
- *Scientific literature for the percentage of products or components treated with flame retardants.*

Figure IV.4.3. Trade in products subsystem



Waste management

Waste is an output of the trade subsystem. The estimates of the amount of waste produced were used as input into the waste management subsystem. Waste management includes reuse, waste water treatment, incineration and disposal in landfill. Data from Switzerland were used to reflect the local situation and estimate the outputs into environment (air, water, soil) from the management of waste containing fire retardants.

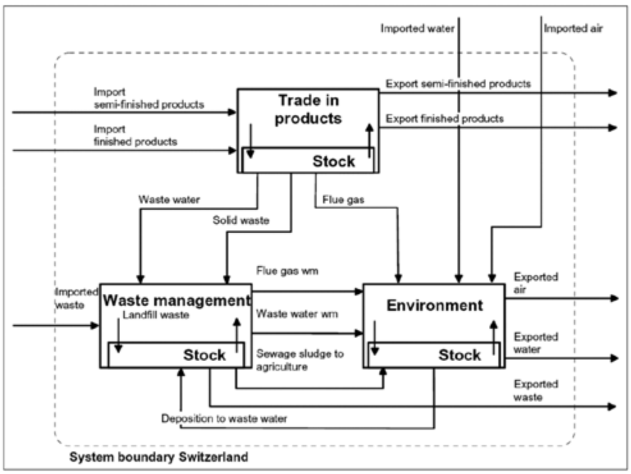
Environment

Inputs into the environment come from the trade in products and waste management subsystems. The analysis in this subsystem looks at how flame retardants end up in different compartments of the environment and in what quantities. Since there were no Swiss data, data on concentrations found in the literature were used to estimate the flows within the Swiss environment.

Results

The three subsystems were combined to give a picture of the flow of flame retardants in Switzerland, including the inflow from the import of products, waste, water, and air containing flame retardants and the outflow from the export of goods, wastes, water and air (*see figure IV.4.4*).

Figure IV.4.4. Processes and goods in the total system (Switzerland)



The substance flow analysis showed that brominated flame retardants are not produced in Switzerland but imported in products. About half of the flame retardants that are imported are re-exported and about 900 tons of flame retardants are disposed of each year. Most of these are destroyed through incineration but an estimated 1,500 tons remain in landfills. There is insufficient data to estimate the fate of flame retardants in landfills. Over the years, stocks totalling about 12,000 tons of flame retardants have accumulated and are present in products in use (*see table IV.4.1*).

Table IV.4.1. Total of stock of flame retardants that have accumulated in Switzerland

Flame retardant	Amount
PentaBDE	500 t
OctaBDE	680 t
DecaBDE	5600 t
TBBPA	5600 t
SUM	12,380 t

Outcomes

Substance flow analyses are carried out to elaborate recommendations or regulatory and technical measures to reduce the risk for humans and the environment resulting from hazardous substances. Due to their persistence, ecotoxicological profile, and ubiquitous presence in the environment, in 2005, Switzerland included flame retardants in the new Ordinance on Risk Reduction related to Chemical Products (ORRChem). This ordinance prohibits pentaBDE and octaBDE in preparations and polybrominated biphenyls, pentaBDE, octaBDE, and decaBDE in new articles. This regulation is compliant with the respective European Union Directives.

Lessons learned

This analysis for Switzerland illustrates the importance and magnitude of contamination of the environment with brominated flame retardants in the Swiss context and can help guide an appropriate response in other countries and internationally.

The substance flow analysis showed that diffuse emissions during consumption, disposal and recycling of a product can be the most important source of a substance into the environment, rather than emissions related to its production or use in manufacturing. Knowing the relative contribution to environmental releases of various stages of the life cycle can help the development of the most effective measures to reduce them.

The lack of data was one of the main obstacles encountered by the authors of the study. The uncertainty of the data in the subsystem “trade in products” is mostly the result of lack of knowledge on the flame retardants used in various products combined with the large volume of products consumed. For the subsystems ‘waste management’ and ‘environment’, no direct measurements (e.g. emissions from landfills and recycling, concentrations in the environmental compartments) were available and the data had to be estimated.

Next steps

To establish national substance flow analyses, a sufficiently precise data basis is required. In most cases, an infrastructure that would permit the preparation of substance flow analyses is lacking. In 2008, the Swiss substance flow analysis was updated, incorporating recent research results on occurrence, emissions and fate of the selected substances.

The globalization of markets makes it extremely difficult to trace the flow of substances contained in products via consumption to disposal. An international effort to improve data available through better recording, reporting, and monitoring of substance flows in industry and trade in products could help fill the data gap. Better knowledge of the diffuse releases of substances into the environment from products in use or in waste would provide a more accurate estimate of the pathways of the substance into the environment.

5. National Programme on the Elimination of Mercury and its Compounds in Qatar

Introduction

According to the global programme for the elimination and phasing out of mercury and its compounds, and as a contribution from the State of Qatar to the international efforts in this regard, the Ministry of Environment adopted the National Program for the Elimination of Mercury and its Compounds in the State of Qatar.

Problem that was addressed

The program aims to reduce the release of mercury and its compounds to the environment from industry, find best alternatives for products and processes that use mercury, and find ways to reduce, limit and eliminate releases of mercury in the State of Qatar.

Approach

To fulfil the goals of this program, the Ministry formed a national project coordinating team from all relevant ministries and organizations. The Ministry of Environment has designated a project coordinator, who is the mercury program focal point, and formed a Project Coordinating Team with members from the relevant ministries and organizations in Qatar:

- *Ministry of Environment*
- *Ministry of Health*
- *Ministry of Agriculture and Municipality*
- *Ministry of Defense (Environment Security Unit)*
- *Ministry of Education*
- *Hamad Medical Corporation*
- *The industry (heavy, medium and light industry)*
- *Qatar University*

The functions of the National Coordination Team were as follows:

- *To oversee and monitor the implementation process of the action plan for mercury program.*
- *To maintain and manage the inventory of mercury sources in Qatar.*
- *To facilitate access to information and data on mercury.*
- *To support the implementation of the plan in their ministries and organizations by raising awareness on the adverse impacts of mercury.*
- *To assess impacts on the environment and public health, including various sectors of the population.*

The team divided the program into three phases:

- *Phase 1: Information and data collection*
- *Phase 2: Literature review, sample collection and processing*
- *Phase 3: Drafting the National Action Plan*

Project implementation

The activities of the program have been financed by the Ministry of Environment.

INFORMATION AND DATA COLLECTION

The team designed and prepared inventory forms based on the challenges related to the use and release of mercury and prepared forms for each of the following sectors:

- *Health*
- *Education (schools, institutes and universities)*
- *Heavy industry*
- *Light and medium industry*
- *Agriculture and municipal*

The results of the inventory were reviewed and emissions were estimated using the UNEP Toolkit for identification and quantification of mercury releases. These findings were then transferred to an electronic platform prepared and designed by the National Information Centre within the Ministry of Environment.

LITERATURE REVIEW, SAMPLE COLLECTION AND PROCESSING

Before starting the second phase, a scientific team was formed with members of research and academic institutions. The phase was divided into two stages. The first was a literature review of studies, research and surveys on various aspects of mercury and its compounds in Qatar, including their uses and quantities used. This stage has been completed. The scientific team collected a large amount of data which will be useful to draft the action plan. The second stage involved collecting and analyzing environmental samples from different areas of Qatar. Samples have been collected from seawater and sediments. This activity is still on-going and samples are being analyzed in the central laboratory of the Ministry of Environment.

DRAFTING THE NATIONAL ACTION PLAN

After completion and processing of the sampling stage, the National Action Plan on Mercury for the State of Qatar will be drafted and submitted to the secretariat of UNEP upon approval from Cabinet.

AWARENESS RAISING CAMPAIGN

During the implementation of the first and the second phases, the team prepared a public awareness raising campaign using for TV, newspapers and radio. In addition, the team conducted and organized several training workshops aimed at teachers, workers, decision-makers and other groups.

Outcomes

The team obtained good results from both the inventory process and the information gathered through studies and surveys. The project has resulted in an increased knowledge about the extent of mercury use and releases within Qatar and is also gathering data on the environmental levels of mercury. The awareness raising campaign has resulted in increased public awareness of the hazards of mercury.

Lessons learned

POSITIVE POINTS

- *Creating a cooperative atmosphere among the members of the national coordinating team facilitates the whole work.*
- *Designing the inventory forms according to the sectors (five sectors as indicated before) facilitated the collection of information and data, and further contributed to an easier transfer of this information to an electronic framework.*
- *The Ministry of Environment was able to collect and obtain enough information and data about the use of mercury and its products in Qatar to gain knowledge of the magnitude of the problem.*
- *The Ministry of Environment, in coordination and cooperation with the Ministry of Health, managed to stop the use of devices containing mercury in the health sector.*
- *The Ministry of Environment, in coordination and cooperation with the Ministry of Education, managed to stop the use of mercury compounds in laboratory experiments at schools.*
- *The Ministry of Environment identified gaps in legislation regarding the use of mercury and its compounds.*
- *The Ministry of Environment achieved a successful public awareness campaign on the health and environmental hazards of mercury and its compounds.*

CHALLENGES

- *The inventory groups faced some difficulties collecting information and data from light and medium industries due to lack of knowledge within the sector about which products might contain mercury.*
- *Confidentiality considerations made it difficult to get copies of some of the studies.*

Next steps

Future work will focus on the following points:

- *Completing the collection and analysis of the environmental samples (air and soil samples).*
- *Drafting the National Action Plan for the Elimination of Mercury and its compounds.*
- *Adoption and approval of the National Action Plan by Cabinet.*
- *Submitting the plan to the Secretariat of the UNEP.*
- *Investigating options for the creation of a special mercury warehouse to collect articles and waste materials containing mercury. This waste will be then disposed of according to national legislation and international regulations and frameworks, particularly the Basel Convention.*

6. Control of movement of products containing hazardous substances in Peru

Introduction

Exposure to toys containing high levels of lead can result in neurological effects, with possible life-long effects on intelligence and development of the nervous system. Small children have the greatest risk, both because their nervous systems are still in a state of development and because their play behaviour can include chewing or biting toys, resulting in direct consumption of paint from the toy's surface.

Peru has established maximum permissible levels of toxic substances in a range of goods, including toys and office supplies. This law seek to prevent access to materials which may be toxic or dangerous to health and are designed to impede the import, manufacture or sale of such goods. There are major challenges in enforcing such a law, due to the wide variety of goods containing toxic substances available in the market place.

Problem that was addressed

The Ministry of Health in Peru, through the General Environmental Health Directorate, became aware of the potential for toys containing hazardous substances exceeding permissible levels to be distributed.

How the problem was addressed

Based on concerns for the health of children, and to safeguard the health of all users of the toys, the General Environmental Health Directorate took action to control and supervise the manufacture, import, commercialization, distribution, and storage of toys and office supplies. This action was taken under the law No.28376, which prohibits the manufacture, import distribution and sale of toys and office supplies which are considered toxic or dangerous.

The law sets out maximum permissible limits of concentration of controlled substances, including lead, arsenic, cadmium, chromium, barium, antimony, mercury, selenium and nickel.

Approach

The General Environmental Health Directorate collected a range of toys readily available on the market in Peru, and had them analyzed for levels of controlled substances. Many of the toys analyzed had levels of up to 30 times the maximum permissible limit concentration of lead. The levels detected also exceeded maximum permissible levels established in other regulatory systems.

Toys that were tested for heavy metals

Outcomes

Based on concerns about the high levels of controlled substances detected in these toys, which were all purchased from one exporting country, stringent controls were placed on the import of such toys. A temporary import ban was put in place, based on the identified health concerns, although it was recognized that most toys met the standard. Action was deemed necessary before serious effects from exposure to these substances were seen in children.

Lessons learned

The investigation highlighted that it is not sufficient to have legal controls in place, but it is necessary to have an enforcement program to ensure standards are being met. Follow-up action to ensure ongoing compliance with the regulations is anticipated.

Next steps

The need for all countries to ensure that standards and regulations in relation to controlled substances are complied was highlighted at a UNEP workshop discussing toxic substances, in particular mercury, lead and cadmium, early in 2009. Control of these substances is being enforced in Peru; similar action in all countries is encouraged.

7. Assessment of lindane in Mexico: An effort towards risk reduction and global elimination

Introduction

Lindane was used in Mexico as a pesticide in agriculture and in pharmaceuticals for both humans and animals. Its use led to accumulation in humans and other organisms. In order to address this problem, Mexico developed a national profile that provided a summary of the use of lindane in Mexico, and availability and cost of alternatives. The compilation of the data was done through a coordinated and collaborative effort with multi-stakeholder participation. The evidence assembled in the profile helped the government decide to revoke the registration for all uses of lindane, including a phase-out for pharmaceutical uses. This experience also led Mexico to support the nomination of lindane and related compounds as candidates for substances to be controlled under the Stockholm Convention on Persistent Organic Pollutants (POPs).

Background

As a member country of the Sound Management of Chemicals (SMOC) initiative of the North American Commission for Environmental Cooperation, Mexico is committed to cooperation on the sound management of chemical substances in the region and internationally. SMOC has given priority to the management and control of persistent and toxic substances that are of mutual concern to Canada, Mexico and the United States.

A feature of this work is the development of North American Regional Action Plans (NARAPs), which are developed for specific substances such as DDT, chlordane, mercury, PCBs and lindane, as well as for more general issues such as the assessment of pathways of exposure and progress in controlling pollution. This collaboration has resulted in information sharing on technical, scientific and policy issues and has helped Mexico build its capacity for the sound management of chemicals.

The problem

There was insufficient information on lindane to support the establishment of regulatory and voluntary actions to phase-out its use. Therefore the Mexican Government conducted an assessment as the first step in the decision-making process. This also contributed to the implementation of the North American Regional Action Plan on Lindane and other HCH Isomers.

The approach

A technical unit of the Federal Environment Ministry, the National Institute of Ecology of Mexico financed and coordinated the project. A stakeholders committee was created to evaluate the feasibility to restrict or eliminate the use of lindane in Mexico. This committee included officials from the Ministries of Health, Environment, Finance (through its customs office), Economy and Agriculture, which are involved in the process of authorizing the use and trade of pesticides. Other relevant stakeholders also participated in the process—members from industry associations, non-governmental organizations focused on the protection of indigenous people exposed to pesticides, and academia with expertise in monitoring data and risk assessment. In addition, as part of the collaboration with Canada and the United States, scientific data and information on management practices was made available to the committee.

The main objectives of this study were as follows:

- *To obtain current information on production, import and export of lindane in Mexico.*
- *To identify lindane-containing products, including commercial names, prices and current uses.*
- *To review existing regulation and control instruments.*
- *To identify feasible and cost effective substitutes and alternatives for lindane.*

The following activities were carried out to accomplish these objectives:

- *Consultations with relevant public and private organizations to obtain information.*
- *Estimates of quantities of imports, exports and production.*
- *A field survey in 5 states collected data on actual prices and uses of lindane containing products.*
- *An analysis of the potential legal basis for elimination done.*
- *An assessment of ways to proceed with elimination.*

The stakeholders' committee held three meetings during the course of its work. The first meeting provided an orientation on the issue and emphasized the importance of active participation in providing relevant information in order to assist the government to make a decision on the on-going use of lindane in Mexico and to identify constraints and obstacles to the prohibition of its use. The other two meetings provided an opportunity to present and discuss the information and data gathered.

Implementation

Information gathered from the pesticide registration authorities showed that lindane was authorized for use to control ticks, fleas, common fly larvae and other parasites on livestock. It was also registered for use as a seed treatment, treatment of fleas on domestic animals and public health uses. The Ministry of Health provided data concerning registrations and companies to which they were issued (*see figure IV.7.1 and 7.2*).

During the initial stage, stakeholders expressed concerns and doubts on the feasibility of the eventual elimination or restriction on the use of lindane. Challenges to moving forward in developing a proposal included:

- *Poor data (lack of, incomplete, or confusing) on import/export and historic production*
- *Difficulty in information sharing between and within government departments*
- *Lack of resources for a study of national scope*
- *Different problems and thus different positions of national and multinational industries*
- *Difficulty in focusing the debate on alternatives*
- *The need to evaluate toxicity, effectiveness, and possible resistance of chemical alternatives for agricultural and pharmaceutical uses*
- *The need to evaluate other alternatives (integrated pest management, organic agriculture, natural methods, etc.)*

To address some of the data gaps, the National Institute of Ecology carried out a survey in five states to determine the price of lindane-based products and their possible substitutes, and to determine the perception of distributors, medical staff and consumers in that regard. With insufficient information on imports and no mechanism to obtain data on product sales or the amounts applied by consumers, it was not possible to estimate the extent of consumption accurately. However, the survey did show that potential substitutes for most of the uses of lindane were readily available.

Once the survey results were shared with the committee, members agreed to share additional information they had available. The Institute also searched several databases and reviewed scientific papers and other evaluations. These activities provided the information needed to draft the supporting documentation for a decision on the future use of lindane.

What was achieved

The effective and coordinated effort with active participation from all sectors resulted in an action plan supported by all stakeholders. Mexico decided to stop all uses (agricultural, veterinary and pharmaceutical) of lindane through a prioritized phase-out.

An additional important outcome of this effort was a proposal for a coordinated programme to reduce the adverse effects of chemicals and chemical wastes at local and regional levels. This proposal included some initiatives, policies and strategies:

- *Research on chemicals of concern*
- *Monitoring and assessment of activities*
- *Awareness raising and outreach campaigns to promote alternatives and substitutes*
- *Capacity building through the development of effective partnerships*
- *Recommendations for policy and decision making*

This experience also improved collaboration between government and industry on other chemical management issues.

In addition, this work allowed Mexico to provide leadership at the international level: it nominated lindane and related compounds (alpha- and beta-hexachlorocyclohexane) as candidates for review under the Stockholm Convention. The POPs Review Committee assessed this nomination and in May 2009, the Conference of the Parties agreed to add these three compounds to the list of substances controlled by the Convention.

The methodology used to collect data in Mexico was incorporated in a handbook to support the effective participation in the work of the POPs Review Committee (POPRC) of the Stockholm Convention. This will help countries identify and compile information for the Committee when it evaluates other chemicals that are nominated to be added to the Convention.

Overall, the success of this initiative was the result of the close coordination and synergies between government agencies, communication with the public, and public participation, as well as the exchange of information and a continuous capacity building process.

Figure IV.7.1. Authorized uses of lindane in Mexico, and companies authorized to distribute it (2003)

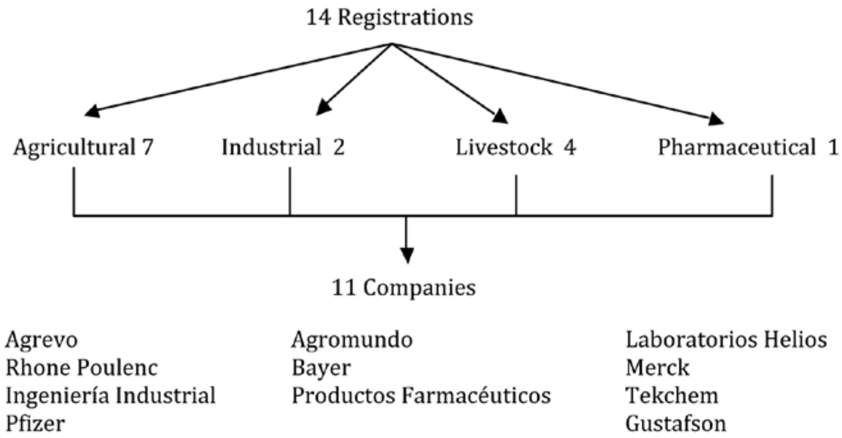
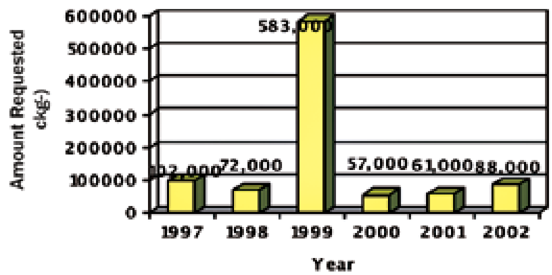


Figure IV.7.2. Quantity of lindane authorized for import in Mexico, 1997-2002*



* The amounts reflect the quantities requested for authorization. Actual importation is likely lower. There was one unusually high request for importation in 1999.

8. PCB management and disposal demonstration project in China

Introduction

China initiated a demonstration project on PCB Management and Disposal (the PCB Demo project) in early 2006. The objective is to identify and demonstrate environmentally sound and cost-effective policies, procedures and techniques for safely managing and disposing of China's stored PCBs, associated PCB-contaminated wastes (for example, PCB-contaminated soils and water) and in-use transformers contaminated by PCBs. The project addresses inventories, regulations, technical capacity and public awareness on PCB management and disposal so that China can fulfil its obligations under the Stockholm Convention. This demonstration is being carried out in cooperation with the World Bank with funding from the Global Environment Facility, Italy, the United States and Japan.

Problem that was addressed

China faces many challenges in PCB management and disposal. These include incomplete baseline data, a weak policy and regulatory framework, lack of disposal technology and facilities and insufficient public awareness.

INCOMPLETE PCB BASELINE DATA: From 1965 to 1974, China produced about 10,000 tons of PCB oil. Of these, about 1,000 tons of pentachlorobiphenyl (PCB5) were used in various open systems, and about 9,000 tons of trichlorobiphenyl (PCB3) were used in nearly 1 million capacitors for the electricity transmission system and in large enterprises. With growing health and environmental concerns about the use of PCBs, China removed most PCB-containing capacitors from service starting in the early 1980s and placed them in temporary storage facilities (underground "concrete coffins" or in caves) intended to hold them for 3-20 years. The several rounds of industrial reconfigurations over the past 30 years have led to the loss of records so there is little data on these capacitors and their locations.

MANAGEMENT NEEDS TO BE STRENGTHENED: Current regulation requires temporary storage of the retired PCB equipment, but, due to the absence of effective monitoring capacity, evaluation measures, and commercialized disposal technologies, it does not include provisions for periodical reporting, monitoring, or the sound management and disposal of PCB wastes. There are also no comprehensive technical guidelines, procedures, or standards for handling in-use PCB equipment and waste management.

LACK OF PCB DISPOSAL TECHNOLOGIES AND FACILITIES: There are currently no facilities in China that meet the requirements of the Stockholm Convention for environmentally sound and safe disposal of PCBs. In 2002, China started the construction of a new incinerator facility to dispose PCBs; however, the design of this facility does not meet the requirements of the Stockholm Convention. This lack of disposal facilities has constrained implementation of site cleanup and waste disposal.

HEALTH AND ENVIRONMENTAL RISKS FROM PCB: Recent surveys and investigations indicate that some PCB-containing equipment remains in temporary storage facilities, and that many of these facilities—caves and burial sites—are leaking PCBs into the environment. A study found indications of PCB exposure in humans: levels (geometric means) of PCBs in women and children were found to be moderately high—below those found in the Canadian Arctic (Nunavut) but above those found in southern Canada.

INSUFFICIENT PUBLIC AWARENESS AND EDUCATION: The public in China has little knowledge of the hazards of PCBs and has not yet realized the potential risk of these PCB sites. Public awareness is important for the proper management of in-use PCB equipment and effective cleanup of PCB sites, especially those near residential areas.

How the problem was addressed

The project addresses these issues in one province (Zhejiang) to identify the most cost-effective practices and technologies for managing and disposing of PCBs in China. This demonstration will then help China design and cost-out a nation-wide PCB program and will also help other countries design theirs.

ESTABLISHMENT OF A COMPLETE PROVINCIAL PCB INVENTORY: Establishment of the provincial inventory is the first and most important step. To do this, the province set up an inventory team with people from the provincial power electricity bureau and related departments. A draft methodology and procedures for compiling the inventory taking into account the national situation was developed to guide the compilation of the inventory. The actual investigation and reporting took place at the city-level with the provincial team collecting all reports to create the provincial inventory. The team also verified and cross-checked the data. This preliminary inventory allowed the geological and environmental teams to locate the exact position of PCB wastes and perform site characterizations. The provincial inventory is the basis from which to plan and implement site risk assessments and cleanup.

REVISION AND IMPROVEMENT OF NATIONAL POLICIES, REGULATIONS AND STANDARDS FOR PCB MANAGEMENT: Policies and regulations at the national and local levels governing PCB management and disposal will be formulated and revised as necessary. The new regulation will outline the requirements for periodical reporting, deadlines for PCB treatment, division of responsibilities for PCB management, and various other aspects of PCB treatment and disposal such as technologies to be used. To support the implementation of this new regulation, technical guidelines and standards covering different aspects of sampling and analysis, site cleanup, storage, transportation, thermal treatment of contaminated soil and final destruction will be developed. In addition, standards for soil, water and waste residues treatment will be established.

CONSTRUCTION OF FACILITIES FOR PCB WASTE TREATMENT AND DISPOSAL: There are currently no facilities in China that meet the requirements of the Stockholm Convention for environmentally sound and safe treatment and disposal of PCBs. This project will demonstrate environmentally sound management of PCBs, including recovery, collection, packaging, transportation, temporary storage in Zhejiang and final disposal in Liaoning. It will support the establishment of a thermal desorption treatment plant for PCB contaminated soil, and upgrade the current Shenyang PCB incinerator so that it meets international standards and can destroy highly-contaminated PCB wastes. The project will also support construction of a temporary storage facility in Zhejiang and an advanced storage facility in Shenyang. Thus, this project will provide China with the initial capacity for handling various PCB wastes.

CLEANUP OF ABOUT 40 PCB SITES: The project will cleanup about 40 underground sites containing capacitors. Site characterization found PCB leakage, which had contaminated the environment, in most of the sites. Soil contaminated with more than 1 ppm of PCBs will be treated locally using a thermal desorption plant. The PCB capacitors will be transported to Shenyang for incineration. The project will completely remove the PCB threat and thus protect human health and the environment.

PUBLIC AWARENESS RAISING ACTIVITIES: This project has greatly increased the local awareness during public consultation at the project preparation stage and through newsletters, TV programs, Internet, and other public outreach materials and activities.

Implementation

The project has various funding resources. The total investment is about 35 million USD—18 million from the Global Environment Facility, 4 million from the central government, 4 million from Zhejiang Province, 7 million from Shenyang and 2 million from Italy, US and Japan. The project started in early 2006 and has accomplished the following:

- *At the central level, a project management team was established within the Ministry of the Environment to organize and supervise all project activities and coordinate the local activities in Zhejiang Province and Shenyang of Liaoning Province. At the provincial level, Zhejiang has also setup its own project implementation team to manage provincial activities.*
- *Zhejiang Province has promulgated provincial regulations on PCBs that provide policy support for project implementation. A draft national regulation on PCBs has been formulated and is now at the consultation stage. Standards for site cleanup and PCB waste incineration, and a series of technical guidelines have been compiled to assist project implementation.*
- *Shenyang has completed the construction of a waste storage facility and upgraded its incinerator to international standards.*
- *The thermal desorption facility construction has been contracted out. The design has been completed and the facility is ready to handle PCB soil.*
- *The first site cleanup has started and is expected to be completed by August 2009. Three more sites in Zhejiang are expected to be cleaned by the end of 2009.*
- *The development of a national replication program has been initiated.*

Outcomes

This project will provide China with initial infrastructure for PCB treatment and disposal and will establish comprehensive policies, regulations and instruments for PCB management. It will remove about 22,000 tons PCB capacitors and associated wastes from Zhejiang Province and increase public awareness of POPs. The project financial arrangement could be replicated to address other similar issues of historical wastes and contaminated sites in the country. In addition to PCBs, the facilities can handle other highly chlorinated wastes, which make them economically viable.

Lessons learned

The project has integrated development of regulation, strengthening of technical capacity, awareness and clean-up activities to successfully address the management of PCBs in one province. This capacity and experience will enable China to address PCB issues in other provinces. However, the international bidding of the thermal desorption plant failed for the first time due to the fact that only one international supplier participated in the bidding; this delayed the project for more than one year. This could be solved by separating the local procurement from the international bidding.

Next steps

A replication program is now under development to reproduce the experience in Zhejiang in all the other provinces in China. It will be designed based on a national inventory which is currently being updated through a nation wide survey. The program will also propose the strengthening of the disposal capacity, especially for soil treatment. The project has provided a complete regulatory system and guidelines on technology selection for various types of PCB wastes. In sum, the basic capacity to achieve the convention goal on PCB will be built by this project.

9. Improving the management of POPs in Moldova

Introduction

The Republic of Moldova, which lies in the south-east part of Europe, gained its independence in 1991 after the collapse of the Soviet Union. The country has a population of 4.3 million—45 per cent urban and 54 per cent rural. Its economy is primarily agricultural with intense use of its natural resources and biodiversity.

During the Soviet era, about 1000 pesticide stores were built on collective farms. Between 1991 and 2003, most of them were destroyed or dismantled. Of those that remained, only 20 per cent were maintained in satisfactory condition. The lack of strategy for pesticide management resulted in pesticides being kept in many different depots across the country, some of which were close to residential areas. They were often sub-standard and not maintained. Improper storage conditions, including storage in the open, led to the deterioration of the packaging, release of pesticides into the environment and contamination of the area surrounding the stores.

Old and banned pesticides are one of the most severe environmental problems in Moldova, because of the lack of adequate infrastructure to collect and store chemicals and a lack of proper management of household and hazardous wastes. Also of concern are polychlorinated biphenyls (PCBs), which were used in dielectric oil for the electrical equipment.

The problem

In the past, large quantities of pesticides were used. From 1950 to the 1990s, an estimated 560,000 tons of pesticides were used, including large quantities of persistent organochlorine compounds (POCs). The absence of controls over pesticides resulted in the accumulation of approximately 6,000 tons, including about 3,940 tons buried at a pesticide dump in Cismichioi, in the South of Moldova. Additionally, approximately 2,000 tons are stored in 26 warehouses, where stocks of obsolete pesticides and other chemicals have been consolidated.

Local authorities and the population are not aware of the potential dangers around pesticide stores. Old stores are used as a source of free construction materials for household needs. Adjacent areas are also used for grazing or agriculture, which results in people and farm animals being exposed to pesticides through contact with contaminated soil. The Moldovan environmental authorities realized that the long term storage of obsolete pesticides was not a sustainable option since it is difficult to ensure the proper storage of pesticides, even after these have been repackaged.

PCBs have never been produced in the Republic of Moldova, all of them being imported. Their utilization in some sectors was discontinued or prohibited in the 1980s. However, PCBs continue to be used in power installations and other types of equipment. A preliminary inventory made in Moldova in 2003 estimated the total amount of dielectric oil from electric installations at approximately 30,000 tons, including 23,300 tons in high voltage transformers, 5,400 tons in circuit breakers and 400 tons in capacitors.

Developing a National Implementation Plan

During the last decade, POPs have been recognized as a national priority problem and Moldova became a Party to the Stockholm Convention on Persistent Organic Pollutants (POPs). With support of the Global Environment Facility (GEF) Moldova developed its National Implementation Plan (NIP) for the Stockholm Convention (http://www.moldovapops.md/app/includes/files/nip_eng.pdf).

An initial step was to compile a preliminary inventory of stockpiles of POP pesticides and PCBs. An environmental impact assessment done as a follow-up estimated that there were about one thousand sites (demolished, abandoned, or empty pesticides storehouses, pesticide mixing facilities and adjacent zones) with an average area of less than 1 ha, which were likely contaminated and would require a detailed inventory, risk assessment, and the development of remediation measures and their implementation. A more recent investigation by the State Ecological Inspectorate estimated the total area of pesticides contaminated lands in the country to be between 800-1000 hectares.

According to provisions of the National Implementation Plan and Moldovan Government Decision No. 81 dated February 2009 on PCB Regulation,[31] all power equipment in the country (e.g. transformers, switches, breakers, inductors and other receptacles containing liquid stocks) will have to be checked for PCB content, to be labelled accordingly and, PCBs removed from equipment containing them. In this regard a comprehensive national PCB inventory was launched in September 2008 under the GEF-World Bank "POPs Stockpiles Management and Destruction Project".

What was done?

An early initiative, which started in November 2003, was to repackage and consolidate obsolete pesticide stocks scattered across the country into a limited number of stores. Then, the Ministry of Ecology and Natural Resources (MENR) developed a proposal for the Persistent Organic Pollutants Stockpiles Management and Destruction Project and sought financial assistance from the GEF to strengthen national POPs management capacities and to dispose of obsolete POPs pesticides and PCBs. The Ministry started the project in March 2006.

The Moldovan Government also applied for and received technical assistance from the Canada POPs Trust Fund to identify and implement cost-efficient best available techniques (BATs) for remediation of areas polluted with POPs pesticides and clean-up of PCB-contaminated oil from power equipment. The government engaged an international company to identify and test cost-efficient best available techniques (BATs) to remediate areas polluted with POPs pesticides. The testing of two alternatives techniques for decontamination of POPs polluted areas in three pilot sites started in March 2009.

Outcomes/impacts of the project

Under daily supervision of Danish and local consultants, between March 2007 and July 2008, 1,292 tons of obsolete pesticides in 12 stores, which were selected based on their risk assessment, have been repacked in containers and incinerated in a French licensed facility in accordance with best environmental practices. Over this period, the same French company also disposed of about 1,000 tons of

31 http://www.moldovapops.md/app/includes/files/PCB%20Regulation%20Eng.pdf

obsolete PCB containing capacitors. The remaining part of obsolete pesticide stockpiles (about 2,000 tons) will be disposed of with assistance from NATO.

More than 100 local officials (plant protection, environmental inspectors and representatives of local authorities) were trained on how to handle the obsolete chemicals in order to prevent the contamination of the environment. While the main aim was to improve environmental conditions in the country, additional benefits include:

- *Building national capacity for the handling and management of hazardous waste including legal and institutional arrangements, raising laboratory analysis and information management capacity, and obtaining knowledge and know-how.*
- *Poverty reduction and economic growth, especially in rural areas, through creation of opportunities for producing clean/organic agricultural products.*

Costs

Moldova received in total USD 6.35 million from GEF for the stockpiles management and destruction project, which was supplemented by USD 1.6 million from the government and 2.3 million in in-kind contributions and other sources of funding. The total cost of destruction activities within the project was about 3 million Euros of which 876,000 Euros came from the Moldovan Government (State Budget and the National Ecological Fund). At the same time, Moldova received CAD 444,000 from the Canada POPs Fund for the demonstration projects.

Lessons learned

The outcomes of the project were considered successful since it addressed the environmental issues caused by POPs and especially those identified as national priorities to protect human health and environment such as organochlorine pesticides in the agricultural sector and PCBs in the energy sector.

The second main factor of success was the involvement of local stakeholders. During the development of the National Implementation Plan and Environmental and Social Assessment of the project proposal, a wide group of local stakeholders, including government, NGOs and local communities affected by POPs pollution were involved. The consensus reached during this consultation process resulted in an agreed National Action Plan.

Next steps

The Moldovan Government will continue to work on meeting all requirements under the Stockholm Convention and other international agreements on POPs, and to mobilise international assistance for projects. It is also expected that local officials who were trained in the sound management of POPs will be able disseminate this knowledge to others as efforts are made to clean up and decontaminate the remaining sites in Moldova. If the site clean-up pilots are successful, the approaches will be used to clean up the other contaminated sites in the country.

The government has already received funding to implement other projects such as Modification of the Regulatory Framework for POPs Management and Upgrading and Strengthening of Existing Laboratories for POPs Analysis. Moldova will also update its National Implementation Plan to include activities which were not foreseen in 2003 when the plan was first drafted—addressing the release of unintentional POPs and the strengthening of monitoring and laboratory capacities are two areas that need further effort.

10. The Africa Stockpiles Programme

It is estimated that over 50,000 tones of unused and unwanted pesticides and associated wastes have accumulated in Africa over the last 40 years. These pesticides can pose serious threats to the health of both rural and urban populations, wildlife and livestock, and contribute to land and water degradation.

Many African governments lack both the capacity and the facilities to dispose of these stocks safely. Urgent action is needed to reduce the risk to the environment and communities by safely collecting and disposing of known stockpiles and putting in place measures that ensure that this dangerous situation does not occur again.

Obsolete pesticides

Obsolete pesticides are those that can no longer be used for their intended purpose or any other purpose, have become hazardous waste and require safe destruction. They include:

- *Pesticides and technical formulations well below their original specification*
- *Banned pesticides*
- *Damaged and degraded products*
- *Unwanted formulations and packages*
- *Contaminated empty containers and application equipment*
- *Buried pesticides and containers*
- *Heavily contaminated soils*

Obsolete pesticides have accumulated in Africa as a result of various factors including inappropriate procurement, untimely and uncoordinated distribution, inadequate storage and stock management, product bans and donations in excess of actual requirements. Often these now unusable and degraded pesticides were originally donated or purchased for emergency use against plagues of locusts, grasshoppers, armyworms, birds and disease vectors such as mosquitoes, but were never used.

The threat

Obsolete stockpiles are often found unmanaged, stored in the open air, or held in broken and disintegrating containers lacking proper labelling. Spills, leaks and dust from these sites may contaminate soil, surface waters, groundwater and the atmosphere. Because some of the stockpiled pesticides are persistent organic pollutants (POPs)[32], the hazards are long-lasting and far-reaching. New research has shown that many of these chemicals, particularly POPs, affect people even at very low doses. The chronic illnesses, reproductive problems and birth defects that may result from such exposure create high long-term risks for communities, individuals, livestock and wildlife. Other obsolete pesticides are acutely toxic and pose an immediate threat of injury or illness. Adverse environmental impacts of inadvertent pesticide release include erosion of biodiversity, reduced populations of pollinators and natural enemies of pest organisms, and detrimental impacts on fish, birds and other wildlife. Many

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32 POPs pesticides are frequently inextricably mixed with other non-POPs pesticides and in contaminated soil or other media. POPs threaten the global environment due to their persistence, mobility, and tendency to bioaccumulate in higher organisms.

of the resources that may be affected such as river water, fish, bees and bush meat, are critical for the livelihoods and food security of poor communities.

The Africa Stockpiles Programme

Since 1990, different organizations have engaged in obsolete stock disposal efforts in Africa. However by 2000, it became clear that a broader approach was needed to accelerate risk reduction and disposal efforts and to give more emphasis to the prevention of stock re-accumulation. Capacity building for affected countries through financial, technical and management support was required as the safe removal and environmentally sound disposal of obsolete pesticides is technically complex and expensive. A concerted international effort was therefore developed to eliminate the POPs and other obsolete pesticides stockpiled in Africa and to help prevent future accumulations.

Initiated in 2005, the Africa Stockpiles Programme (ASP) is a multi-stakeholder partnership that aims to remove obsolete pesticide stocks from Africa and put in place measures to help prevent their recurrence. The ASP does this by:

- *Cleaning up stockpiled pesticides and pesticide-contaminated waste in an environmentally sound manner.*
- *Catalyzing the development of measures to prevent future accumulation.*
- *Providing capacity building and institutional strengthening on important chemicals-related issues.*

This innovative programme works with African countries to help meet their obligations under the Stockholm Convention on Persistent Organic Pollutants and other international treaties. The ASP partnership presently includes the African Union, the Food and Agriculture Organization of the United Nations (FAO), CropLife International, Pesticide Action Network, the World Bank and WWF- the global conservation organisation.

The programme is expected to run from September 2005 for a period of 12–15 years covering all African countries on a rolling basis. The first seven participating countries—Ethiopia, Mali, Morocco, Nigeria, South Africa, Tanzania and Tunisia—are funded by US$25 million from the Global Environment Facility (GEF) and funding from various bilateral donors, the private sector and civil society amounting in total to US$58 million. The first phase is being implemented by the participating countries supported by a network of participating organizations. Activities by CropLife International, FAO and Croplife are also underway in additional countries including Egypt, Eritrea, Mozambique, Cameroon, Ghana, Kenya and Malawi.

Outcomes

Significant results have been achieved so far, including the inventory of close to 5,000 tons of obsolete pesticides and associated waste and the development of toolkits and guidance documents for the Country Environmental and Social Assessments, Monitoring and Evaluation and procurement of waste disposal services. It is expected that by early 2010, disposal of obsolete pesticides will have commenced in Mali and Tunisia.

A wide-reaching awareness campaign and outreach programme targeted at farming communities and other relevant stakeholders ensures that farmers, traders and all vulnerable populations are aware of the danger of improper pesticide management. Community-based monitoring of health and environmental impacts, education of journalists, use of media campaigns, and development and dissemination of easy to read and understand informative products is empowering communities on the continent.

Pesticide management practices and pesticide legislation have been reviewed and key recommendations taken up by National Steering Committees composed of government, NGO and industry stakeholders. New legislation has been drafted in some countries and long term storage facilities for pesticides built or improved. Farmers have been trained in Integrated Pest Management (IPM) and IPM policies addressed to encourage increasing adoption of IPM methods. Several innovative projects have been implemented in participating countries. An example is the remediation of a contaminated site in Molodo in Mali (*see box IV.10.1*).

Box IV.10.1. Safeguarding, cleaning and remediation activities in Molodo, Mali

In July 2008, the Mali Ministry of Agriculture, Ministry of Environment and Sanitation, the Central Veterinary Laboratories (LCV), and a number of national programmes undertook the urgent task of safeguarding, cleaning, and remediating a highly contaminated site in the town of Molodo. The site contained large quantities of highly toxic obsolete pesticides and empty containers, which for many years had contaminated soil, water, and vegetation. Using local staff and simple and cost-effective techniques, 2400 litres of obsolete pesticides, amongst them the insecticides dieldrin, parathion, fenthion and cyanophos, were safeguarded. An additional 260 contaminated containers were removed, and the soil at the site was remediated using a landfarming technique. This is the first time land-farming, a bioremediation treatment process, was tested successfully in Mali.

Lessons learned

Some key lessons have been drawn from implementation of the programme to date. It is evident that for the disposal activities to be effective, they must be supported by implementation of strong measures to prevent accumulation of new stocks. Future projects should aim to continue the ASP initiative by mainstreaming pest and pesticide management in the countries' broader development agenda, and ensuring that adequate funding is available. Such efforts would ideally involve a combination of government, NGO and industry stakeholders.

The development of disposal programmes requires good indicative data on the volumes of obsolete pesticides that need be disposed of. However, lapses in time between initial inventory taking and disposal operations may sometimes lead to the discovery of significantly larger amounts of stock than have been budgeted for at the project design stage.

Next steps

These lessons have been taken into consideration in the development of the next phase of the ASP. It is anticipated that over 15 additional countries will participate in the second phase of the project, another advance toward the objective of safely ridding Africa of her stockpiles of obsolete pesticides.

11. POPs in PICs—A project to eliminate persistent organic pollutants from Pacific Island countries

Introduction

For hundreds of years, people living in the Pacific Island countries (PICs) have lived in close harmony with their environment, in a region that is as immense as it is diverse. The Pacific Islands region covers over 30 million square kilometres of which only 2 per cent is land mass. The vast marine environment surrounding the land is rich in biodiversity and is vital to the survival and livelihoods of many Pacific Islanders.

Decades of European settlement eventually connected the islands with the larger world, bringing much advancement but also introducing many products and technologies that PICs were simply not equipped to deal with. An example of this was the exposure of the Pacific Islanders to chemicals including POPs. Many of these chemicals were brought in bulk as part of development aid and have ended up as stockpiles which the PICs have had difficulty managing.

Problem that was addressed

POPs such as Dieldrin, DDT and PCBs are hazardous, persistent and accumulate in the food chain, creating serious health risks to humans and the environment. People in the Pacific Islands region are specifically at risk because of their high reliance on their surrounding environment for sustenance.

Many open air dumps containing chemicals and contaminated material were endangering the health of people and the already vulnerable environment. This situation arose because of the lack of understanding of the risks posed by these chemicals and because disposing of POPs is difficult for PICs due to their limited resources, inappropriate technologies and remoteness from appropriate disposal facilities in other countries.

How the problem was addressed

In the early to mid 1990s, recognizing the potential threats to Pacific Islanders' way of life from waste management practices, the Australian Agency for International Development (AusAID) developed the "Persistent Organic Pollutants in Pacific Island Countries" (POPs in PICs).

The aim of the POPs in PICs project was to reduce the threat to human health and the environment posed by POPs and related chemicals. The nine-year project was funded by the Australian Government (AusAID) to a value of approximately AUD 6.5 million and implemented by the Secretariat of the Pacific Regional Environment Programme (SPREP) which is the Pacific inter-governmental agency tasked with promoting environmental protection within the PICs.

The project was implemented in 13 of the 21 Pacific Island members of SPREP, and included Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Palau, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu. Key partners in each PIC generally included the National Ministries of Foreign Affairs and Environment Agencies, the Government of Australia through AusAID and GHD Pty Ltd—the Australian Managing Contractor who provided the technical support and advise for the project.

Implementation

The project consisted of two phases. Phase I was implemented by SPREP and ran for 3 years from 1997–2000. It involved an assessment of stockpiles of waste and obsolete chemicals and the identification of the contaminated sites in the thirteen PICs. A review of the relevant legislation in the countries was also carried out to strengthen their capacity to manage future chemical wastes.

Phase II of the project lasted for a period of six years (2000–2006) and was undertaken in two distinct parts: Part 1 was focused on undertaking an initial visit on each island to inspect identified storage sites, to confirm contents and volumes of all chemicals and to conduct any field testing or sampling required. If the composition of chemicals was unclear, samples were collected and sent to Australia for analysis.

The availability of handling equipment, transportation options and local resources were also explored. In cases where chemicals were discharged to the environment, some preliminary repackaging and remediation work was undertaken to secure chemicals and reduce potential for exposure.

The second part of the Phase II work focused on the collection, packaging and shipment of the identified wastes to a suitable facility in Australia for eventual destruction or disposal.

Once the POPs were securely repackaged, import permits were sought from the Australian Department of Environment and Heritage. Capacity building exercises were implemented to help the PICs comply with the obligations related to transboundary movement of hazardous wastes under the Basel and/or Waigani Conventions[33].

In Australia, state-of-the-art POPs destruction technology utilizing non-incineration catalyzed dechlorination (BCD) and plasma arc processes were deployed to dispose of the POPs.

During the entire implementation of the project, awareness activities were conducted among government officials, chemicals users, non-government organizations and the communities in order to increase their awareness of the dangers of toxic waste. In addition, contacts with officials were established to discuss the international legal requirements relating to the repackaging and shipment of wastes. Relationships and increased awareness established proved very useful and contributed significantly to the success of the project.

Impacts

As a result of the project, 140 tones of POPs were removed from the 13 PICs involved. This quantity represents about 30 per cent of the total chemicals identified. Nonetheless, removal of this quantity of waste is a huge step forward for the Pacific region realizing significant environmental and health benefits.

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33 Waigani Convention to Ban the Importation into Forum Countries of Hazardous and Radioactive Wastes and to Control the Transboundary Movements and Management of Hazardous Wastes within the South Pacific Region

Table IV.11.1 outlines the approximate volumes of POPs collected by the end of project in 2006 for each country.

Table IV.II.1 Approximate volumes of POPS collected

Country	Estimated Field Quantity of Chemical, kg	Estimated Field Quantity of Chemical Containers, kg	Estimated Combined Casing Weight, kg	Estimated Combined PCB Oil Volume, kg	Total
Cook Islands	*4,236*	*1,386*	*0*	*0*	*5,622*
FSM	*4,118*	*1,347*	*10,500*	*5,165*	*21,131*
Fiji	*28,203*	*9,228*	*0*	*0*	*37,430*
Kiribati	*327*	*107*	*0*	*0*	*433*
Marshall Island	*0*	*0*	*15,000*	*720*	*15,720*
Nauru	*0*	*0*	*500*	*179*	*679*
Niue	*2,992*	*979*	*0*	*0*	*3,971*
Solomon Islands	*6,508*	*900*	*300*	*100*	*7,808*
Samoa	*3,301*	*1,080*	*6,000*	*1,234*	*11,615*
Tonga	*443*	*145*	*5,000*	*1,345*	*6,933*
Tuvalu	*0*	*0*	*500*	*324*	*824*
Vanuatu	*3,080*	*1,008*	*20,000*	*4,529*	*28,617*
Totals	**53,208**	**16,180**	**57,800**	**13,596**	**140,783**

Lessons learned

The project has been widely acclaimed to be a success story for the region. There were a number of lessons learned during its implementation including:

Attaining political endorsement at the Ministerial level for work to be done on the ground is crucial.

- *Local people need to be involved in all phases of the project and to establish key contacts with the government.*
- *Communication lines from the project team to the local communities have to be regular and at a level that is understood by all involved.*
- *Training activities need to be carried out before implementing key activities to make sure all stakeholders are engaged and that all personnel is capacitated to manage hazardous wastes in the future.*
- *Adequate funding is primordial to make sure that the project is properly implemented and, where necessary, followed up.*

Next steps

Despite the tremendous benefits of this project, the Pacific is still faced with some significant hazardous waste management challenges; not all the identified chemicals were removed during this project and limited work has been undertaken to date in conducting similar inventories of inorganic chemicals and other hazardous wastes in other islands in the region.

Work will continue to identify opportunities for removing the remaining legacy of chemicals and also for putting sustainable programmes in place for managing POPs and other chemical and hazardous materials in order to minimize the accumulation of chemical and hazardous wastes in the future.

Conclusions

The POPs in PICs project was a successful example of how to comply with a number of International chemicals- and waste-related conventions and agreements, as well as national and local environmental regulations. The project has achieved several significant milestones within just five years by successfully managing the identification, cleanup and destruction of POPs wastes. It also highlights the complexities of transporting chemicals across international boundaries.

This project has increased the awareness of hazardous chemicals at a range of levels in the Pacific countries involved. In many instances the work of the project team was broadcast on local radio and television to promote general knowledge and understanding of chemical management. Government officials, chemicals users, NGOs and the communities themselves all learned how to better identify and manage these types of chemicals. They also learned more about the health problems that could potentially arise from exposure to chemicals.

12. Awareness Creation on the Effects of Persistent Organic Pollutants amongst Vegetable Farmers in the Accra Metropolis, Ghana

Overview

There is widespread use of agrochemicals in Ghana. Monitoring of vegetables, water and sediments in areas of intensive vegetable production in Ghana have found high levels of organochlorine pesticides, including banned products.

The aim of the Awareness Creation on the Effects of Persistent Organic Pollutants (POPs) Amongst Vegetable Farmers in the Accra Metropolis project was to provide relevant information on the level of POPs contamination in vegetables from various places in Ghana with the view to influence consumer and producers' behaviours. The study conducted laboratory analysis of the presence of POPs in vegetables, created public awareness on the effects of POPs, and promoted integrated pest management in vegetable production.

The project confirmed the over use of agrochemicals in vegetable farming, and showed that integrated pest management can be promoted to minimize the use of agrochemicals and eliminate POPs in vegetable production. It highlighted the effective role non-governmental organizations (NGOs) can play, and showed the need for strong collaboration among policy makers, researchers and farmers to effectively address the hazard of improper use of chemicals in Ghana.

The problem that was addressed

The improper use of agrochemicals in vegetable production especially within the urban and peri-urban areas in Ghana is widespread. A number of chemicals, which have been banned in developed countries, are clandestinely used in vegetable farming.

The Accra Metropolis, the capital of Ghana, consumes the largest proportion of vegetables produced in Ghana. Vegetables from all over the country are transported daily into the region. Most of the products (80 per cent) are sold in open markets with no refrigeration. Commonly used pesticides include lambda-cyhalothrin, carbofuran, thiothanate-methyl, chlorpyrifos and cupric hydroxide. A survey carried out by the Ecological Restorations in 2004 at the Weija Irrigation site (one of the major vegetable production centres for Accra) found that some banned chemicals were used unknowingly in the production of vegetables to supply the local markets in Accra-Tema. Sometimes pesticide preparations include banned ingredients (for example, DDT, lindane or endosulfan).

A survey of farmers carried out during this project found that 45 per cent of the vegetable farmers in the area had developed chronic skin diseases. Most farmers (65 per cent) indicated that they had on occasion experienced dizziness and sometimes total blackouts after the use of pesticides. Furthermore, run-off water from the vegetable farms enters the Okurudu River which in turn flows into the Nyanya lagoon—a major fishing and salt mining area in Accra.

One of the reasons for increased use of pesticides is to overcome resistance to insecticides. Reduced populations of non-target useful species can also result in resurgence and development of secondary pest infestations that are then treated using additional pesticide.

How the problem was addressed

The intervention was planned in three phases:

1. *A scientific analysis to establish the presence of POPs contamination in vegetables being produced and sold on the Accra market.*
2. *Creation of awareness amongst the Ghanaian vegetable farmers and consumers, especially those in the Accra Metropolis, on the level of POPs contamination and ways to minimize the use of POPs.*
3. *Introduction of the farmers to integrated pest management in vegetable production.*

Vegetable farmers, research and academic institutions, policy makers, consumers, the press and civil society organizations were actively engaged in the implementation.

Implementation approach

PROVIDING RELEVANT INFORMATION ON THE LEVEL OF POPS CONTAMINATION IN VEGETABLES

Samples of vegetables (cabbages, lettuce, tomatoes, carrots and cauliflower) were collected from the project site and purchased from four different vegetable markets in Accra. The Centre for Scientific and Industrial Research (CSIR) analyzed various POPs including aldrin, DDT, dieldrin, eldrin, endosulfan, heptachlor, lindane, PCBs and related compounds.

The analysis showed that:

- *Lindane and DDE (the breakdown product of DDT) in tomatoes were more than 500 times the maximum residue limit (MRL).*
- *For some of the substances measured in cabbages, cauliflower, carrots, cucumbers and lettuce, residue levels were above guideline values.*

AWARENESS CREATION ON POPS

The findings of the analysis were published into booklets, pamphlets and hand bills. Six hundred stakeholders participated in the series of workshops—commercial vegetable producers (55 per cent), consumers (20 per cent), researchers (10 per cent), policy makers (10 per cent), the press and civil society groups (5 per cent). The Ministry of Food and Agriculture and Members of Parliament actively participated in these events. National newspapers and state television carried reports of the forums and weekly discussions on the effects of POPs were held on radio and television to influence the producers and consumer's behaviours.

INTRODUCTION OF INTEGRATED PEST MANAGEMENT IN VEGETABLE PRODUCTION

A hundred vegetable farmers selected from Tuba, Weija and Bortianor (major peri-urban vegetable producing areas in Accra) were introduced to the production of organic vegetables and provided with financial assistance. Training was conducted by staff from the Department of Crop Science of the University of Ghana and the Weija Irrigation Farm. Farmers were introduced to compost preparation using cow dung and crop residues, the preparation of neem oil, and the use of Bt (a biopesticides) to control pests attacking their crops, especially cabbage and okra.

Project outcomes

LAWS ON POPS ENFORCED AND SOUND CHEMICALS MANAGEMENT PROMOTED—A TOXIC FREE FUTURE

- *Documentary evidence of the traces of POPs in vegetable production prompted policy makers to re-inforce the chemical monitoring team on the local borders to improve the control of banned chemicals and refresher courses on identification, detection and destruction of banned chemicals were provided to border control staff.*
- *The Ministry of Food and Agriculture (MOFA) in collaboration with the Ghana Agricultural Inputs Dealers Association identified and disposed of 71 tones of obsolete stocks of pesticides (mostly aldrin and monocrotophos).*
- *The CSIR is looking for funds to repeat the project on a national scale.*
- *Collaborative work among governments, IGOs, research and academic institutions and communities on the elimination of illegal trade in chemicals and the use of POPs.*
- *Adoption of organic farming including a national network on POPs and a more active role of farmers in the development of national policies and the review regulatory frameworks.*

AWARENESS CREATION ON THE EFFECTS OF POPS

- *The press has carried several articles in the print media on the dangers of POPs and it is estimated that more than 50 per cent of vegetable producers and consumers in Accra, policy-makers, restaurant operators and street vendors are now aware of the effects of POPs.*
- *The project has strengthened NGOs activities related to POPs elimination and other Multilateral Environmental Agreements (MEAs), including the Strategic Approach to International Chemicals Management (SAICM).*
- *The project provided helpful information for planning and strategies for remedial and prevention measures related to POPs.*

CAPACITY BUILDING IN INTEGRATED PEST MANAGEMENT

- *The project assisted 100 vegetable farmers in Accra metropolis to adopt Integrated Pest Management (IPM).*
- *The biopesticides were highly effective in controlling the major pests of okra and cabbage with a resultant increase in yield.*
- *The adoption of IPM in vegetable production has reduced the cost of production thereby increasing the profit margin on the production of per hectare production of vegetables by 35 per cent, improving the financial situation of the farmers involved.*

Lessons learned

- *Local farmers are relatively better off when they use IPM in vegetable production.*
- *Lack of effective market for organic products discourages farmers to invest in organic farming.*
- *The NGOs and community-based organizations can make significant contributions in programme implementation and reporting as they have the trust of communities. The impact of NGOs on the sound management of chemicals can be strengthened through:*
    - *Greater government recognition of their potential contribution.*
    - *Improved access to technical, financial, training and policy support.*
    - *Strengthened coordination, collaboration and communication among different stakeholders (researchers, academia and policy makers).*

The way forward

The success of this project in reducing decreasing exposures to POP and other pesticides can be replicated if:

- *Farmer education and agricultural extension promotes the adoption of integrated pest management and organic agriculture to minimize the use of pesticides.*
- *Markets of organic produce are strengthened.*
- *Guide to chemical conventions are made available in local languages and disseminated, and community-based organizations, extension staff and farmers are trained on how to implement them at the grassroots level.*

13. Non pesticidal management—An alternative to endosulfan in a large scale success story from Enabavi, Andhrapradesh, India

Executive summary

Since 2002, a silent revolution has been taking place in the remote villages of Andhra Pradesh in India. Farmers who suffered adverse effects from modern agricultural practices turned to a system called 'Non Pesticidal Management' (NPM). The system has provided economic and social benefits, as well as an understanding of the effects of pesticides like endosulfan and monocrotophos, and knowledge of alternatives. This time it was not about substituting safer pesticides, but about employing safer sustainable methods that eliminate the need for pesticides altogether. This is happening in 3,000 villages, over an area of 1.7 million acres.

Pesticide and agrarian crisis in Andhra Pradesh

Andhra Pradesh was in the news in early 2000 for the large scale migration of farmers following the agrarian crisis caused by drought in its central districts. The situation had worsened by 2006 and a large number of farmer suicides were recorded in the state, as with other states of India. The farmers faced severe problems that compelled them to migrate or take their own lives. Chemical intensive farming demanded intensive resource use, while the role of the farmers' skills was diminished by the externalization of knowledge and tools. Huge input costs for pesticides and chemical fertilizers made production capital intensive and, therefore, unaffordable for small and marginal farmers. Yet even so, pest infestations increased. Many farmers became indebted to pesticide dealers, seed vendors and money lenders. An acute water shortage coupled with continuous and diverse pest attacks literally took away the hope of recouping unprecedented losses.

The Enabavi village lies within the Telengana region (Districts of Anantpur, Nalgonda and Warrangal). This region was known for chemical intensive farming; endosulfan was used on almost all crops, especially cotton, paddy, red gram and some vegetables. In addition to pest-control, endosulfan was also used to mimic a hormone that induces flowering in plants. On average, one litre of endosulfan was being used per acre of land per crop. In paddy fields, it was applied twice a year, once for each season, at a rate of 0.5 litres per acre.

The following economic comparisons of farms using NPM and farms using endosulfan show that the net income of farmers has increased as much as 44 per cent, through reductions in input costs, with only minor decreases in yield (*see table IV.13.1-3*) .

Table IV.13.1. Comparative net incomes—Chemical intensive farming and NPM

	Name and Location of the Farmer	Name and Location of the Farmer
	Mr. Jillela Yella Reddy *Kallem Village, Warrangal,* *Uses pesticides and fertilizer*	*Mr. Ponnam Mallaiah* *Enabavi Village, Warrangal,* *Uses organic farming methods*
Investment on cotton crop on one acre	*Rs.15,250.00*	*Rs.8,550.00*
Total yield	*12 quintals*	*10 quintals*
Total Gross income	*Rs.24,600.00*	*Rs.22,000.00*
Net income	*Rs.9,350.00*	*Rs.13,450.00*

Source: Down To Earth January 1-15, 2009, courtesy of Down To Earth

Table IV.13.2. Replacing pesticides with NPM

Crop	Cost of plant protection Rs. / acre		Savings (Rs.)
	With pesticides	NPM	
Cotton	*5000*	*1000*	*4000*
Chilli	*15000*	*2000*	*13000*
Redgram	*1500*	*300*	*1200*
Groundnut	*1500*	*300*	*1200*
Castor	*2000*	*400*	*1600*
Paddy	*2000*	*225*	*1775*

Source: Society for Elimination of Rural Poverty (SERP), Department of Rural Development, Hyderabad.

Table IV.13.3. Endosulfan usage

Crop	Area (acres)	No. of crops/year	Usage	Quantity of endosulfan (litres)
Paddy	*50*	*2*	*1Litre / Acre*	*50*
Cotton	*6*	*1*	*2 Litres / Acre*	*12*
Pigeon pea	*30*	*1*	*2 Litres / Acre*	*60*
Tomato	*4*	*1*	*0.5 Litre / Acre*	*2*
Tobacco	*40*	*1*	*1 Litre / Acre*	*40*
Total	*130*			*164*

Money previously spent on endosulfan in Enabavi per year at Rs.300/litre, (164 x Rs.300) = Rs.49,200.

Non Pesticidal Management (NPM)

In 1986 farmers turned to NPM following assistance by the Centre for World Solidarity (CWS), a Hyderabad-based NGO headed by Dr. M.S. Chari, in controlling red hairy caterpillars which are a pest of rainfed crops like castor, groundnut, cotton, etc. These caterpillars used to invade farms in large numbers, despite the use of chemical pesticides, and caused huge losses. The red hairy caterpillars were brought under control, without using chemical pesticides, through effective interventions such as bonfires, trap crops, etc. The successful practices were adopted by other villages as well. Later CWS, with the help of local NGOs, started working in villages to build capacity for Non Pesticidal Management of crops. The Centre for Sustainable Agriculture (CSA), an offshoot of CWS, took the lead in implementing NPM in a more organized manner through technical support, capacity building programmes, research, campaigns and marketing. CSA implemented NPM in 45 villages spread over 6 districts in Andra Pradesh, involving 6,000 acres. This was later expanded by the Government of Andhra Pradesh's Department of Rural Development to cover 3,000 villages (1.2 million acres) across 18 districts. As more land of the 3,000 villages was brought into the programme the area under NPM grew further to approximately 1.7 million acres. This accounts for 5 per cent of total land under agriculture in the vast state of Andra Pradesh; the government is currently targeting 50 per cent coverage by 2014.

Unlike many other community programmes, NPM gathered momentum when farmers themselves took an interest in promoting the system through the sharing of experiences and inputs. These farmers recommend NPM to neighbouring villages with confidence and volunteer to train them. The NGOs have provided technical support, monitoring and follow up in every village. NPM has demystified pests, pest control and chemical management and it has encouraged farmers to once again take control of plant protection, from crop planning to pest management. NPM provides farmers with an understanding of the life cycle of different pests, with reference to their crops, and thereby helps them to make timely interventions to avoid crop damage and the use of chemical pesticides.

Non Pesticidal Management is based on the following principles:

ECOLOGICAL SUSTAINABILITY: NPM advocates no chemicals (since use of chemicals has increased pest infestations), no use of genetically modified crops, and low use of energy and water.

ECONOMIC SUSTAINABILITY: Local procurement of inputs eliminates external agencies and allows the money to be circulated within the local economy, which generates more employment and a fair price to farmers.

SOCIAL EMPOWERMENT: Promotes institutional mechanisms, such as cooperatives, that empower local people in planning, decision making and managing markets.

SAFE FOOD: NPM yields pesticide-free food for people and animals and thus reduces incidence of health problems.

General practices

Notwithstanding variations based on crop and season, the general practices of NPM are as follows:

PREVENTION:

Deep summer ploughing of farms to expose the larvae/pupae of many pests to the sun and birds.

- *Biological treatment of seeds to avoid pests getting into the seed.*
- *Crop planning and spacing between crops to maintain balance of pests.*

PRECAUTION

- *Soil health is the key; it is reflected in improved productivity and resistance to diseases and/or pest attacks.*
- *Application of tank silt, compost, vermicompost, poultry manure, green leaf manure and cowdung-based preparations like Panchagavya to improve soil health.*
- *Growing of border crops such as Jowar (a variety of sorghum), the height of which obstruct pest movement.*
- *Growing of pest trap plants, like marigold and castor, to help in pest control.*
- *Pheromone traps and bonfires to attract pests.*
- *Proper planning of crops to reduce the incidences of pest attack.*

MANAGEMENT

- *Use of neem seed kernel extract, chilli-garlic extract, cowdung-cow urine extract, buttermilk and asafoetida solutions, etc, to serve as pest repellents as well as pesticides.*
- *Provision of bird perches in the farm to help pest control.*
- *Shaking of plants at times, which helps the pests to drop off or become exposed to birds.*

Institutional outcomes

NGOs in the region helped farmer groups, such as Sri Rama Ryth Seva Sangam, Sri Manjunatha Ryth Seva Sangam and Kakathiya Ryth Seva Sangam, open saving bank accounts to pool money for the initial investments needed for NPM. A producer cooperative—Enabavi Sendriya Rythula Paraspara Sahayaka Sahakara Parimitha Sangam (Ltd.)—has been formed, with 99 members, to support the farming activities in the region. The Society for Elimination of Rural Poverty (SERP), a network of women's self help groups supported by the Government of Andra Pradesh's Department of Rural Development, has decided to upscale the NPM efforts to other parts of the state as part of livelihood generation. SERP has created its own institutional mechanism with the support of local NGOs for implementing NPM. This has resulted in new employment opportunities for women as producers or formulators of farm inputs needed in NPM. The Centre for Sustainable Agriculture (CSA) is providing technical support and troubleshooting help to the farmers, including through the creation of a helpline. CSA is also facilitating the formation of consumer and producer cooperatives to provide better markets for farmers and better prices for consumers. In addition, CSA is examining possibilities for adding value to products to improve incomes for farmers.

Lessons learned

- *Prevention is better than cure. NPM focuses on prevention of pest incidences through logical and scientific interventions, as a part of crop planning.*
- *The crux of NPM is equipping farmers to make a correct decision, based on their circumstances, to protect crops.*
- *Pest control involves maintaining pest levels at or below threshold levels in specific crops and areas, and not on the elimination of pests.*
- *Pesticides drain out money out of the local economy and NPM retains the money within the local economy.*
- *NPM is more cost effective than chemical intensive farming.*
- *NPM is sustainable.*

Next steps

- *Spread the word—develop an effective campaign to bring more villages under NPM;*
- *Develop standards for the operational programme and develop a guarantee system for it.*
- *Increase accessibility and availability of inputs—promote planting of trees, herbs and shrubs which are used for NPM.*
- *Branding and marketing—create a brand and a market for agricultural products created through NPM methods.*

14. Illegal traffic of DDT in Tajikistan

Pesticides use in the Republic of Tajikistan

The Republic of Tajikistan, a former part of the Soviet Union, became a sovereign state in 1991. Employing 67 per cent of the working population, agriculture is the main economic sector in Tajikistan. During the time of the Soviet Union agriculture was very pesticide intensive. Various preparations containing organochlorine, organophosphorous and mercury compounds were used. All pesticides in Tajikistan were imported, including DDT which was used for cotton and vegetable crops. The excessive use and poor management of chemical pesticides in agriculture have had severe environmental effects in Tajikistan.

Pesticides storage and disposal conditions

Over the years until 1990, large amounts of pesticides accumulated in storage facilities, as imports surpassed actual demand. These obsolete or banned pesticides have become a serious problem in Tajikistan.

During the Soviet era, numerous storage facilities were built, of which 372 still exist. About 90 per cent of these are in very poor or sub-standard conditions. Many of them are freely accessible and dilapidated—they are not safeguarded, some are missing doors, windows or roofs, as these and other materials have been taken to build new structures. Pesticides, which might contain persistent organic pollutants (POPs) listed in the Stockholm Convention, mineral fertilizers and soil are stored together. The exact location and condition of pesticides stockpiles and contaminated sites are unknown—DDT has not been legal for over 30 years, hence information on the location of stocks has been lost.

There are two main disposal sites for pesticides in Tajikistan—the Vahshski site in the Southern Khatlon region, which contains 7,000 tons of banned or obsolete pesticides on 12 hectares of land, and the Kanibadam site, in the Northern part of the country (Sugd region), which contains 4,000 tons of pesticides. These disposal sites, established during the Soviet period, received between 100 and 300 tons of pesticides per year from Tajikistan, Kyrgyzstan and Uzbekistan. Pesticides in these sites were either incinerated or buried.

Both disposal sites, which contain about 40 per cent of organochlorine pesticides stocks including 3,000 tons of DDT, are in poor condition and do not meet health and safety requirements (for example, there is no fencing). Run-off and condensation water from the sites cause death by poisoning of cattle in neighbouring villages.

After 2001, the high price and scarcity of agricultural chemicals in the country led people to engage in the illegal trade of old stocks of pesticides from storage facilities and disposal sites. The storage facilities and the disposal sites are in urgent need of remediation to ensure that they meet health and safety standards. Tajikistan also lacks required technologies and financial resources to dispose POPs pesticides properly and to clean up contaminated land in an environmentally sound manner.

FSCI project on illegal trade of DDT

In 2008, the Tajikistan NGO "Foundation to Support Civil Initiatives" (FSCI), implemented the project "Illegal trade of DDT and its use in Tajikistan" with financial support from the International POPs Elimination Network (IPEN). Research was conducted in the city of Dushanbe and surrounding communities to gather information on the storage, sale and use of pesticides in Tajikistan and to provide support for an international awareness raising campaign on the need for the sound management of chemicals.

Activities carried out

During the first phase of the project, information on the legal status, production, import, illegal traffic, storage and use of DDT was collected, compiled and analyzed. The Foundation reviewed studies on the incidence of DDT in foodstuffs and the impact of DDT on human health. Field trips to storage facilities and market places were also undertaken to examine storage conditions and take samples of soil and pesticides. Commonly sold pesticides packages labelled "Dust" were analysed at the laboratory in the Institute of Chemistry of the Academy of Science of Tajikistan, and a survey on the use of DDT was conducted in markets and at the Vahsh disposal site. Activities were documented in pictures and video.

In a second phase, public awareness was raised through the dissemination and discussion of the results. The Foundation prepared a publication[34], a video-film and a display of pictures of the sites visited and information leaflets in Tajik and Russian on the pesticides sold in the market. The outcomes of the research were presented in seminars, made available on the Foundation website[35] and distributed to seminar participants, NGOs and the media. The leaflets were also distributed to the public and placed on DDT containers and bags.

Two round table discussions on the safe use of pesticides were held in July and December 2008. The aim of the round tables was to discuss the storage, use and sale of pesticides in Tajikistan and find possible solutions to the current problems. Results of the research on illegal importation and trade of DDT were presented. Participants included lead specialists from government ministries, scientific research institutes, higher educational institutions, NGOs, international organizations and journalists, as well as the Tajik Stockholm Convention Coordinator. Press releases covering the round tables were distributed and the second round table was broadcast on national television.

Outcomes of the research on the situation of DDT in Tajikistan

The research and discussions during the round tables highlighted the following:

1. *During the Soviet era, no attention was paid to the harmful effects and excessive use of pesticides. Overuse has resulted in decreased agricultural yields which contributed to increased poverty among peasants.*
2. *While studies on health impacts of DDT in Tajikistan were undertaken in the 1980s, no recent studies exist.*

34 FSCI: "Pesticides: general questions, saving and using", 2008
35 www.fsci.freenet.tj

3. *Although the use of DDT in agriculture has been illegal since 1970, farmers still use it. Since DDT is not produced in Tajikistan and the Customs Services do not have any data concerning the import of DDT, it is likely that the substance is imported illegally from Afghanistan, Uzbekistan, China and Russia or taken from storage facilities and disposal sites.*
4. *Packages labelled "Dust" are commonly sold at market places mainly by women and children (see pictures). Some of these packages contain DDT in concentrations between 26 and 30 per cent and another chemical substance, which could not be determined with the available laboratory equipment.*
5. *At the Shohmansur market, the preparation labelled "Dust" is kept in regular sacks and is sold by weight (see plates).*
6. *The poor conditions of storage facilities and disposal sites were confirmed. Soil at disposal sites was found to contain isomers of DDT.*
7. *Many farmers know about the potential harm of DDT, but believe they have to use it as they do not know appropriate alternatives.*
8. *During the Soviet era, the import and distribution of pesticides was a centralized process, carried out by a state enterprise "Tajikselhozhimia". Now the state no longer controls the process, and private business and uninformed individuals carry out these activities.*
9. *The Tajik Inter-Agency Committee on Chemical Safety established in March 2003 with the mandate to develop a list of chemicals allowed for use in Tajikistan has not been able to undertake its work successfully and there is no agreement on what should be allowed for use. Progress on developing an approval system, testing requirements, control of production, importation and use of chemicals is very slow and the process has not been transparent.*

Recommendations

The participants at the round table discussions agreed that regulation of chemical substances contributes to achieving the Millennium Development Goals. Their specific recommendations are as follows:

1. *Research on the risks related to the use of DDT, the concentration of contaminants in foodstuffs and water sources near DDT disposal sites and at points of sale should be strengthened in Tajikistan.*
2. *The mass media should be used to inform the public about the risks related to DDT, and in order to prevent its use in agriculture, farmers need to be informed of the advantages of appropriate alternatives.*
3. *Tajikistan needs to re-establish and strengthen state control over the import and use of pesticides, including customs controls. The Inter-Agency Committee on Chemical Safety, government agencies for internal affairs, and customs should actively seek to establish measures to stop the import of DDT and prevent its dumping at disposal sites.*
4. *The Vahsh and Kanibadam disposal sites need to be cleaned up and an appropriate solution for the disposal of pesticides in Tajikistan needs to be found.*
5. *The Ministry of Agriculture should conduct regular training on the environmentally sound management of pesticides and recognize the role of organic agriculture, including use of biological methods and organic fertilizers, in improving agricultural incomes.*

Lessons learned

The project involved various stakeholders including government authorities, representatives of ministries and other governmental bodies, business, scientific community, NGOs and the general public. The partnership that was created was considered very successful.

Next steps

The government of Tajikistan is preparing several projects in order to address the situation of pesticides storage and disposal sites. One of them, the remediation of the Vahsh disposal site is currently underway with support from GEF and the World Bank. The project also seeks to reduce farmers' reliance on POPs pesticides by building the capacity of farmers to change to more environmentally friendly alternatives.

15. Solid waste for money and the environment, Douala, Cameroon

Introduction

Solid waste management has been identified as one of the major environmental concerns of the city of Douala. Inadequate collection and disposal of solid waste is affecting and changing the environment adversely in many ways. Plastic waste for example is carelessly buried into the soil which modifies soil texture by making it less porous, but more frequently burnt in the open air resulting in the release of persistent organic pollutants (POPs). Pollution of surface and underground sources of drinking water through leaching from abandoned or poorly disposed waste is very common. Uncollected solid waste also attracts insects and rodents—vectors of certain gastrointestinal and parasitic diseases or ends up being washed into the gutters, blocking them and provoking floods. The Cameroon environmental law 96/12 (5 August 1996) regulates the handling of waste and includes requirements for hazardous waste, recycling, treatment and disposal methods. It also has provisions to encourage the reuse of materials through recycling and for training and public awareness.

The Douala IV Urban Council area is seated in Bonaberi which is one of two big ports into the Douala metropolitan area. It is the location of the Douala seaport which facilitates the export of locally produced goods to the outside world and the import of goods into Cameroon and the Central African sub-region. Bonaberi also has an important industrial zone with an increasing number of facilities such as plastic factories, breweries and local cash-crop processing units. Most youth and women in Bonaberi have an annual income of less than 120,000 CFA (or about USD 250).

The problem

The low income communities (more than 75 per cent of the total population) in the Douala IV municipality live in areas poorly served by municipal refuse services. Uncontrolled disposal of the ever increasing amount of solid wastes in Douala poses health and environmental risks. The potential economic benefits of sorting and separating various kinds of plastic and glass waste are not fully realized.

The Douala City Council spends about 7 billion per year on the collection and transportation of municipal waste to dumpsites. It is estimated that non-hazardous glass waste, which includes broken window louvres, vehicle windows and bottles, is produced at a rate of 10 tons per day in the Douala IV council area. Plastic waste production, which includes wrapping materials, containers, drums and plastic buckets (but not tires), is estimated to be 20 tons a day. Biodegradable waste (which accounts for the largest fraction of waste) could be composted and made available for agriculture. This would help improve the fertility of the sandy soils in the Douala municipality. The diversion of these wastes would reduce the amount of waste to be disposed of, lowering costs and extending the lifespan of the landfill.

The approach

The non-governmental organization Environmental Defence and Consumer Interest Forum (EDCIF), is implementing the solid waste minimization and valorisation project with initial funding from the UNDP-GEF Small Grants Program. EDCIF is collaborating with the Douala IV Urban Council and other stakeholders, including women, youth and organized groups, are also involved. The project has the following components:

- *Sorting*
- *Transportation*
- *Temporary storage*
- *Sale or exchange with household consumables*
- *Recycling of plastic and glass collected from households, streets, bars and other enterprises*

Meetings with traditional authorities, quarter heads and heads of households were held to gain support for the initiative and to identify 20 collection points and a temporary storage (transition warehouse) in poorly-served and low income areas. Radio announcements, posters and brochures were used to raise awareness among public, waste collectors and quarter heads of the location of collection points including a warehouse. Recyclable plastic waste is separated and the organic matter collected for composting.

Outcome

Five neighborhoods (Ndobo, Grand Hangar, Quatre Ètages, Mambanda and Quartier Bilingue) which accounts for about 75 per cent of the communities that are poorly served by the municipal authority are involved in this initiative. The project is generating employment for youth and women in the targeted neighbourhoods and helping to increase recycling. It is expected to reduce the amount of waste that the municipality has to dispose of by 30 per cent.

An awareness raising campaign and the distribution of bags to separate waste into different types (plastics, organic waste and glass.) targeted at households, women, youth and six secondary schools is already curbing the uncontrolled dumping and burning of plastics. The waste is separated into various categories and quality and, then transported to recycling facilities and are transformed into new glass bottles and plastic containers for yoghourt and construction plastic pipes.

Sixty one waste collectors are being recruited, trained and equipped with protective gear. They will be involved in the sorting of recyclable materials (glass and plastics). Twelve tons of glass and six tons of plastics have already been recovered and sold to local companies for recycling. Other companies have also shown interest and outlined their requirements for the quality of the materials they can use. At the time of writing, the composting programme for biodegradable waste had not yet begun.

Impacts

The project has had a positive impact on the community. For example, enhanced awareness helped the Bonassama Market in Mambanda to win the competition for the cleanest neighbourhood in Douala. There is less litter in the targeted areas, for example on the grounds of the National Bilingual College. Environmental education has increased in 6 schools thanks to the project. As more and more schools become engaged with the project, more children will be sensitized to environmental issues. In turn, they can talk to or train their parents to foster change in the community as a whole.

A market has been found for the recovered materials. Revenues from the sales of waste to recycling companies are used to compensate waste collectors. Some of the revenues are also ploughed back into the project to help its sustainability. The project has provided jobs to 61 youths in the neighbourhood with the associated social benefits of employment.

Future challenges

Changing the behaviour of youth and women and obtaining stakeholder approval has been critical in ensuring the success of the waste minimisation and valorisation program. Behaviour change followed a six step model adopted by EDCIF:

1. Creating attention
2. Increasing understanding
3. Transforming the old attitude
4. Generating a statement of intent
5. Changing old behaviours
6. Maintaining new behaviour

The biggest challenge ahead is that residents are now aware that the waste has a value and this will make its collection for free difficult.

A presentation of the project during a workshop of municipal officials and civil society resulted in interest at the metropolitan level and in the other five local municipal councils of Douala in extending the project to other areas of the city. Discussions to achieve this are ongoing with the municipal government and donors. In addition to the composting, the inclusion of a biogas component is being explored.

The framework law of environmental management in Cameroon, especially in the context of the 2004 law of decentralisation which will be effective as of January 2010, needs to include and formalise recycling activities of the informal sector.

Encouraging the government and securing support for a policy on persistent organic pollutants in Cameroon is needed. This could include:

- *Development of guidelines for appropriate POPs national policy formulation.*
- *Procedures for developing and implementing supportive legislation.*
- *Institutional issues for POPs control and management.*
- *Planning tools and management guidelines to support the work of decision makers and environmental (waste) managers.*

Conclusion

The effective management of waste collection, storage, transport, treatment and disposal is a major concern not only to the industry producing such waste, but to the government due to the potential impact of waste on the environment and public health. The solid waste minimization and valorisation project in Douala IV is an example of how to improve the collection of municipal wastes, recover useable materials, integrate the informal sector into the overall management of municipal wastes, and address the open burning of waste, an important source of unintentionally produced POPs in developing countries.

16. The Chemical Information Exchange Network

Introduction

Chapter 19 of Agenda 21 adopted at the United Nations Conference on Development and the Environment in Rio in 1992 identified the access to information on chemicals, including pesticides, as critical to capacity building for the sound management of chemicals and the achievement of sustainable development: Every person should have access to information about the environment, be able to participate in decision-making processes affecting the environment, and have access to justice, including redress and remedy. These three "access principles" outlined in Principle 10 of the Rio Declaration are a benchmark for equitable and environmentally sound decision-making.

The sound management of chemicals requires adequate information about the nature, effects, use and control of substances. This information exists in a variety of sources, but these are not always readily available to those who need it. Since 2000, UNEP Chemicals has implemented the Chemical Information Exchange Network (CIEN) project in about 50 countries worldwide and has provided training and electronic equipment to facilitate information access and exchange. In addition, UNEP Chemicals collaborated with the International Environmental Technology Centre (IETC) to introduce the use of Environmentally Sound Technology Information System (ESTIS) as a tool to build national electronic portals for access, exchange and dissemination of chemical information on the Web.

Background

OBJECTIVES

The CIEN project aimed to enhance the capabilities of countries to obtain and share the information needed for their national decision-making, in particular, the sound management of chemicals. It created a framework for access to, and exchange of, chemical information to support related national, regional and international activities. The CIEN project goals were as follows:

- *To eliminate barriers to information exchange.*
- *To facilitate access to technical information on chemicals that can be found on the Internet.*
- *To enhance communication among national and sub-regional stakeholders.*
- *To create synergies between national agencies involved in chemicals management.*
- *To strengthen national capacity for the environmentally sound management of chemicals and participation in international activities and agreements for the protection of human health and the environment.*

APPROACH

Since Internet access was not very widespread, Africa was selected as a priority region. The focal points of the Basel, Rotterdam and Stockholm Conventions and of the Intergovernmental Forum on Chemical Safety were contacted and a national CIEN focal point responsible for implementation of national activities was identified.

To promote national, regional and sub-regional networks, institutions that were identified as national centres were provided with resources (computers, Internet access, reference materials) to facilitate access and exchange on information. As part of this effort, the U.S. Environmental Protection Agency and UNEP developed a website where information about CIEN and links to project partners and information sources on chemicals could be found.

Regional events were also held to strengthen collaboration and create synergies among governments and other stakeholders among neighbouring countries in various regions—CEMAC, ECOWAS and SADC. These demonstrated the use of ESTIS as a tool to promote the networking and information exchange. The Centro de Gestión Tecnológica e Informática Industrial (CEGESTI) provided the mechanism for a regional approach in Central America.

Project activities

At the national level, the project activities included a stakeholder meeting, an Internet training workshop and the initiation of a chemical information exchange network. To avoid any duplication of effort and create and develop synergies, CIEN used existing activities developed by others institutions. This was, for example, the case of the United Nations Institute for Training and Research (UNITAR) National Profile.

STAKEHOLDER MEETING

To optimise the limited funds available to the project the active involvement of stakeholders was crucial. This approach uses the strengths of different partners (the haves and the have-nots) to create synergies. The core group consisted of the focal points of the chemical Multilateral Environmental Agreements (MEAs), such as Basel, Rotterdam and Stockholm Conventions. In addition other organizations including government agencies, environmental NGOs and others who could provide their time and expertise to build the knowledge base were invited to take part.

The representatives from the corresponding institutions were invited to review the existing national information infrastructure and identify gaps and needs. Specifically, participants were encouraged to:

- *Discuss needs and priorities in terms of information exchange.*
- *Suggest ideas on how to meet the identified chemical information needs as well as how to implement networking plans.*
- *Discuss a national chemical information charter, identify other national partners and agree on national needs.*
- *Provide input to the electronic-readiness assessment of each of the key partner chemical management institutions, to ensure the best use of the electronic equipment provided by this project.*
- *Discuss project implementation and follow-up.*

The main expectation from these meetings was to develop an agreement or Information Charter to guide the implementation of CIEN at the national level.[36]

36 http://www.sisei.net/nationaux/benin/histo-projet/Charte-Informationnelle.pdf

CIEN TRAINING COURSE

The CIEN course provided an overview of the challenges to the sound management of chemicals in developing countries, and skills and knowledge in using the Internet to:

- *Access technical and legal information on chemicals for their sound management.*
- *Access specialized data bases.*
- *Access information sources from specialized institutions.*

The workshop also included discussions on a multi-stakeholder approach to resolving issues of chemical management, harmonization of data, information dissemination and the role of the Internet as a tool for improving the environmentally sound management of chemicals. This course provided skill to access information that facilitates decision-making and increased awareness of the potential of networking among various stakeholders to improve the quality and quantity of information available and to facilitate joint problem solving (*see box IV.16.1)*.

Box IV.16.1. Participant Comments

Fantastic, rewarding, fulfilling, exhilarating, inspiring. To see a group of professionals, who last year did not know what we meant by "double click", now doing capacity building and creating a periodic newsletter, selecting outreach issues and finding the resources on the Internet?

Amazing. These developing countries need hand holding. These things would not have been accomplished without our efforts or without our follow up visit to Ghana. An annual visit and/or mentorship program is now needed. Each country would benefit from regular emails,

I continue to provide articles and emails to the countries I have trained. OIA should encourage and follow up with the other CIEN trainers to do the same.

The return from just a little moral support is staggering! There is so much to do in these countries. The environmental concerns can be overwhelming. But a positive attitude, an educated U.S. Contact, a good teacher/mentor and some encouragement goes a long way! When can I go again?!

ESTABLISHMENT OF A CHEMICAL INFORMATION EXCHANGE NETWORK

ESTIS is a Web-based tool that facilitates the creation of websites and databases and the exchange of information among partners. It promotes the flow of information and collaboration between various websites at the national, regional and international levels. ESTIS provides users with a simple on-line website builder designed for non-technical people. It enables users to develop their own websites in their own language without the need of specialized web designing skills. It also allows the website owner to link their site to others that share the same linguistic or regional grouping and allows for a single search portal across a defined group of sites. An advantage of ESTIS is that since the tools were developed by UNEP, the service is free to the end-user. ESTIS is a system that can be used and promoted worldwide to improve capacity in exchanging chemical information. The use of ESTIS was introduced at regional workshops. Additional training at the national level was also provided as a follow-up activity. For more information see the CIEN website.[37]

37 http://www.estis.net/communities/cien/

Table IV.16.1. Status of CIEN implementation worldwide (August 2009)

CIEN : A network of countries worldwide ...

UNEP

Region	Countries	Stakeholders involved	Officials trained/ Webmasters
Southern African Development Community (12)	Angola, DRC, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, United Rep. of Tanzania, Zambia, Zimbabwe (and) Madagascar	360	195/17
Central Africa Economic and Monetary Community	Cameroon , Chad, Sao Tome, Congo	130	91/8
Economic Community of West Africa(14)	Benin, Burkina Faso, Cape Verde, Cote d 'Ivoire, The Gambia, Ghana, Guinea, Bissau Guinea, Mali, Niger, Nigeria, Senegal, Togo (and) Mauritania	420	280/54
East Africa countries	Djibouti, Kenya, Rwanda	103	60/21
Other African countries (2)	Morocco and Rwanda	70	50/20
Asian countries	Cambodia, Philippines	66	50/18
Central America(8)	Belize, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama	231	120
Total	**46 countries**	1380	846/ 138

What was achieved

The project has been implemented in almost 50 countries involving a total of 1,380 officials through national stakeholder meetings. Of these officials 846 received training on access to information on the Internet, and 138 webmasters were trained on the use of ESTIS. More than 100 computers were provided to countries as part of the project (*see table IV.16.1*).

In many countries, the stakeholder meeting fostered the development of an "information charter", which defines how information is exchanged, disseminated and managed, and what the responsibilities of various stakeholders are. This provided an initial road-map to strengthen the institutional infrastructure and, in certain countries, it led to formal interdepartmental arrangements or agreements on information exchange.

CIEN offers many opportunities for integration, adaptation and/or interaction, for example:

- *CIEN is being used to build the capacity of the POPS Monitoring Regional Organization Group of the Stockholm Convention to collect and process data (http://jp1.estis.net/sites/rog/).*
- *CIEN provides a platform where national stakeholders can exchange information on harmful substances and hazardous wastes: http://jp1.estis.net/sites/kenya.*

- *CIEN provides a electronic platform were people in charge of the national environmental policy can exchange ideas and views on the sound management of Chemicals: http://www.reic-cien.com/dokeos/.*
- *CIEN developed a e-learning platform that can serve various communities and projects, including UNEP programme: http://www.reic-cien.com/dokeos.*

National CIEN activities can facilitate the establishment of national information system for reporting as requested under various MEAs such as the clearing house of the Stockholm Convention. The report "Clearing-house mechanism for information exchange on persistent organic pollutants" (UNEP/POPS/COP.4-19) highlights the role of CIEN as a tool which can be used to exchange information under the Stockholm Convention.

Lessons learned and conclusion

Through facilitated discussions, the CIEN project highlighted that the sound management of chemicals needs collaboration among various government agencies and other stakeholders. It was successful in increasing the awareness of the Internet as a tool for obtaining information and provided an opportunity for selected individuals to become more proficient in accessing chemical information. Through the provision of equipment and Internet subscriptions it also made this information more readily accessible in countries that lacked such facilities. Feedback and follow-up communication from the participants has shown repeatedly that this type of training is essential to allow developing countries and countries with economies in transition to participate in the international activities related to hazardous substances and hazardous wastes and thus, the sound management of chemicals.

The project showed that a significant impact can be achieved with a limited investment of resources, time and staffing. With limited funding, the CIEN project was implemented in nearly 50 countries across Africa and Central America. The project is currently underway in Asia. It involved more that 1,500 senior level officials and key cabinet members. Under the project, more that 120 institutions have now been equipped and connected to the Internet. In addition, 20 countries were then trained on how to use ESTIS for developing their own webpage to serve as a portal to national information, to create links to key sources of information on chemicals and to facilitate networking.

It is also important to note that decisions which incorporate local and public inputs generally result in outcomes that are more effective and environmentally sustainable than those that do not. Public pressure will often encourage action at the governmental level. In addition to involving government institutions, the CIEN program made efforts to involve NGOs. A network like CIEN provides a mechanism for greater openness and participation. Empowering governments to use their own tools and structures to create their own network will help ensure follow-up and sustainability of such the efforts.

CIEN was a cost-effective project. It had many applications and potential for future expansion. It demonstrated how improved access can easily help countries close the information gap and facilitate the promotion of sustainable development, including the sound management of chemicals. With the experience gained through CIEN, countries are now in a better position to establish their own information system and to meet obligations under MEAs and, therefore, be effective actors in the implementation of the Strategic Approach to International Chemicals Management (SAICM).

17. The Responsible Care Global Charter and the Global Product Strategy in action: Sound chemicals management

Executive summary

The Responsible Care Global Charter (RCGC) and the Global Product Strategy (GPS) are programmes developed by the International Council of Chemical Associations (ICCA) as part of its commitment to the Strategic Approach to International Chemicals Management (SAICM). The objective of the programmes is to enhance stewardship best practices within the industry and throughout the product chain. The Responsible Care Global Charter reflects a commitment by 53 industry associations. About 80 per cent of the world's 110 top chemical producers and a total of 155 companies are subscribed to the Charter. ICCA recently extended the Responsible Care network to include Russia and other countries in Eastern Europe, established a pilot project with Chinese national companies, and is actively exploring an initiative within the Gulf region.

The aim of the Global Product Strategy (GPS) is to promote the safe use of chemical products working within the context of Responsible Care to enhance product stewardship throughout the value chain. This agreement is a genuine breakthrough and a giant step forward for global chemical safety. GPS is intended to reduce existing differences in the safe handling of chemical substances between developing, emerging and industrialized countries and to ensure that chemicals are not handled incorrectly due to a lack of information or incorrect assessments, thus endangering people and the environment. The initiative thereby meets all the requirements of effective, efficient, modern chemicals management.

ICCA believes that the global chemical industry is part of the solution for an improved environmental performance and a more sustainable society. ICCA is convinced that a balanced combination of regulations and voluntary industry programs is the best way to achieve the safe management of chemicals.

Challenges

In today's world of globalised product flows, problems related to product safety are no longer restricted to their country of origin. Our world is drawing closer together, not just economically but also on political and environmental issues. The chemical industry has expanded and intensified its voluntary programs for demonstrating responsible handling and marketing of all chemical substances. Taking the concerns of the public seriously and addressing them appropriately is a prerequisite for long-term success and our license to operate.

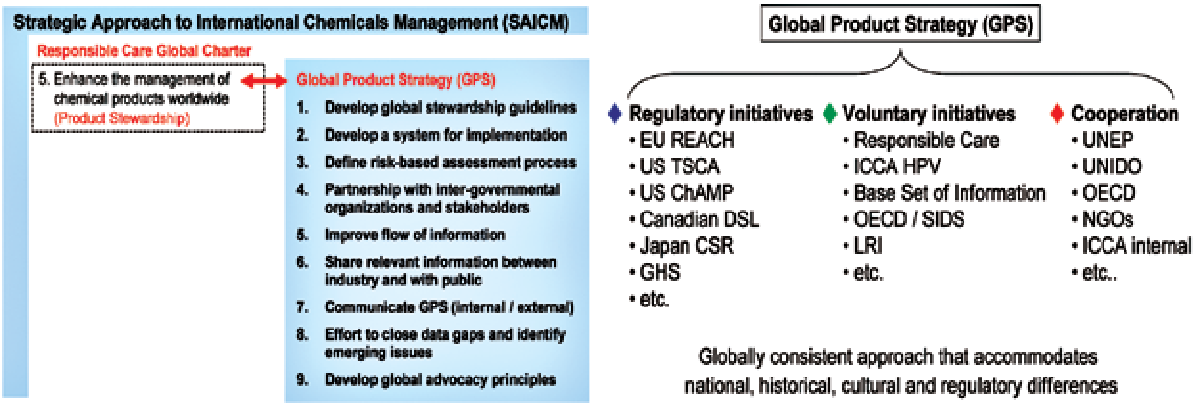
ICCA's contribution to sound chemicals management

In addition to its existing efforts to promote the sound management of chemicals worldwide (including compliance with national and global rules), ICCA publicly launched two voluntary initiatives (*see figure IV.17.1*) as their contribution to the Strategic Approach to International Chemicals Management

(SAICM) at the first International Conference on Chemicals Management (ICCM-1) in February of 2006:

- *The Responsible Care® Global Charter, a renewed commitment to expand the implementation of Responsible Care globally.*
- *A Global Product Strategy, which committed the industry to higher levels of transparency, a sustained commitment to its Long-range Research Initiative (LRI) and global implementation of product stewardship.*

Figure IV.17.1. Responsible Care Global Charter and Global Product Strategy



RESPONSIBLE CARE® GLOBAL CHARTER

The Responsible Care Global Charter (RCGC) is the industry's overarching initiative to go beyond existing programs and address growing public dialogue over sustainable development, health issues relating to the use of chemical products, and the need for greater industry transparency. The RCGC builds on the original Responsible Care program under which companies, through their national chemical industry associations, worked to continuously improve their environmental, health and safety performance. Presidents of 53 associations and Chief Executive Officers from over 150 companies have signed a letter of commitment to the RCGC. Historical accomplishments under Responsible Care have been widely lauded and the launch of the RCGC was described by former UN Secretary-General Kofi Annan as an "inspiring model of self-regulation that other industries should consider following."

GLOBAL PRODUCT STRATEGY

The other major initiative launched in 2006 at ICCM-1 by ICCA was the Global Product Strategy (GPS). GPS is designed to advance product stewardship performance, measure and improve product safety performance, and improve communication and transparency about chemical hazards, risks and appropriate safe handling to the public and along the value chain. As part of its commitment to GPS, ICCA established global guidelines for product stewardship and a process for conducting chemical safety assessments that leads to specific safe management recommendations rather than broad bans and restrictions. This approach allows for the benefits of chemicals while minimizing the potential for adverse impacts to human health or the environment.

Under GPS, ICCA has committed to:

- *Establish a base set of hazard and exposure information adequate to conduct safety assessments for chemicals in commerce.*
- *Share relevant product safety information with co-producers, governments and the public;*
- *Work across the chain of commerce so that suppliers and customers can effectively evaluate the safety of their products and enhance their performance.*
- *Make product safety summaries on chemicals publicly available.*
- *Extend their monitoring and reporting structure by including additional metrics to quantitatively track progress and support continuous improvement in the sound global management of chemicals.*
- *Enhance the global capacity to implement safety assessment practices and safe management procedures, especially in developing countries.*

Objectives of the RCGC and GPS

PROMOTE KNOWLEDGE AND SKILLS TRANSFER IN LINE WITH COMPANIES NEEDS

Resources are a key factor for small and medium sized enterprises (SMEs) in developing countries when implementing RC and GPS. An important objective is therefore to find ways for associations and large companies to support SMEs.

ICCA is continuously engaging in longer-term capacity building efforts to improve the competency of SMEs and developing countries, such as RC/GPS Awareness building workshops, Basic Product Stewardship workshops and Value Chain outreach. Examples for GPS workshops conducted and planned in 2009 include: Bangkok-Thailand, Shanghai–China, Moscow-Russia, Buenos Aires-Argentina, Tokyo-Japan and Varna-Bulgaria. Product safety specialists from leading chemical companies are available during the workshops for training and knowledge transfer. The response to these workshops has been very positive; in particular contributions by speakers from companies who can offer practical examples and extensive experience in implementing Product Stewardship are seen as positive and extremely helpful.

In addition, ICCA has developed a comprehensive set of guidance materials for risk assessment and risk management as part of its GPS implementation efforts. This guidance particularly addresses small and medium sized enterprises in developing economies which may need assistance in the assessment of chemicals regarding their hazardous and exposure potential and to develop risk management measures for safe handling of substances throughout their life cycle (incl. value chain activities). Further support will be available via the ICCA GPS network of experts, who will answer technical questions about risk assessment or on GPS safety summaries.

IMPROVE THE AVAILABILITY OF RELIABLE INFORMATION ON CHEMICALS

Under GPS, a base set of information is gathered for any product placed on the market. This basic information includes physical-chemical parameters, toxicological and eco-toxicological data, and information on use and exposure. For substances with an increased hazard potential or higher exposure of humans or the environment, more information is needed as part of an incremental approach. Relevant information needed for a risk assessment of the chemical will be made available to co-producers and be jointly used by the companies to minimize unnecessary animal testing.

Furthermore, to promote greater transparency, companies will provide the general public and interested stakeholders with information about marketed substances, in an easily understandable format (GPS Safety Summary) and national associations will promote the process. ICCA is currently in the progress to develop a web-based IT-Portal to make the information collected under GPS publicly available. All interested stakeholders will have open access to this portal.

INCREASE RESEARCH ON EXISTING AND EMERGING ISSUES

The objective of ICCA's Long Range Research Initiative (LRI) is to identify and fill gaps in its understanding of the potential risk posed by chemicals and to improve methods available for risk assessment, thereby enabling industry and regulators to make informed decisions based on high quality information. The initiative was launched in 1999 and implemented under the responsibility of three regional centres (US, Japan and Europe). More than USD 200 million have been invested so far. LRI projects seek to:

- *Improve and simplify risk-assessment procedures.*
- *Improve and develop new toxicological and eco-toxicological methods.*
- *Develop and validate in vitro test methods, modelling (e.g. QSAR), and screening methods for assessing e.g. low dose effects, exposure to mixtures and endocrine disruptors.*

The high scientific quality of the LRI results supports the mutual international acceptance of tests, a major breakthrough in minimizing animal testing.

INCREASE AWARENESS ON CHEMICAL MANAGEMENT ISSUES AND INTEGRATE MULTIPLE APPROACHES

ICCA advocates the development of national chemicals management capacities that adhere to common principles and elements in order to foster greater consistency and transparency in regulatory systems. Regulatory convergence (where appropriate) provides greater certainty, and creates an environment in which industry initiatives like the Responsible Care Global Charter and GPS can thrive. GPS was designed to support national, regional and international chemicals management policy expectations. ICCA views GPS as a best practice example which could serve as a basis for the revision of existing regulations in developed countries and for the creation of new policies in developing countries. The ultimate objectives of such policies and GPS are the same: protection of human health and the environment.

ADDRESSING LEGACIES OF THE PAST

ICCA member companies take responsibility to clean up chemical contamination of their facilities. During the past 15 years, the industry has participated in over 25 multi-stakeholder projects in 20 countries, in collaboration with over 30 organizations, leading to the safe disposal of an estimated 10,000 tons of obsolete crop protection products. Via CropLife companies are actively contributing to the Africa Stockpiles Program, a partnership that includes the World Bank, FAO, WWF and the Pesticide Action Network, which seeks to safely dispose of an estimated 50,000 tons of obsolete stocks and associated wastes across the entire continent of Africa in a fifteen year timeframe and to put in place measures to prevent their re-accumulation. In addition, ICCA is currently exploring potential partnerships with other stakeholders such as UNEP to increase its efforts to address legacies of the past.

Case studies on RC and GPS implementation—knowledge transfer in practice

Within the global chemicals sector, capacity building involves activities as diverse as working with stakeholders such as regulators and the authorities to prevent illegal traffic, developing emergency response programs, training distributors on safe handling and promoting technology transfer. Below are two company specific examples out of many (for more information - ICCA Capacity Building brochure at www.icca-chem.org)

1. *How successfully the transfer of knowledge between big, medium and small companies can work and thus improve product safety is shown by the "1+3" project, which BASF initiated in China in 2006. Here, sustainability standards were passed on to partners in the value chain. BASF experts formed a team with three business partners to exchange principles, established practices and experiences in areas like product safety. The project produced a snowball effect, in which the SMEs taking part actively continued the project by each inviting three customers from their value chain to exchange experiences. In this way, in just two years more than 55 companies had taken part in the project. Due to this outstanding success, the "1+3" project was recognized by the United Nations Global Compact in 2008 as a best practice case study.*
2. *Another valuable example is the agreement between MEP officials, UNEP and The Dow Chemical Company signed in September 2008, creating a project designed to support safer production of chemicals and enhance safety management systems in pilot industries. The first of its kind in China, the partnership will also assist organizations charged with improving local awareness and preparedness for industrial environmental emergencies. Lijun Zhang, the Vice Minister of Environment of China, commented, "We face formidable, but reachable goals in China concerning safety and emergency response. This program will draw us closer to where we need to be, in essence, having safer places to live and work."*

Lessons learned

ICCA has identified several obstacles and constraints to achieving its objectives. One of the biggest challenges is the lack of capacity in certain parts of the developing world to effectively manage chemicals. This lack of capacity can take several forms, for example: lack of appropriate expertise, lack of data and scientific information, lack of resources and lack of infrastructure. ICCA is working with other SAICM stakeholders to address these gaps through capacity building and other relevant initiatives.

A further challenge is to ensure effective chemicals management across the supply chain and throughout the product lifecycle. ICCA has made important progress in strengthening product stewardship and developing sustainable business practices through Responsible Care, but more remains to be done both within the industry and through additional cooperation with other industry sectors, governments and other stakeholders, in order to reach the 2020 goal.

Another important lesson learned is that the capability gaps in chemicals management regimes in certain countries have highlighted the need to promote transparent, science-based and cost-effective regulatory regimes around the world, leading ICCA to develop a set of principles for chemicals management systems based on a combination of regulation and industry-led initiatives

Next steps

ICCA is currently exploring potential partnerships with other stakeholders (governments, IGOs and NGOs) such as UNEP to increase its efforts. The chemical industry has a unique role to play in promoting sustainable development. It is committed to preserving our resources for future generations by reducing emissions, conserving energy, and developing sustainable materials, technologies and business practices. In addition to being committed to achieving sustainable outcomes, the industry helps to provide sustainable development solutions for other industry sectors, including energy, information technology, construction and the waste sector. Chemistry and the chemical industry is also instrumental in meeting human needs, including food and clothing, housing, transport and communications. For all of these reasons, the chemical industry has an important role in efforts to meet the Millennium Development Goals.

18. Crop Protection Stewardship: Sound Management of Pesticides throughout Their Lifecycle

Executive summary

CropLife International and its members promote a lifecycle—or stewardship approach—to managing crop protection products that aims to maximize benefits and minimize risks from their use. This helps fulfil the industry's commitment to the International Code of Conduct on the Distribution and Use of Pesticides—the main guidance for management of crop protection products. CropLife International and its members work with a variety of partners to train up to 350,000 thousand people per year in the responsible handling and use of crop protection products and produces numerous guidelines which are distributed around the world.

Challenges and achievements

CropLife International is the global federation representing the plant science industry that develops, manufactures and sells crop protection and plant biotechnology products and services designed to improve the global production of food, feed, fibre and fuel in a sustainable way.

The global federation represents a network of regional and national association in 91 countries across the world and is led by the major R&D-driven plant science companies—BASF, Bayer CropScience, Dow AgroSciences, DuPont, FMC, Monsanto, Sumitomo and Syngenta.

CropLife International's members are committed to safety, stewardship and sustainable agricultural practices that benefit not just the industry, but its millions of consumers and the environment in which we live. As part of this commitment, CropLife and its members have adopted and promote a stewardship approach to managing its products, described as the responsible and ethical management of a crop protection or biotechnology product throughout its lifecycle—from the initial research and development, through distribution and use, to eventual disposal of any waste.

The industry is committed to stewardship of its products and has adopted a 'cradle to grave' concept of managing products. Stewardship is a core element of the industry's business strategy and is reflected across its range of activities; it is not only important to sustainable agricultural production and development, but also to sustainable business. Stewardship is well established for crop protection products—mainly chemicals, but its overall philosophy and principles are also relevant to, and incorporated in, the management of biotechnology products. Stewardship is emphasized within the International Code of Conduct on the Distribution and Handling of Pesticides—the main guidance tool for management of crop protection products—adopted by FAO member countries in 2002 and supported by industry, NGOs and other international organizations such as WHO; adherence to this Code is a requirement of membership of CropLife International.

The seven key elements of stewardship are (*see figure IV.18.1*):

- *Research*
- *Manufacture*

- *Storage, Transport and Distribution*
- *Responsible Use*
- *Integrated Pest Management*
- *Container Management*
- *Management of obsolete pesticide stocks*

Figure IV.18.1. The life-cycle of a crop protection product

Looking at each of the elements in turn:

RESEARCH & DEVELOPMENT

The industry is committed to developing innovative products that can be used safely and effectively with minimal environmental impact. Innovation includes the development of more targeted products that can be used at lower volumes of active ingredient per hectare. Improved formulations, as well as innovative chemistry help achieve this.

To reach the market, plant science technologies must be exhaustively tested in the laboratory and field to ensure that they do not unacceptably impact non-targeted species, soil, water or air, while still accomplishing their intended task. Typically, for a crop protection product, approximately one third of the average of Euro 200 million research and development costs are spent on environmental impact assessments. As well as being an important requirement for registration, it is important for sustainable use.

Research also includes development of appropriate containers that do not leak, avoid spillage and can be effectively recycled (see container management below).

MANUFACTURE

Manufacture of products is subject to tight control. Strict regulations, coupled with effective enforcement are designed to prevent accidental release of chemical products into the environment. CropLife International's member companies are also participants in the Responsible Care® programme or similar local schemes aimed at achieving improvements in environmental, health and safety performance beyond government regulation. Improvements in energy efficiency of up to 40 per cent, reduction in greenhouse gases of up to 76 per cent, improved water efficiency by up to 40 per cent and reduction in waste of up to 63 per cent have all been reported since the 1990s.

STORAGE, TRANSPORT AND DISTRIBUTION

The industry supports and participates in various training programmes and, where appropriate, certification schemes that promote the safe and effective storage, transport and distribution of their products. Global guidelines have been developed and distributed by CropLife International, which form the basis of training programmes for distributors and dealers. Industry associations are active partners in providing training for dealers in crop protection products in several countries; the industry is supportive of government schemes that require training and certification of these dealers. For example, CropLife Egypt has specifically adapted the global training guidelines to provide the required training for certification of dealers in that country. Some countries also require certification of warehouses that store crop protection products—national associations actively support and promote such schemes. In Canada, for example, association members will only deliver products to warehouses certified by the Agricultural Warehousing Standards Association (see http://www.awsacanada.com/AWSA06/). To date over 1,300 warehouses have been audited, with re-auditing required every two years. CropLife International has also distributed across the world several thousand copies of guidelines on safe transport and safe warehousing.

INTEGRATED PEST MANAGEMENT (IPM) AND RESPONSIBLE USE

The plant science industry has endorsed IPM practices for many years, and has publicly declared its commitment to promoting IPM. All CropLife International member companies support and abide by the definition of IPM put forth in the International Code of Conduct on the Distribution and Use of Pesticides:

IPM is the careful consideration of all available pest control techniques and subsequent integration of appropriate measures that discourage the development of pest populations and keep pesticides and other interventions to levels that are economically justified and reduce or minimize risk to human health and the environment. IPM emphasizes the growth of a healthy crop with the least possible disruption to agro-ecosystems and encourages natural pest control mechanisms.

The responsible use of crop protection products ensures that their benefits are maximized, while risk to human health and the environment is minimized.

An elementary principle of effective IPM is to develop pest control strategies that take into account all relevant control tactics and locally available methods, and is sensitive to the local environment and social needs. IPM involves careful observation of the crop and an understanding of the impact of both beneficial and pest species and the effect of control operations on their interaction. The successful user of IPM will evaluate the potential cost effectiveness of each alternative as well as the whole control strategy. IPM includes selection of appropriate plant varieties, including those developed through biotechnology, as well as agricultural practices that help ensure a “healthy crop”. IPM is included within the wider concept of Integrated Crop Management and Good Agricultural Practice (GAP), which includes management of the whole farming system—for example proper land preparation, water and nutrient management, as well as habitat management.

One of the industry's most visible stewardship activities is the ongoing "Safe Use" programme, which provides training in IPM and the responsible use of crop protection products. This programme has been in operation for more than 10 years in Africa, Asia and Latin America and has trained over 2 million individuals. National programmes and companies have trained tens of thousands more. Elements of the programme include when and how to control pests within an IPM system and how to safely and effectively apply crop protection products if they need to be used. The aim is to reduce pest numbers to acceptable levels—not to eradicate the pest—whilst minimizing impacts on beneficial insects and other non-target organisms, as well as to avoiding unacceptable risks to the environment and residues on the crop. Training also concentrates on how to protect farm workers and others from unacceptable risk when using crop protection products.

These programmes have often been carried out in partnership with other stakeholders. Globally, CropLife national associations work with over 100 different partners, including national and local agricultural departments, research centres, NGOs and international donors. Approximately 250,000–350,000 people are trained each year in programmes covering approximately 50 countries, including several thousand trainers, who go on to train more people.

CONTAINER AND OBSOLETE STOCKS MANAGEMENT

The industry supports various schemes for management of empty containers of crop protection products. The ultimate aim is to prevent contaminated containers being discarded into the environment or used for storage of food or water and for all containers to be recycled in an appropriate manner. However, it is recognized that this will not be achievable in all countries, at least in the short term. A minimal requirement that is actively promoted is the "triple rinsing" of containers, where they are washed with water three times prior to appropriate disposal or recycling (see www.usagrecycling.com/triple.html). In some countries, effective recycling programmes are already in operation, for example Brazil, Canada and Belgium—where up to 80-90 per cent of containers are recycled. In 2008 over 43,000 tons of used containers were collected in 30 countries; additional pilot schemes have been established in 19 countries.

Obsolete stocks of crop protection products are those that are unfit for further use or for re-conditioning. Stocks of crop protection products become obsolete mostly because of poor long-term storage during which the product and/or its packaging degrades to a point where it is no longer useable and cannot be cost–effectively reconditioned. However obsolescence may also arise because a product has been de-registered locally or banned internationally. Obsolete stocks can be disposed of efficiently and safely if skilled resources are brought together. CropLife International and its leading companies have worked actively on this issue for more than a decade, in partnership with national governments, international organizations, donors and NGOs, and have facilitated disposal projects in over 25 countries and contributed to the safe disposal of over 5,000 tons of obsolete products from developing countries and promoted initiatives where over 5,000 tons of obsolete stocks have been collected from farmers in developed countries.

We continue to seek partnerships to deal with the overall problem; one such partnership is the African Stockpiles Programme (ASP). The ASP is a multi-stakeholder partnership, which includes the World Bank, FAO, WWF, Pesticide Action Network and CropLife, to dispose of all obsolete stocks and contaminated waste in Africa in an environmentally sound manner. It also aims to provide appropriate capacity building to prevent future build-up of obsolete stocks—for example through appropriate warehousing and stock management. A further important element of the proposed programme is the continent-wide reduction of environmental and health risks by "making safe" leaking and the most hazardous stocks through repackaging and appropriate storage prior to disposal. (See www.africastockpiles.org.)

Lessons learned

It is apparent that the elements in the stewardship approach are not isolated, but are related and overlap—thus appropriate research and design of containers is a requirement for effective recycling; good storage and stock control helps prevent build up of obsolete stocks; development of selective crop protection products, and new varieties through biotechnology, provide a wider range of tools available for use in IPM strategies. The industry therefore supports the promotion of stewardship as whole, rather than isolated elements—although there is recognition that at the local level one element may take precedence to address a particular issue.

It is also clear that no one group can meet all of these challenges, and that we must work together in partnership to provide lasting improvements in people's livelihoods and the environment. This is especially true as one moves through the lifecycle—Research and Development and Manufacture is closely controlled by the industry, but as products move through the lifecycle more and more stakeholders become involved, for example distributors, retailers, users and waste management companies. The Plant Science Industry has to lead and influence through development and demonstration of best practices, distribution of guidelines and working in partnership with the other stakeholders. The role industry plays to support sustainable development, and the need to underpin this with sustainable business practices is recognized, as is the need to continually improve the activities and impact, based on lessons learned by industry and others. The industry is therefore proactive in developing new initiatives, and seeks partnerships with other stakeholders. To be successful, these partnerships must be built on transparency and mutual trust where all have a sense of "ownership" in the programme.

Annex 1: List of chemicals of international concern

Persistent Organic Pollutants (POPs):

POPs are a group of compounds that remain intact in the environment for long periods, become widely distributed in nature and accumulate in the fatty tissue of humans and wildlife. Exposure to POPs can lead to serious health effects including certain cancers, birth defects, dysfunctional immune and reproductive systems, greater susceptibility to disease and even diminished intelligence. The first 12 POPs under the Stockholm Convention were aldrin, chlordane, dieldrin, endrin, heptachlor, hexachlorobenzene, mirex, toxaphene, polychlorinated biphenyls (PCBs), DDT, PCDD (dioxins) and PCDF (furans). In May 2009, nine new chemicals were added: alpha, beta and gamma hexachlorocyclohexane, chlordecone, commercial penta- and octa- brominated diphenyl ethers, pentachorobenzene, hexabromobiphenyl and perfluorooctane sulfonic acid (PFOS), its salts and perfluorooctane sulfonyl fluoride.

DDT

DDT (1,1,1-trichloro-2,2-bis(p-chlorophenyl)ethane) is a pesticide that was widely used in agriculture and public health. DDT is often used to refer to related compounds DDE (1,1-dichloro-2,2-bis(p-chlorophenyl)ethylene) and DDD (1,1-dichloro-2,2-bis(p-chlorophenyl)ethane). DDE and DDD are present as contaminants in technical grade DDT and are also breakdown products of DDT. The Stockholm Convention allows the use of DDT for use in public health for disease vector control as recommended by and under the guidance of the World Health Organization (WHO). The WHO recommends the use of DDT for indoor residue spraying only to control, in particular, the anopheles mosquito that carries the malaria parasite.

DDT and related compounds are very persistent in the environment. Half of them can be found in the soil 10-15 years after application. They are also transported large distances and have been found in the Arctic and Antarctic environment where they have never been used. DDT accumulates acutely in fish and marine mammals (such as seals and whales), reaching levels many thousands of times higher than in the surrounding water. DDT and its metabolites have been detected in food from all over the world. For most people, food is the greatest source of exposure.

DDT is not very toxic to humans. However, its persistence and accumulation has given rise to concern in relation to possible long-term impacts. While a wide range of effects have been reported in laboratory animals, these have not been confirmed in human studies. There is some evidence that DDT may disrupt reproductive and endocrine functions, and studies in animals have shown that oral exposure to DDT can cause liver cancer. The World Health Organization is currently undertaking an updated human health risk assessment of DDT, to be finalized in 2010. Several harmful effects in wildlife populations have been linked to DDT: these include the thinning of eggshells in birds, feminization and altered sex-ratios, and impacts on the nervous system and on behaviour.[38]

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38 Source: An Assessment Report on: DDT, Aldrin, Dieldrin, Endrin, Chlordane, Heptachlor, Hexachlorobenzene, Mirex, Toxaphene, Polychlorinated Biphenyls, Dioxins and Furans, IPCS; Public Health Statement for DDT, DDE, and DDD, ATSDR, 2002; The Use of DDT in Malaria Vector Control, WHO, 2007.

Dioxins and Furans

Polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs), often referred to simply as dioxins and furans, have never been used or manufactured for other than laboratory purposes.

Because these chemicals exist throughout the environment, almost all living creatures, including humans, have been exposed to them. Exposure arises mainly through fatty foods, including breast milk, but can also arise from accidental releases or in workplaces.

Much of the information on the toxicity of these chemicals is based on extensive studies in experimental animals of the most toxic member of the family – 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD). TCDD and related compounds can produce a wide variety of effects in animals and might produce many of the same effects in humans.

The International Agency for Research on Cancer (IARC) identified 2,3,7,8-TCDD as the most toxic of all dioxin compounds, and as carcinogenic to humans, based mainly on studies of cases involving heavy accidental or occupational exposure. Animal studies have also shown an increased risk of cancer from long-term exposure to dioxins and furans as well as a wide variety of reproductive and developmental effects, including reduced viability, structural alterations, growth retardation and functional alterations. There is also evidence of neurobehavioural effects and effects on immune and various endocrine functions, including those of the thyroid. Because of this evidence in animals, particularly at high doses but in some cases at doses close to those with relevance for human beings, scientists are concerned about the potential for humans to show the same effects, especially those on developing children that result from prenatal exposure.[39]

Endosulfan

Endosulfan is an organochlorine compound commonly used as an agricultural insecticide. It comes in two forms, alpha (α) and beta (β). In the environment it transforms into endosulfan sulphate.

Endosulfan and its transformation products have been found at concentrations of potential concern at some distance from where they were applied. Endosulfan is also found in remote areas, including the Arctic and Antarctic, evidence that it has enough persistence and transport potential to move around the planet.

The toxicity and ecotoxicity of endosulfan and its metabolites is well documented. It is highly toxic to aquatic and terrestrial animals, including humans. It shows acute and chronic effects at relatively low levels of exposure to both invertebrate and vertebrate animals. Endosulfan affects the central nervous system and it may cause endocrine disruption and affect the immune system.[40]

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39 Source: Guidelines on BAT and Guidance on BEP December 2006.

40 Source: Endosulfan Draft Risk Profile. POPs Review Committee, Stockholm Convention on Persistent Organic Pollutants, July 2009.

Lindane

Lindane has been used as a broad-spectrum insecticide for seed and soil treatment, leaf applications, in tree and wood treatment and against external parasites such as ticks and flees in both veterinary and human medicine. The manufacture of lindane results in the production of by-products of two related chemicals – alpha- and beta-hexachlorocyclohexane – which are also of concern.

Lindane can be found in all environmental compartments; it has been detected in air, water, soil sediment, aquatic and terrestrial organisms and food worldwide, including in human blood, fatty tissue and breast milk in different countries. Levels of lindane in the environment in colder regions is often higher than in warmer parts of the globe.

Lindane is highly toxic to aquatic organisms and moderately toxic to birds and mammals following acute exposures. There is also evidence of chronic effects to birds and mammals – studies have shown effects on reproduction such as reduction in egg production in birds. Some effects seen in these studies suggest that lindane may disrupt the endocrine system. Laboratory studies have found lindane to have adverse effects on development, the liver, and the nervous and immune systems. The International Agency for Research on Cancer (IARC) has classified lindane as possibly carcinogenic to humans. Exposure of children and pregnant women to lindane is of particular concern from its use to treat scabies and headlice, and its presence in breast milk.[41]

PCBs

Polychlorinated biphenyls (PCBs) have been used as coolants and lubricants in transformers, capacitors and other electrical equipment because they do not burn easily and are good insulators. Among other things, products that may contain PCBs include old fluorescent lighting fixtures and electrical devices with PCB-capacitors. PCBs can also be released as a by-product of combustion and industrial processes.

The most commonly observed health effects in people exposed to large amounts of PCBs are skin conditions. PCB exposures in the general population are not likely to result in skin and liver effects.

Studies in exposed workers have shown changes in blood and urine that are linked to liver damage. In two incidents, each involving about 2,000 cases, Japanese and Taiwanese people were exposed to high concentrations of PCBs and furans through consumption of contaminated rice oil. When compared to the general population, the people exposed were found to have 2-3 times the expected number of fatal liver disease.

Most of the studies of health effects of PCBs in the general population have looked at children of mothers who were exposed to PCBs. PCBs may be associated with developmental or endocrine effects. Women who were exposed to relatively high levels of PCB in the workplace or ate large amounts of fish contaminated with PCB had babies that weighed slightly less than babies of women who did not have these exposures. Babies born to women who ate PCB-contaminated fish also showed abnormal responses in tests of infant behaviour. Some of these behaviours, such as problems with motor skills and a decrease in short-term memory, lasted for several years.

41 Source: Lindane Risk Profile. Adopted by the POPs Review Committee, Stockholm Convention on Persistent Organic Pollutants, November 2006.

IARC has determined that PCBs are probably carcinogenic to humans. A few studies of exposed workers have indicated that PCBs are associated with certain kinds of cancer in humans, such as cancer of the liver and biliary tract. Rats fed food containing high levels of PCB for two years developed liver cancer.[42]

PFOS

Perfluorooctane sulfonate (PFOS) is commonly used as a salt in some applications or incorporated into larger polymers. PFOS can be formed by degradation from a large group of substances, referred to as PFOS-related.

PFOS-related chemicals are used in a variety of products, including as surface-treatments of fabric for soil/stain resistance, as part of a sizing agent formulation in coating of paper and in specialised applications such as fire fighting foams. They can be released to the environment during their manufacture, during their use in industrial and consumer applications, and from disposal of the chemicals or of products or articles containing them after their use.

PFOS is persistent in the environment and has been shown to bioconcentrate in fish. The only known condition whereby PFOS is degraded is through high temperature incineration. PFOS also travels large distances in the environment and is found in the Arctic biota far from its sources.

PFOS is toxic to mammalian species. Repeated exposure damages the liver and increases mortality; newborns may be more sensitive to these effects. Studies of exposed workers have shown an association between PFOS and the incidence of bladder cancer; an experimental study in animals has show that exposure to PFOS results in liver and thyroid tumours. PFOS appears to be of low toxicity to fish but more toxic to other aquatic organisms. There is evidence of high acute toxicity to honey bees.[43]

Polybrominated Flame Retardants

Polybrominated diphenyl ethers have had a wide range of uses, including in polyurethane foams and plastics for electronic equipment. They are a class of substances used as flame retardants that are physically combined with the material being treated. This means that they retain their chemical structure in the product. The physical, chemical and toxicological properties of the compounds vary depending on the form and bromination level of the specific substance.

Brominated diphenyl ethers are of concern because they are persistent, bioaccumulate and are transported long distances in the environment. Monitoring data in remote areas shows evidence of the long transport range of these compounds. The degradation of brominated diphenyl ethers in the environment and biota is a key issue as compounds with higher number of bromine atoms are converted to forms with less bromine that are possibly more toxic. Some brominated diphenyl ethers have been measured in wildlife at levels that are similar to those where adverse effects have been noted in experimental animals.

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42 Source: Guidelines on BAT and Guidance on BEP December 2006

43 Source: Perfluorooctane Sulfonate Risk Profile. Adopted by the POPs Review Committee, Stockholm Convention on Persistent Organic Pollutants, November 2006; Hazard Assessment of Perfluorooctane Sulfonate (PFOS) and its Salts, Organisation for Economic Co-operation and Development, Joint Meeting of the Chemicals Committee and the Working Party on Chemicals, Pesticides and Biothechnology, Paris, November 21, 2002.

There is incomplete understanding of the toxicology of brominated diphenyl ethers, either individually or as a mixture. Specific studies have reported hazards such as delayed neurotoxicity, immunotoxicity, reproductive toxicity, neurodevelopmental toxicity and effects on the thyroid hormones. It is also possible that polybrominated diphenyl ethers are endocrine disruptors. Pregnant women, embryos and infants are more vulnerable because of effects on the thyroid hormone balance and the development of the embryo's central nervous system.

The phase-out of polybrominated flame retardants has reduced their release in the environment and levels measured in people in Europe. However, there is still a large stock of materials in use, such as polyurethane foams and plastics in electronic equipment. Polybrominated flame retardants continue to be released during the use of these articles, as well as when they are collected for recycling or disposed of. The main routes for human exposure are food and exposure to dust in indoor air at home and workplaces. Fish and agriculture products are the main food sources of certain brominated flame retardants, as well as mother's milk for the nursing child.[44]

POPs Pesticides (Organochlorine)

Organochlorine pesticides are effective against a variety of insects. Some have also been used as fungicides, antimicrobials and termicides. These chemicals were introduced in the 1940s and vary in their chemical structures and mechanisms of toxicity. They can be classified into four categories: dichlorodiphenylethanes (such as DDT), cyclodienes (such as dieldrin, endosulfan and heptachlor), chlorinated benzenes (such as hexachlorobenzene) and cyclohexanes (such as hexachlorocyclohexane or lindane). The use of most organochlorine pesticides has been banned or severely restricted around the world, although endosulfan, is still widely used in some countries.

Organochlorine pesticides can enter the environment from direct application and runoff, disposal of contaminated wastes into landfills, emissions from waste incinerators and releases from manufacturing plants that produce them. Some organochlorine pesticides are volatile or can adhere to soil or particles in the air. In aquatic systems, organochlorine pesticides are adsorbed into sediments in water that can then bioaccumulate in fish and other marine mammals.

Because these chemicals are soluble in fat, they are found at higher concentrations in fatty foods. The main source of exposure to organochlorine pesticides is through eating fatty foods, such as milk, dairy products, or fish that are contaminated with these pesticides. It is also possible to pass these pesticides through the placenta to the unborn child or by breastfeeding, or to absorb them through the skin.

Organochlorine pesticides affect the nervous system and can harm the liver. Potential adverse effects include reproductive effects, endocrine disruption and cancer. Organochlorine pesticides can build up in a person's body over time, but the health effects associated with low exposure are still uncertain. Organochlorine pesticides have been linked to adverse reproductive effects in wildlife.[45]

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44 Source: Commercial Octabromodiphenyl Ether Risk Profile. Adopted by the POPs Review Committee, Stockholm Convention on Persistent Organic Pollutants, November 2007; Pentabromodiphenyl Ether Risk Profile. Adopted by the POPs Review Committee, Stockholm Convention on Persistent Organic Pollutants, November 2006

45 Source: Third National Report on Human Exposure to Environmental Chemicals, July 2005 (including fact sheet "Spotlight on Organochlorine Pesticides"). U.S. Centers for Disease Control and Prevention; The History of "Organochlorine Pesticides" in Australia. Australian Pesticides and Veterinary Medicines Authority.

Mercury

Mercury has been used in various products and processes for hundreds of years. Industrial processes, coal-fired power plants, mining and waste sites are important sources of mercury into the environment. In recent years, levels of mercury in the environmental mercury have risen. Once released in the environment, mercury can persist and move among air, water, sediments, soil and biota and concentrate up the food chain. Mercury in the air can be transported long distances away from the point of release.

Mercury and mercury-containing compounds are highly toxic and have a variety of significantly adverse effects on human health, wildlife and the environment. In the human body, mercury damages the central nervous system, thyroid, kidneys, lungs, immune system, eyes, gums and skin. Neurological damage to the brain caused by mercury cannot be reversed. There is no known safe exposure level to mercury in humans, and effects can be seen even at very low levels.

The most common way for people to be exposed to mercury is through fish and other marine species contaminated with methylmercury. People who are more vulnerable to exposure to mercury include fetuses, newborn babies and children, as they are more sensitive to its effects. People who have a diet rich in fish and other seafood are at risk of higher exposure as well.[46]

Lead

Lead is a heavy metal that is toxic at very low exposure levels and has acute and chronic effects on human health including neurological, cardiovascular, renal, gastrointestinal, haematological and reproductive effects. Once emitted into air, lead is subject to atmospheric transport and bioaccumulates in most organisms. Lead is released by various natural and anthropogenic sources, including mining and processing activities and the manufacturing, use, disposal and recycling of products containing lead, such as batteries, ammunition and alloy for cable shearing. Lead used in paint is of particular concern as there is a high risk of exposure for vulnerable groups such as children. Recent recalls of millions of children's toys possibly containing lead attracted worldwide attention due to both the health risk to the end user and the economical risk for the producer.

Ozone Depleting Substances

Chlorofluorocarbons (CFCs) and other ozone-depleting substances (ODS) include a range of industrial chemicals first developed in the 1920s. They are stable and nontoxic, cheap to produce, easy to store and highly versatile. As a result, they came to be used in a wide range of applications, including as coolants for refrigeration and air conditioning, for blowing foams, as solvents, sterilants and propellants for spray cans.

When released, they rise into the stratosphere, where they are broken apart by solar radiation to release chlorine or bromine atoms, which in turn destroy ozone molecules in the protective stratospheric ozone layer. They are slow to disappear, which means that past and present emissions will contribute to ozone depletion for years to come.

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46 Source: The Mercury Issue: Introduction. UNEP, 2008.

Highly Hazardous Pesticides

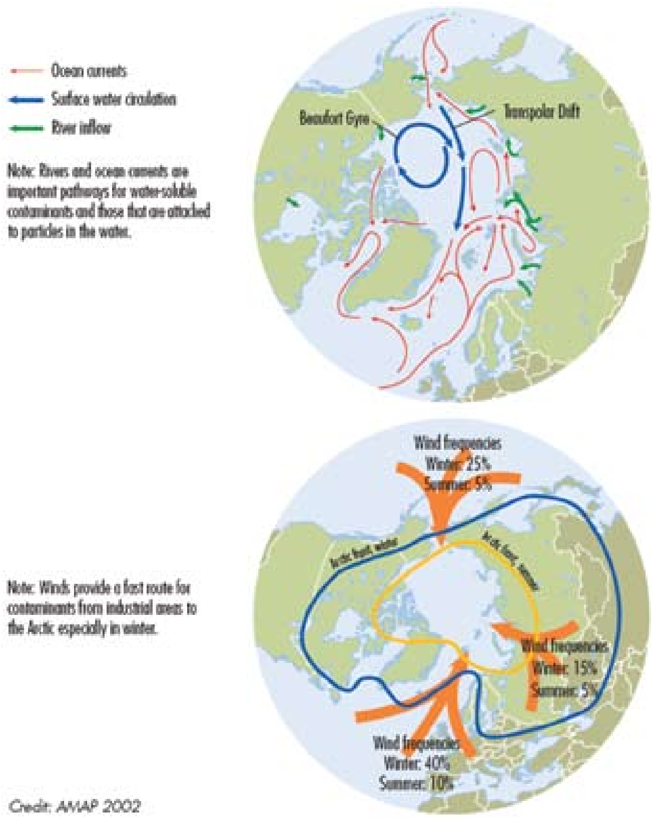
While further regulation in advanced industrialised countries increasingly excludes highly hazardous pesticides, their intensive use remains common in many developing countries. In many areas there is considerable overuse and abuse of such products, resulting in relatively high incidence of farmer poisoning and pesticide residues on food crops, particularly fruit and vegetables, above established Maximum Residue Levels. The Forum VI of the Intergovernmental Forum on Chemical Safety (IFCS) recognised and recommended that promotion of integrated pest management, which reduces reliance on pesticides, should be a key element of risk reduction strategies for pesticides.

Annex 2: Global travelers

The identity and overall well-being of indigenous peoples is closely linked to their relationship to the environment. Persistent organic pollutants (POPs) and heavy metals have been found in all parts of the Arctic ecosystem, including in people. By following their traditional diet, Inuit in the eastern Canadian Arctic and Greenland are exposed to among the highest levels of POPs and mercury in the world.

Contaminants reach the Arctic from all over the world through wind, air and water currents and there it enters the food chain. This endangers a sustainable lifestyle based on harvesting, distribution and consumption of local renewable resources, which has existed for generations. Yet, most of these substances are present in the Arctic ecosystems and in the diets of Arctic peoples as a result of activities carried out elsewhere (such as using the insecticide toxaphene on cotton fields).

Pollutants path to the Arctic



Source: UNEP: Global Environment Outlook 4, 2007

Annex 3: Overview of main international chemicals-related agreements

Basel Convention[47]

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal came into force in 1992. It aims to protect human health and the environment against the adverse effects resulting from the generation, management, transboundary movements and disposal of hazardous and other wastes. The Convention had 172 Parties as of November 2009. It regulates the transboundary movements of hazardous and other wastes applying the Prior Informed Consent (PIC) procedure. The Convention furthermore obliges its Parties to ensure that hazardous and other wastes are managed and disposed of in an environmentally sound manner. Technical assistance, technical guidelines on the Environmentally Sound Management (ESM) of specific hazardous waste streams and further guidance material are provided as a support to developing countries and countries with economies in transition, to manage and dispose of hazardous wastes in an environmentally sound manner.

Rotterdam Convention[48]

The Rotterdam Convention creates legally binding obligations for the implementation of the PIC procedure for pesticides and industrial chemicals that have been banned or severely restricted for health or environmental reasons by the Parties. The Convention builds on the voluntary PIC procedure, which was initiated by UNEP and FAO in 1989 and came to an end on 24 February 2006. The Rotterdam Convention had 130 Parties as of November 2009. Its objectives are:

- *to promote shared responsibility and cooperative efforts among Parties in the international trade of certain hazardous chemicals in order to protect human health and the environment from potential harm;*
- *to contribute to the environmentally sound use of those hazardous chemicals by facilitating information exchange and by providing for a national decision-making process on the import and export of those hazardous chemicals.*

Stockholm Convention[49]

The Stockholm Convention is a global treaty to protect human health and the environment from persistent organic pollutants (POPs). POPs are chemicals that are persistent, bioaccumulative, subject to long-range environmental transport and that are toxic to humans and the environment. Governments have to take measures to eliminate or reduce the release of POPs into the environment. At its adoption, the Convention targeted 12 particularly toxic POPs for reduction and eventual elimination. Nine further POPs have been added to the Convention based on a consensus decision by the Parties in May 2009. The Convention also provides support to developing countries and countries with economies in transition to phase out and clean up stockpiles of certain chemicals. The Stockholm Convention entered into force in 2004 and had 168 Parties as of November 2009.

47 Basel Convention website: www.basel.int
48 Rotterdam Convention website: www.pic.int
49 Stockholm Convention website: www.pops.int

Strategic approach to international chemicals management (SAICM)[50]

Adopted by the International Conference on Chemicals Management (ICCM) on 6 February 2006 in Dubai, United Arab Emirates, the Strategic Approach to International Chemicals Management (SAICM) is an international voluntary policy framework to foster the sound management of chemicals. Its aim is to support the achievement of the goal agreed at the 2002 Johannesburg World Summit on Sustainable Development of ensuring that, by the year 2020, chemicals are produced and used in ways that minimize significant adverse impacts on the environment and human health. A major driving force for the establishment of the Strategic Approach has been the recognition of the growing gaps between the capacities of different countries to manage chemicals safely, the need to improve synergies between existing instruments and processes and the growing sense of urgency regarding the need to assess and manage chemicals more effectively to achieve the 2020 goal articulated in the Johannesburg Plan of Implementation.

Vienna Convention for the Protection of the Ozone Layer and the Montreal Protocol on Substances that Deplete the Ozone Layer

The 1985 Vienna Convention, its 1987 Montreal Protocol and subsequent amendments are aimed at protecting the ozone layer from various human activities. The Convention encourages intergovernmental cooperation on research, systematic observations of the ozone layer, monitoring CFC production and the exchange of relevant information on human activities. The Convention is concerned with the indirect effect of chemical substances on the ozone layer. When CFCs breakdown, they release chlorine atoms which give rise to ozone depletion. Similarly, bromine atoms are released by halon breakdowns that have a similar impact. The Vienna Convention is a framework Convention and does not contain legally binding controls or targets. The Montreal Protocol was designed to reduce the production and consumption of a number of CFCs and several halons following agreed phase-out schedules that are based on scientific and technical assessments. Amendments to the Protocol have adjusted the phase-out schedules, introduced new controlled substances to the list and introduced other types of control measures. A range of alternative chemical substances have been developed and commercialized allowing developed countries to end the use of CFCs faster than originally anticipated. The Montreal Amendment to the Protocol included provision to ban exports of used, recycled and reclaimed substances other than for destruction, to discourage illegal sales of these substances.[51]

International Code of Conduct on the Distribution and Use of Pesticides (Revised version)

The 2002 version of the FAO International Code is a revised version of the 1985 Code of the same name. Provisions for PIC originally drafted in the earlier Code were removed from the revised version, as the Rotterdam Convention specifically addressed this important issue. The Code was developed in response to a growing concern regarding the appropriateness of supplying pesticides to countries that lack the infrastructure to register pesticides and thereby ensure their safe use. The objectives of the

50 SAICM website: www.saicm.org

51 Developing and Sustaining an Integrated National Programme for Sound Chemicals Management; UNITAR, 2004.

Code are to establish voluntary standards of conduct for all public and private entities engaged in, or associated with the trade, distribution and use of pesticides, particularly where there is inadequate or no national legislation to regulate pesticides. The standards set forth in the Code focus on risk reduction, protection of human health and the environment, and support for sustainable agriculture developed by adopting various procedures. The Code details responsibilities of governments to legislate, regulate and enforce such actions as well as establish information exchange networks between regulatory authorities on actions for banned or severely restricted pesticides. Establishment of appropriate educational, advisory, extension and health care services are also included. Under the Code, industry is responsible for adhering to standards of manufacture, distribution and advertising of pesticides especially in countries that lack appropriate legislation or means of implementing regulations. They also have to ensure that pesticides are adequately tested in terms of risk and that pesticides are adequately labelled and packaged. [51]

ILO Chemicals Convention 1990, No. 170

The Convention represents one of the most far-reaching international agreements in the area of chemicals management and specifically addresses the protection of workers from harmful effects of chemicals at the workplace. It applies to all branches of economic activity in which chemicals are used, covers all chemicals and provides specific measures in respect of hazardous chemicals. The Convention requires that classification systems be established and that all chemicals should be marked to indicate their identity. Hazardous chemicals should be labelled to provide essential information on their classification, their hazards and safety precautions to be observed. Because of the tri-partite composition of the ILO under whose jurisdiction the Convention was negotiated, governments, suppliers, employers and workers all have responsibilities for the safe management and handling of chemicals. Governments are required to develop national policies on safety in the use of chemicals at work and that may include measures to prohibit and/or restrict the use of certain chemicals. Suppliers, which may include manufactures, importers and distributors, are required to ensure that chemicals are properly classified and labelled and that safety data sheets are provided to employers.

Employers have an obligation to ensure that workers are not exposed to chemicals exceeding national or international limits, that they are provided with safety data sheets and that they are trained on all aspects of safety in the use of chemicals in the workplace. Employers are also required to assess the risks associated with use the use of chemicals and identify options to protect workers throughout all stages of the life-cycle of the chemical. Workers have an obligation to co-operate with their employers and to take all reasonable steps to minimize or avoid risk. [51]

51 Chemical Leasing is a service-oriented business model that shifts the focus from increasing sales volume of chemicals towards a value-added approach. In such a model, the producer does not just provide the chemical, but also his know-how on how to reduce the consumption of chemicals and how to optimize the conditions of use. While in the traditional model the responsibility of the producer ends with the selling of the chemical, in Chemical Leasing business models the producer remains responsible for the chemical during its whole life cycle, including its use and disposal.