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.

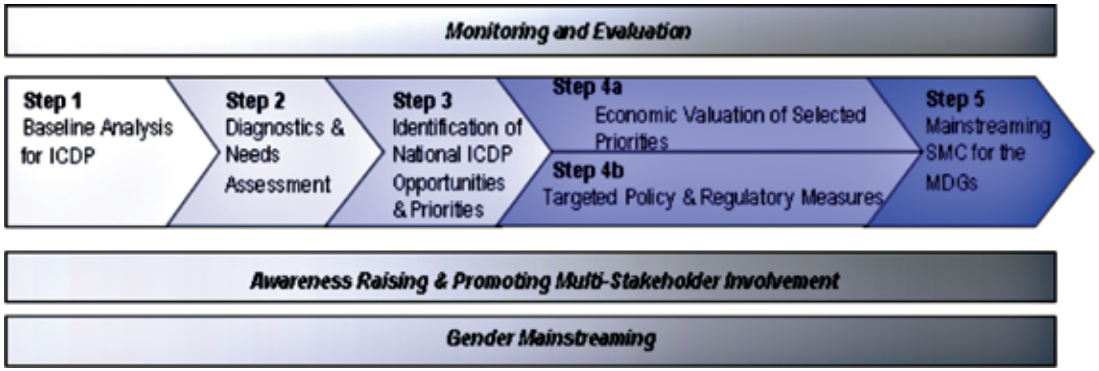
The partnership helps countries:

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.

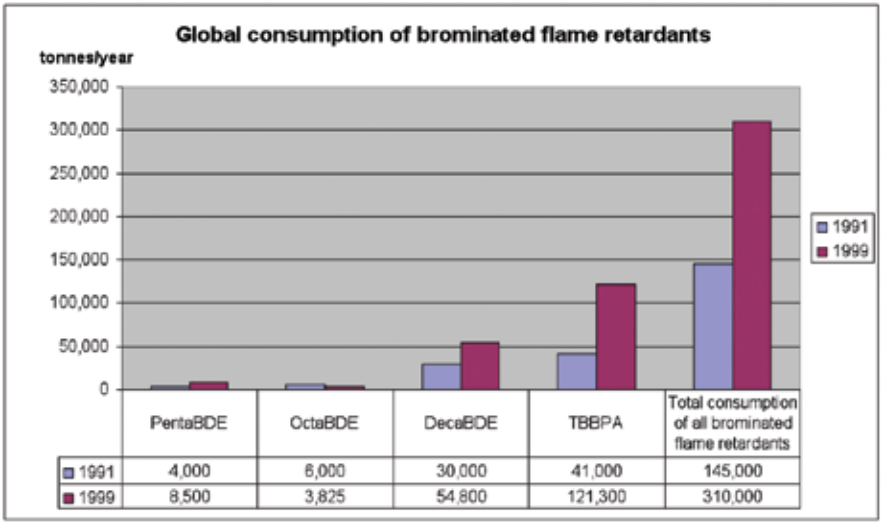
The U.S. EPA will also continue to work collaboratively with other countries on the many international initiatives on PFCs, including SAICM participants, the OECD and enhanced engagement countries and through the Stockholm Convention, as appropriate, to reduce emissions and product content of PFCs internationally,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

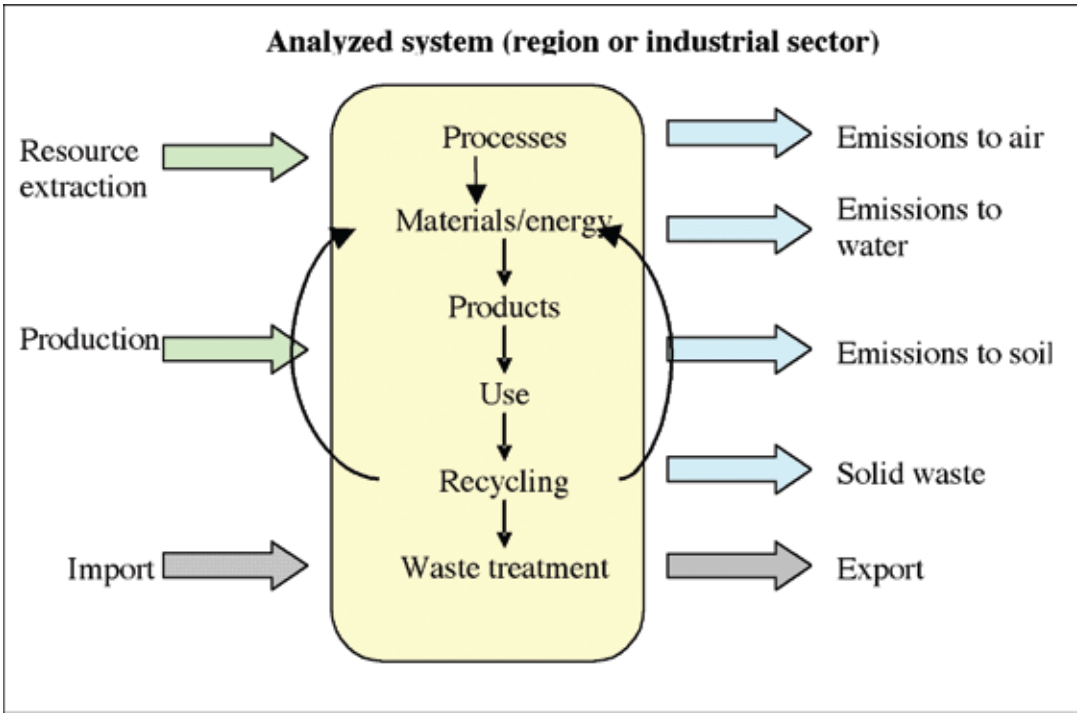
A substance flow analysis is a way to examine what happens to a chemical at different stages of its life cycle. It describes how much chemical is produced and how much is distributed to various compartments at every stage—extraction, production, transformation, consumption, recycling and disposal as 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

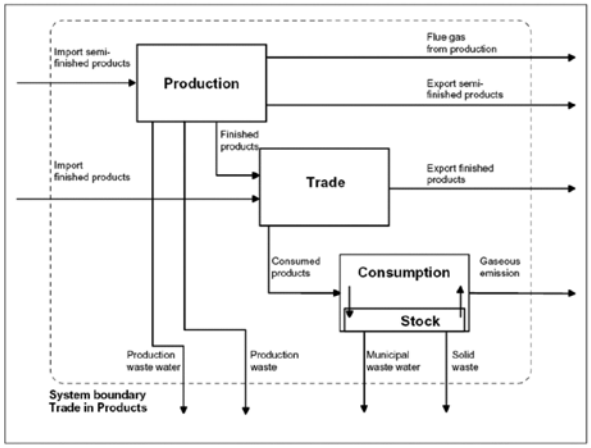
The Swiss analysis collected data in three sub-systems: trade in products, waste management and environment.

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.

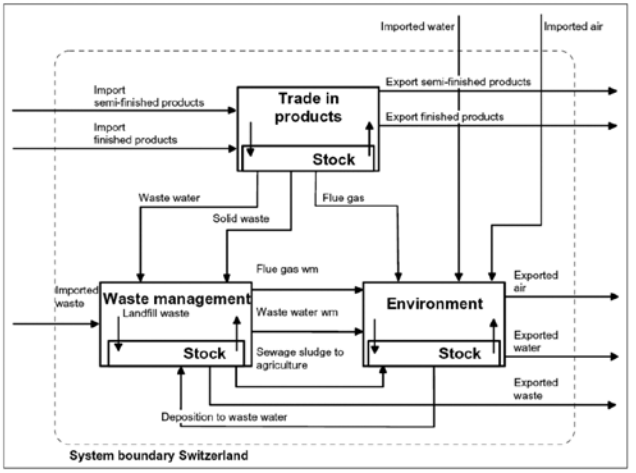
Environment

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 or-

ganizations 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*

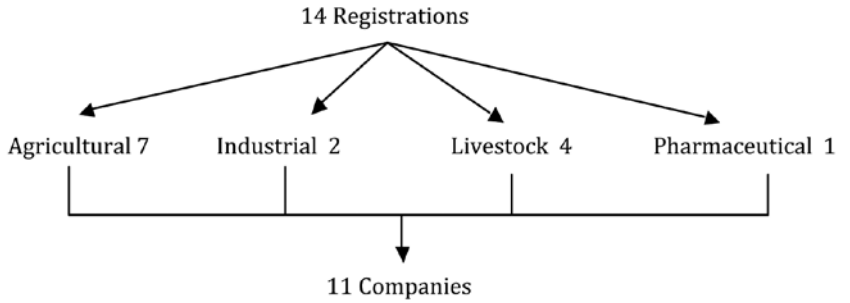
This experience also improved collaboration between government and industry on other chemical management issues.

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.

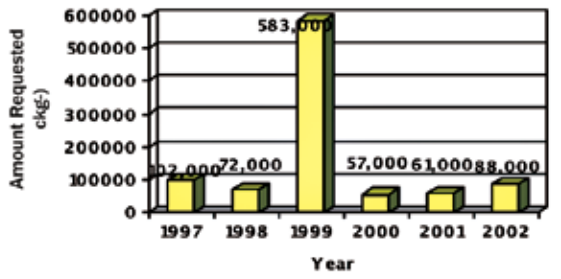
Overall, the success of this initiative was the result of the close coordination and synergies between government agencies, communication with the public, and public participation, as well as the exchange of information and a continuous capacity building process.

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



Agrevo	Agromundo	Laboratorios Helios
Rhone Poulenc	Bayer	Merck
Ingeniería Industrial	Productos Farmacéuticos	Tekchem
Pfizer		Gustafson

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

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 Na-

tional 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 reinforce 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.