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Pollution control and the regulation of chemicals and e-waste

Zada Lipman

Pollution regulation is one of the oldest areas of environmental law. This chapter will provide an overview of key international environmental regimes aimed at the control and management of chemicals. It will also consider how this regime can be designed and/or improved to meet the challenges of an increasingly industrialised world. In particular the issue of recycling and e-waste will be analysed.

Introduction

For many years, the chemical industry has played a major role in scientific advances. This role has increased in the past 40 years as global chemical production has escalated. It is reported that over 63 million organic and inorganic chemicals have been registered to date.[1] Many of these chemicals have contributed greatly to an improved quality of life. Agriculture, health, hygiene, nutrition transport, housing, communications, sport, entertainment and many areas of daily life have been transformed by the development and application of chemical products. However, in some cases these benefits are outweighed by the risks that certain chemicals pose to human health and the environment. The World Health Organization (WHO) has estimated that toxic chemicals are responsible for approximately 355,000 deaths each year, with two-thirds of these deaths occurring in developing countries.[2]

Pesticides are one of the most toxic types of chemicals. Pesticides can adversely impact the long-term survival of major ecosystems and result in loss of biodiversity. They can also have

1 Chemical Abstracts Service. Online. Available HTTP: <www.cas.org> (accessed 10 February 2012).

2 World Health Organization, 'Toxic Hazards'. Online. Available HTTP: <www.who.int/heli/risks/toxics/chemicals/en/index.html> (accessed 10 February 2012). The Pesticides Action Network has brought an action against six of the world's major agrochemical companies in the Permanent Peoples' Tribunal, an international opinion tribunal, in December 2011 for promoting use of dangerous pesticides. See 'Permanent Peoples' Tribunal 2011', *The Ecologist*, 16 November 2011. Online. Available HTTP: <www.cbgnetwork.org/4163.html> (accessed 10 February 2012).

significant impacts on human health[3] which were not foreseen when these chemicals were first produced and only become apparent after years of use. Some of the most toxic organic chemicals and pesticides are known as persistent organic pollutants (POPs). They are particularly dangerous to humans and other life and resistant to degradation by chemical, physical or biological means.[4]

Apart from the problems that chemicals pose during their life cycle, disposal can be equally problematic. This has been exacerbated by the emergence of new waste streams, the most outstanding example of which is electronic waste (e-waste).

As the risks associated with chemicals and pesticides have become apparent, more stringent measures have been adopted to regulate their use and disposal, especially in developed countries. In some cases, pesticides have been banned, or their use has been restricted, while disposal options to landfill have become increasingly limited. This has led to an increase in exports of chemicals and hazardous wastes to developing countries where there is less regulation, lower environmental safety requirements and a lack of awareness of the dangers involved. Many of these countries lack the capacity to ensure that recycling is undertaken safely so as to ensure the protection of human health and the environment.

International concerns about the dangers of hazardous chemicals and pesticides and their impact on developing countries has led to the adoption of several international conventions. The first global convention was the *Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal 1989* (Basel Convention), which regulates the export of hazardous waste consistent with environmentally sound management principles and subject to a prior informed consent (PIC) procedure.[5] This was followed by two further conventions which regulate the export of certain hazardous chemicals and pesticides, prohibit their generation and institute a PIC procedure: the *Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade 1998* (Rotterdam Convention)[6] and the *Stockholm Convention on Persistent Organic Pollutants 2001* (Stockholm Convention).[7] These three conventions together provide a 'cradle-to-grave' framework for the environmentally sound management of hazardous chemicals and wastes throughout their life cycles.

This chapter examines the measures that the international community has adopted to deal with hazardous chemicals and pesticides. It discusses the development of the PIC procedure in the *International Code of Conduct on the Distribution and Use of Pesticides*[8] and the *London*

3 FAO, *Control of Water Pollution from Agriculture*, Chapter 4, 'Pesticides as Water Pollutants'. Online. Available HTTP: <http://www.fao.org/docrep/w2598e/w2598e07.htm> (accessed 15 November 2011).

4 OECD, 'Environmental Outlook for the Chemicals Industry', OECD 2001, p. 19. Online. Available HTTP: <www.oecd.org/dataoecd/7/45/2375538.pdf> (accessed 15 November 2011).

5 *Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal*, opened for signature 22 March 1989, 1673 UNTS 126 (entered into force 5 May 1992).

6 *Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade*, opened for signature 11 September 1998, 38 ILM 1 (entered into force 24 February 2004).

7 *Stockholm Convention on Persistent Organic Pollutants*, opened for signature 23 May 2001, 40 ILM 532 (entered into force 17 May 2004) (Stockholm Convention).

8 Food and Agriculture Organization (FAO), *International Code of Conduct on the Distribution and Use of Pesticides* (FAO Code), Art. 1(1). Online. Available HTTP: <http://www.fao.org/docrep/x5562E/X5562e0a.htm> (accessed 15 November 2011).

Guidelines for the Exchange of Information on Chemicals in International Trade[9] and its incorporation into a globally binding instrument in the Rotterdam Convention. The chapter then discusses the chemical regime imposed by the Rotterdam and Stockholm Conventions, and assesses its effectiveness.[10] A key focus of the chapter is the special problem of e-waste and an evaluation of the success of the Basel, Rotterdam and Stockholm Conventions in addressing this issue. Finally, product stewardship is considered as a possible solution to some of the challenges of an increasingly industrialised world.

International responses

Most international responses are directed at the protection of developing countries. These initiatives focus on the provision of information and the development of a PIC procedure.

International Code of Conduct on the Distribution and Use of Pesticides

In 1985 the United Nations Food and Agriculture Organization (FAO) introduced the first *International Code of Conduct on the Distribution and Use of Pesticides* (the Code).[11] The Code established voluntary standards of conduct for all public and private entities engaged in the distribution and use of pesticides and provided the first globally accepted standard for pesticide management. It was particularly designed to assist countries which had no national legislation to regulate the risks associated with pesticides.[12] The Code placed the responsibility on governments to regulate the availability, distribution and use of pesticides in their countries.[13] It required pesticide industries to adhere to the provisions of the Code as a standard for the manufacture, distribution and advertising of pesticides.[14] Governments of pesticide-exporting countries were required to provide technical expertise on pesticides to other countries and to ensure that good trading practices were followed in their exports, especially to those countries without adequate legislation.[15]

In 1989 the Code was amended to introduce a PIC procedure.[16] In essence this required that the international shipment of a pesticide that is banned or severely restricted in order to protect human health and the environment should not proceed without the agreement of, or contrary to, the decision of the importing country.[17] Pesticides initially selected were those that were previously banned or severely restricted in at least five countries, as well as pesticide formulations that were acutely toxic. The PIC procedure required a participating government to notify the FAO as soon as possible of any action taken to ban or severely restrict the use or

9 UNEP, *London Guidelines for the Exchange of Information on Chemicals in International Trade*. Online. Available HTTP: <http://www.chem.unep.ch/ethics/english/longuien.htm> (accessed 20 November 2011).
10 The Basel Convention is only briefly discussed as it is comprehensively considered by T.G. Puthucherril in Chapter 17 of this volume.
11 FAO Code, op. cit., UN Doc M/R8130. E/8.86/1/1500 (1986).
12 Ibid., Art. 1(1).
13 Ibid., Art. 3(1).
14 Ibid., Art. 3(2).
15 Ibid., Art. 3(3).
16 FAO Conference Res 6/89 (1989) Appendix E. Online. Available HTTP: <http://ufdc.ufl.edu/UF00084642/00001/208j> (accessed 15 November 2011).
17 FAO Code, op cit., Arts 2, 9(7).

handling of a pesticide.[18] If the control actions notified fell within the definitions of the Code, the FAO then provided participating countries with a decision guidance document to assist them in making an informed decision as to whether to permit imports. A database of control actions and decisions was maintained by the FAO and notified to participating governments, who were required to take appropriate measures to ensure they were observed.[19]

Although the Code was approved and reaffirmed at the United Nations Conference on Environment and Development (UNCED),[20] it was not entirely successful in changing pesticide management practices, particularly in developing countries. Although the number of countries without pesticide legislation decreased after the Code was adopted, these countries characteristically did not enforce their legislation, primarily due to a lack of technical expertise or resources. In 2002 it was reported that 'highly hazardous or sub-standard pesticide formulations are still widely sold; and end-users are often insufficiently trained and protected to ensure that pesticides can be handled with minimum risk'.[21] Part of the problem with the Code was that it was voluntary. It was also not clear whether the pesticides included in the PIC procedure were those most responsible for causing health hazards in developing countries.[22] The Code also had 'no reporting mechanism, no monitoring, and no means of enforcement beyond public pressure and self-policing by the parties'.[23]

The Code was radically revised in 2002 to reflect international developments and address persistent pesticide management problems. The revised Code focuses on risk reduction, protection of human and environmental health, and life cycle management. It includes measures to strengthen monitoring and explicitly invites regular feedback on its implementation. The revised Code remains an important framework and reference for pesticide management.[24]

The London Guidelines for the Exchange of Information on Chemicals in International Trade

The United Nations Environment Programme (UNEP) introduced a complementary system to the FAO Code in 1987. The *London Guidelines for the Exchange of Information on Chemicals in International Trade*[25] (London Guidelines) were intended to assist in increasing chemical safety in all countries through the exchange of information on chemicals in international trade.[26] The London Guidelines were voluntary and, with some exceptions, applied to all chemicals, including pesticides. Although they were not specifically prepared for developing countries,

18 Ibid., Art. 9(1).
19 Ibid., Art. 9(8), 9(9).
20 *Agenda 21: The United Nations Programme of Action From Rio*, A/Conf.151/26 (1992), Ch. 14.
21 FAO Code, (revised version) adopted by the 123 session of the FAO Council in November 2002, 'Preface'. Online. Available HTTP: <http://www.fao.org/docrep/005/y4544e/y4544e01.htm#bm1> (accessed 15 November 2011).
22 B. Dinham, 'The Success of a Voluntary Code in Reducing Pesticide Hazards in Developing Countries', *Green Global Yearbook*, 1996, p. 34. Online. Available HTTP: <http://www.fni.no/ybiced/96_02_dinham.pdf> (accessed 18 November 2011).
23 Ibid., p. 31.
24 FAO Code (revised version), op. cit.
25 UNEP, London Guidelines, op. cit., UN Doc UNEP/GC, 14/17, Annex IV (1987).
26 Adopted by UNEP Governing Council Decision 14/27 of 27 June 1987, amended by UNEP Governing Decision 15/30 of 25 May 1989.

they provided a framework for establishing procedures for the effective use of information on chemicals in these countries. States with advanced information systems for the safe management of chemicals were required to share their experience with others in need of assistance.[27] States' activities in regard to chemicals were to be conducted in accordance with Principle 21 of the Stockholm Declaration of the UN Conference on the Human Environment.[28] All states were required to strengthen their existing infrastructures and institutions so as to improve control and management of chemicals.[29] The Guidelines also emphasised the importance of technical and financial assistance to enhance decision-making and training in the safe use of chemicals.[30]

The London Guidelines were amended in 1989 to introduce a PIC procedure which operated in a similar manner to that under the FAO Code.[31] States that had banned or severely restricted a chemical were required to notify the International Register of Potentially Toxic Chemicals (IRPTC).[32] If the chemical satisfied the requirements under the Guidelines, a decision guidance document was sent to participating countries who could then decide whether to permit imports.[33] The PIC procedure operated in addition to information exchange and export notification. Countries could participate in the information exchange procedures without participating in the PIC procedure.[34]

In 1992 the FAO and UNEP agreed to cooperate and in 1995 implemented a joint programme on the PIC procedure. This was known as the original PIC procedure and remained in operation until the text of the Rotterdam Convention was adopted in 1998.[35]

The Rotterdam Convention

Background

The voluntary PIC procedures in the FAO Code and London Guidelines were an important initial step in providing information on toxic chemicals. However, their non-binding nature undermined their effectiveness. As a result, the FAO Council and UNEP Governing Council commenced negotiations for a legally binding instrument on PIC procedures. The outcome was the Rotterdam Convention, which was adopted in 1998 and entered into force on 24 February 2004.[36] As at 2011, 143 parties had ratified the Convention.

27 UNEP, *London Guidelines*, op. cit., Art. 2(e).
28 Ibid., Art. 2(b). According to Principle 21: 'States have . . . the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction': UNCED: Final Documents, 16 June 1972, ILM 11: 1416. This principle is reproduced in Principle 2 of the *Rio Declaration on Environment and Development* (1992), Annex I, UN Doc A/Conf.151/26 (Vol. I) 31 ILM 874 (Rio Declaration).
29 UNEP, *London Guidelines*, op. cit., Art. 2(f).
30 Ibid., Art. 15.
31 UNEP Governing Council Decision 15/30 of 25 May 1989.
32 UNEP *London Guidelines* (amended 1989), Art. 6. Online. Available HTTP: <http://www.chem.unep.ch/ethics/english/longuien.htm> (accessed 23 November 2011).
33 Ibid., Arts 7(2), 7(3).
34 Ibid., Art. 7(1).
35 FAO, 'Guidance to Designated National Authorities on the Operation of the Rotterdam Convention: Introduction and Summary'. Online. Available HTTP: <http://www.fao.org/docrep/007/y5423e/y5423e02.htm> (accessed 18 November 2011).
36 UNEP, 'Rotterdam Convention: How it was Developed'. Online. Available HTTP: <http://www.pic.int/TheConvention/Overview/Howitwasdeveloped/tabid/1045/language/en-US/Default.aspx> (accessed 18 November 2011).

Objective

The objective of the Rotterdam Convention is:

> to promote shared responsibility and cooperative efforts among Parties in the international trade of certain hazardous chemicals in order to protect human health and the environment from potential harm and to contribute to their environmentally sound use, by facilitating information exchange about their characteristics, by providing for a national decision-making process on their import and export and by disseminating these decisions to Parties.[37]

Chemicals subject to the Convention and the listing process

The chemicals and pesticides subject to the PIC procedure in the Rotterdam Convention are listed in Annex III. These include banned or severely restricted chemicals and severely hazardous pesticide formulations. A 'banned' or 'severely restricted' chemical is more broadly defined than in the FAO Code or London Guidelines. It includes a chemical that has been refused approval for first-time use, or withdrawn from the domestic market, or from the domestic approval process in order to protect human health and the environment.[38] A 'severely hazardous pesticide formulation' refers to 'pesticide formulations that produce severe health or environmental effects observable within a short period of time after single or multiple exposure'.[39] This category of pesticide is included to protect developing countries or a country with an economy in transition, which experiences problems with the pesticide under conditions of use.[40] Certain chemicals are excluded from the scope of the Convention.[41] When the Convention entered into force, 23 chemicals were listed in Annex III, with provision for progressive additions by consensus of the Conference of the Parties (COP). There have been five meetings of the COP since then and a number of additions have been made to Annex III. As at 2011, there were a total of 43 chemicals listed in Annex III, of which 32 are pesticides, including 4 severely hazardous pesticide formulations and 11 industrial chemicals.[42]

The mechanisms for adding chemicals to Article III have been criticised by non-government organisations (NGOs), in particular the requirement for a consensus[43] of the COP to be obtained before the chemical can be listed.[44] This has often resulted in recommendations for

37 *Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade*, opened for signature 10 September 1988, 38 ILM 1 (entered into force 24 February 2004) (Rotterdam Convention) Art. 1.
38 Ibid., Arts 2(b), 2(c).
39 Ibid., Art. 2(d).
40 FAO, 'Guidance to Designated National Authorities on the Operation of the Rotterdam Convention', op. cit.
41 Rotterdam Convention, Art. 3(2).
42 Ibid., Annex III chemicals. Online. Available HTTP: <http://www.pic.int/TheConvention/Chemicals/AnnexIIIChemicals/tabid/1132/language/en-US/Default.aspx> (accessed 20 November 2011).
43 Rotterdam Convention, op. cit., Art. 22(5).
44 Rotterdam Convention Alliance (ROCA), ROCA Position Paper in Preparation of the Rotterdam Convention COP 5. Online. Available HTTP: <http://www.cela.ca/sites/cela.ca/files/Position%20paper%20ROCA92%20%28June%202011%29_0.pdf> (accessed 20 November 2011).

listing being blocked by a small number of parties with a financial interest in maintaining the use and supply of the chemical or pesticide. For example, the Chemical Review Committee has recommended the listing of chrysotile asbestos, which meets all the criteria for listing. However, its listing was blocked at COPs 3, 4 and 5, and it has still not been listed although it results in the death of over 100,000 people each year.[45] This has led to suggestions that the Convention be amended to require a two-thirds majority for listing in Annex III, instead of consensus.[46]

The prior informed consent procedure

The Rotterdam Convention adopts a different procedure to the FAO Code and London Guidelines for determining which chemicals are subject to the PIC procedure. All chemicals[47] in relation to which 'final regulatory action'[48] has been taken to ban or severely restrict their use must be notified to the Secretariat. The notification has to be made no later than 90 days after taking any such action and must include information about the chemical.[49] The Secretariat must forward a summary of the information to all participating parties within six months.[50] Each party is required to appoint a designated national authority to receive information and perform other administrative duties.[51] When at least one notification has been made from two of the seven PIC regions[52] the Secretariat must forward it to the Chemical Review Committee. The Committee then reviews the information and makes a recommendation to the COP as to whether the chemical should be made subject to the PIC procedure and listed in Annex III.[53] The recommendation is accompanied by a decision guidance document providing information about the chemical.[54] Recommendations for listing in Annex III can also be made by a developing country or a country with an economy in transition that is experiencing problems with a pesticide.[55]

Within nine months of receiving a decision guidance document, a response must be made to the Secretariat as to whether to allow imports.[56] A response can be a final decision, detailing legislative or administrative measures on which it is based, to allow imports, refuse imports, or to allow imports on specified conditions. Alternatively, a party may make an interim response that could include a request for further information or for assistance in evaluating

45 Ibid.
46 Ibid.
47 'A 'chemical' means 'a substance by itself or in a mixture, whether manufactured or natural, but does not include any living organism. It consists of the following categories: pesticide (including severely hazardous pesticide formulations) and industrial': *Rotterdam Convention*, op. cit., Art. 2(a).
48 'Final regulatory action' is defined as action taken that does not require subsequent regulatory action for the purpose of banning or severely restricting a chemical: ibid., Art. 2(e).
49 Ibid., Art. 5(1).
50 Ibid., Art. 5(3).
51 Ibid., Art. 4.
52 These regions are: Africa, Asia, Europe, Latin America and Caribbean, Near East, North America and the Southwest Pacific.
53 *Rotterdam Convention*, op. cit., Arts 5(5), 5(6).
54 Ibid., Art. 7.
55 Ibid., Art. 6.
56 Ibid., Art. 10(2).

the chemical.[57] If the decision is to refuse imports, or to allow them subject to conditions, the party must ensure that the same restriction is placed on imports from any source, including domestic production for domestic use.[58]

Exporting parties are required to implement appropriate legislative or administrative measures to communicate the responses from importing parties to all persons within their jurisdiction and to ensure that exports do not take place without the prior informed consent of the importing party. Each exporting party is also required to assist importing parties to obtain further information and to strengthen their capacities and capabilities to manage chemicals safely during their life cycle.[59]

Exchange of information

The Rotterdam Convention provides for the exchange of scientific, technical, economic and legal information concerning chemicals.[60] Exports of chemicals are to be appropriately labelled and accompanied by basic health and safety information. Provision is made for protection of confidential information.[61] Parties are also required to provide technical assistance to developing countries and countries with economies in transition, so that they can develop infrastructure and the capacity to manage chemicals throughout their life cycle.[62] Each party is required to introduce national measures, such as chemical registers, initiatives to promote chemical safety, public access to information on chemical handling and accident management and safer alternatives to the chemicals listed in Annex III.[63]

Compliance and dispute settlement

A weakness of the Rotterdam Convention is its failure to include a compliance mechanism. Instead, the COP is required to develop procedures and mechanisms for determining non-compliance and for treatment of parties in non-compliance.[64] A non-compliance committee was established at COP3, but failed to reach agreement on decision-making, trigger mechanisms and punitive measures. Some NGOs have pointed out that a compliance mechanism is fundamental to the success of the Convention, and that as long as no functioning compliance mechanism is in place, no party is forced to implement the provisions of the Convention.[65]

Provision is made for dispute settlement through negotiation, arbitration or submission to the International Court of Justice (ICJ).[66] At COP1 in 2004 Annex VI was adopted, which sets out procedures on arbitration and conciliation.[67]

57 Ibid., Art. 10(4).
58 Ibid., Art. 10(9).
59 Ibid., Art. 11(1).
60 Ibid., Art. 14(1).
61 Ibid., Art. 14.
62 Ibid., Art. 16.
63 Ibid., Art. 15.
64 Ibid., Art. 17.
65 Rotterdam Convention Alliance (ROCA), Position Paper in Preparation of the Rotterdam Convention COP 5, op. cit.
66 Rotterdam Convention, op. cit., Art. 20.
67 Decision RC-1/11.

The Stockholm Convention on Persistent Organic Pollutants

Background

Persistent organic pollutants (POPs) are the most dangerous category of pesticides. They are characterised by toxicity, volatility[68] and their capacity to bioaccumulate in the fatty tissues and organs of human beings and animals. Over 90 per cent of human exposure occurs through ingestion of animal products, including milk.[69] Even in low doses, POPs are extremely dangerous to human and animal health.[70]

In 1995 UNEP's Governing Council requested several international bodies to assess 12 of the most dangerous POPs.[71] In 1997, an intergovernmental negotiating committee was established to develop an international legally binding instrument on POPs. The text of the Stockholm Convention was adopted in May 2001 and entered into force in May 2004. The Convention currently has 176 parties.[72]

Objective

The objective of the Convention is set out in Article 1:

> Mindful of the precautionary approach as set forth in Principle 15 of the Rio Declaration on Environment and Development, the objective of this Convention is to protect human health and the environment from persistent organic pollutants.

The objective sets the benchmark by which all action under the Convention should be measured. However, this positive role for precaution is somewhat undermined by the failure to define its role, or to reinforce it in the operational clauses of the Convention.

Intentionally produced POPs

The convention lists chemicals in three Annexes. Annex A chemicals are to be eliminated, Annex B contains chemicals to be restricted, and Annex C calls for the minimisation of intentional releases of certain chemicals.

In relation to intentionally produced POPs, the Convention imposes obligations on parties to take legal and administrative measures to eliminate production, use, import and export of

68 Australian Government, *Regulation Impact Statement for the Consideration of the Addition of Nine Chemicals to the Stockholm Convention on POPs'*. Online. Available HTTP: <http://www.environment.gov.au/settlements/chemicals/international/publications/pubs/ris.pdf> (accessed 20 November 2011).

69 Ibid.

70 Ibid.

71 UNEP Governing Council Decision 18/32. The POPs assessed were: aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, mirex, toxaphene and hexachlororbenzene (hexachlorobenzene can be a pesticide, industrial chemical or by-product). It included the by-products: dioxins, furans and polychlorinated biphenyls (polychlorinated biphenyls can be an industrial chemical or by-product).

72 UNEP Governing Council Decision 19/13C; Linkages, 'Summary of the Seventh Meeting of Persistent Organic Pollutants Review Committee of the Stockholm Convention 10–14 October 2011', *Earth Negotiations Bulletin* 15(189), 2011. Online. Available HTTP: <http://www.iisd.ca/vol15/enb15189e.html> (accessed 13 March 2012).

Annex A chemicals. In addition the production and use of Annex B chemicals must be restricted.[73]

Generally, imports and exports of Annex A and B listed chemicals are prohibited, except for environmentally sound disposal or for a use which is permitted for that party under Annex A or B.[74] The same principles apply in relation to exports to non-parties; these are subject to annual certification specifying the intended use of the chemical and a commitment by the non-party to protection of human health and the environment by taking measures to prevent releases and manage stockpiles.[75]

The exemptions detract from the effectiveness of the Convention. The Convention provides for both country-specific exemptions and those applying generally to all chemicals. A register is established for identifying country-specific exemptions.[76] To obtain an exemption, a state may, on becoming a party to the Convention, provide a notification of its intention to register for one or more types of specific exemptions listed in Annex A or B. Exemptions expire after five years, but can be extended for a further five years if the country can justify the need for an extension. Parties that have a specific exemption must take appropriate measures to ensure than any production or use is carried out in a manner that prevents or minimises human exposure and release into the environment.[77] When there are no longer any parties registered for a specific exemption, no new registrations may be made.[78]

In addition, there are a number of general exemptions applying to chemicals and products; for example, the general exemption in Article 3(5) for chemicals used for laboratory-scale research or as a reference standard. A number of additional exemptions are listed in Annexes A and B. These include: chemicals in articles manufactured or already in use prior to the coming into force of the Stockholm Convention and notified to the Secretariat; closed-system site-intermediates (applied only to hexachlorobenzene and DDT); and POPs occurring as unintentional trace contaminants in products and articles.

Unintentional production of POPs

Parties are required to reduce or eliminate releases from unintentional production of POPs listed in Annex C to the convention. There is no immediate requirement for the elimination of these POPs; rather, parties are required at a minimum 'to take measures to reduce the total releases . . . with the goal of their continuing minimization and, *where feasible*, ultimate elimination'.[79] There is a further requirement to develop an action plan to identify, characterise and address the release of these chemicals. Parties are required to promote available, feasible and practical measures that can achieve a realistic and meaningful level of release reduction or source elimination and to promote the development and use of substitute materials.[80] To assist in this process, Annex C lists sources of unintentional POPs and provides general guidance on 'best available techniques' and 'best available practices'.

73 Stockholm Convention, op. cit., Art. 3
74 Ibid., Art. 3(2).
75 Ibid., Art. 3(2).
76 Ibid., Art. 4.
77 Ibid., Art. 3(6).
78 Ibid., Art. 4.
79 Ibid., Art. 5.
80 Ibid., Arts 5(a), (b).

Even if an exemption has been registered, there are still strict controls on the use of certain chemicals, for example polychlorinated biphenyls. Their use is permitted in equipment, such as electrical transformers, capacitors or other receptacles containing liquid stocks, until 2025.[81] This is subject to the percentages and volumes of polychlorinated biphenyls present, as well as labelling, packaging and handling measures to ensure public safety.

Reducing or eliminating releases from stockpiles and wastes

The Stockholm Convention adopts a cradle-to-grave approach to POPs management by requiring stockpiles of wastes to be managed to protect human health and the environment. Parties are required to adopt appropriate strategies for identifying stockpiles containing chemicals listed in Annexes A or B.[82] The Convention specifies how disposal of POPs is to be conducted. Specifically, parties are required to take appropriate measures so that wastes, including products and articles becoming wastes, are:

- handled, collected transported and stored in an environmentally sound manner;
- disposed of in such a way that the POP content is destroyed or irreversibly transformed so that they do not exhibit POPs characteristics, or otherwise disposed of in an environmentally sound manner consistent with international standards and global regimes governing the management of hazardous wastes;
- not permitted to be subjected to disposal operations that may lead to recovery, recycling, reclamation, direct reuse or alternative uses of POPs; and
- not transported across international boundaries without taking into account relevant international standards.[83]

Parties are also required to develop strategies for identifying sites contaminated by POPs, and to carry out any remediation in an environmentally sound manner.[84] The Stockholm Convention does not specify any particular technology that must be used to destroy stockpiles and wastes. However, in considering environmentally safe disposal technology, the COP is required to cooperate with the appropriate bodies of the Basel Convention to determine the methods necessary for environmental sound disposal.

Adding new chemicals to the Annexes

The procedure for listing new chemicals is set out in Article 8 of the Stockholm Convention. Any party can submit a proposal to the Secretariat for a new listing of a chemical in Annexes A, B or C. The proposal must be supported by the information about the chemical specified in Annex D relating to persistence, bioaccumulation, potential for long-range environmental transport and toxicity. If the chemical meets this requirement, the Committee drafts a risk profile taking into account the economic factors in Annex E associated with possible control measures for the chemical. On the basis of the risk profile and risk management evaluation, the Committee then recommends whether the chemical should be considered by the COP

81 Ibid., Annex A, Pt 2.
82 Ibid., Art. 6(1).
83 Ibid., Art. 6(1)(d).
84 Ibid.

for listing in Annexes A, B and/or C. The COP then makes the final decision in a precautionary manner as to whether to list the POP, and the annex in which it should be listed, taking into account the recommendation of the Committee and any scientific uncertainty.

The first additions to Annexes A, B and C occurred at COP4 in 2009 when nine new chemicals were included.[85] A further chemical, endosulfan, was added to Annex A at COP5 in 2011.[86] Amendments bind all parties unless the party declared at the time of ratifying the Convention that any additions to Annexes A, B, and C would not apply unless ratified,[87] or if they have notified their intention not to be bound within one year of being informed of the amendment.[88] These provisions distinctly detract from the precautionary approach envisaged by the Convention.

Information exchange

The Stockholm Convention requires parties to facilitate the exchange of information relevant to the reduction or elimination of the production, use and release of POPs, as well as alternatives, including information about the risk. Information supplied is not treated as confidential.[89] Parties are encouraged to provide information to the public and to promote awareness and education programmes about the health and environmental effects of POPs.[90] Further, parties are expected to undertake research, development and monitoring of POPs.[91] Developed countries are required to provide financial assistance to developing countries.[92]

Compliance and dispute settlement

A reporting system is set up whereby parties are required to detail the measures taken to implement the Convention and their effectiveness.[93] Provision is made for a periodic evaluation of the effectiveness of the Convention.[94]

The COP is required to develop mechanisms for determining non-compliance and for treatment of parties in non-compliance.[95] Article 18 requires the COP to adopt arbitration and conciliation procedures to govern the settlement of disputes between parties. This was effected by the adoption of a new Annex G at COP1 in 2005.[96]

85 Stockholm Convention, op. cit., 'Introduction', citing Decisions SC-4/10 to SC 4/18.
86 Linkages, 'Summary of the Seventh Meeting of Persistent Organic Pollutants Review Committee of the Stockholm Convention', op. cit.
87 Stockholm Convention, op. cit., Arts 22(4), 25(4).
88 Ibid., Art. 22(3).
89 Ibid., Art. 9.
90 Ibid., Art. 10.
91 Ibid., Art. 11.
92 Ibid., Art. 13.
93 Ibid., Art. 15.
94 Ibid., Art. 16.
95 Ibid., Art. 18.
96 Decision SC-1/2.

The Basel Convention[97]

The Basel Convention was adopted in 1989 and entered into force in 1992. Its principal concern was to protect developing countries from hazardous waste dumping by industrialised countries. The Convention regulates international movements of hazardous waste through a PIC system and in accordance with the principles of environmentally sound management. It provides the final link in the chain and together with the Stockholm and Rotterdam Conventions creates a cradle-to-grave approach to hazardous waste management.

Only those 'wastes' that are 'hazardous' fall within the scope of the Basel Convention. 'Wastes' are broadly defined to include substances or objects that are intended for disposal.[98] Wastes are designated as 'hazardous' for the purpose of the Convention, unless they do not possess any of the characteristics contained in Annex III.[99] Annex I lists general categories of wastes to be controlled, while hazardous characteristics are listed in Annex III. Annex I classifies waste according to waste streams and constituents, and includes wastes such as polychlorinated biphenyls, lead, mercury and asbestos. The hazardous characteristics listed in Annex III include explosives, flammable liquids and solids, substances liable to spontaneous combustion, and toxic and ecotoxic waste. Wastes are also treated as hazardous if they are listed in Annex II.[100] This includes household wastes and incinerator ash. Wastes defined as hazardous in the national and domestic legislation of the exporting, importing or transit party are also subject to the Convention.[101]

The definition of 'hazardous waste' is complex and creates uncertainty as to which wastes are hazardous for the purposes of the Convention. To clarify this aspect, two lists of wastes were drawn up and adopted as Annexes VIII and IX to the convention. Wastes listed in Annex VIII are presumed hazardous, while those in Annex IX are not.[102]

The Convention focuses on regulating hazardous waste destined for 'disposal'.[103] 'Disposal operations' are broadly defined to include operations leading to final disposal as well as a number of operations that may lead to recovery or recycling.[104] Although the Convention discourages exports of hazardous waste to developing countries, it allows some exports that are required as a raw material for recycling or recovery in the importing country, subject to ensuring its environmentally sound management.[105] The exploitation of this exception by hazardous waste exporters led to a decision to ban exports of all hazardous wastes from Organisation for Economic Co-operation and Development (OECD) countries to non-OECD countries in 1994[106] and to the adoption of the export ban as a new Annex VII in 1995.[107] The amendment prohibits exports of hazardous waste from Annex VII countries (EU, OECD and Liechtenstein) to non-Annex VII countries. The ban applied immediately

97 The operation of the Basel Convention is discussed in detail by T.G. Puthucherril in Chapter 17 of this volume and is only briefly discussed here in the context of e-waste.
98 Basel Convention, op. cit., Art. 2.
99 Ibid., Art. 1(1)(a).
100 Ibid., Art. 1(2).
101 Ibid., Art. 1(1)(b).
102 Decision IV/9.
103 Basel Convention, op. cit., Art. 2.
104 Ibid., Art. 2(4). 'Disposal operations' include the activities specified in Annex IV to the Convention.
105 Ibid., Art. 4(9).
106 Decision II/12, COP2.
107 Decision III/I COP3. A new Art. 4A is proposed to implement the provisions of Annex VII.

to exports of hazardous waste for disposal, while recycling exports were prohibited from December 1997. However, as at 2011 the amendment had not yet come into effect[108] although a number of parties have already informally implemented the ban amendment.[109]

There are indications that the focus of the Convention is shifting from the movement of hazardous waste to its minimisation. At COP8 the parties adopted a Declaration on E-Waste, agreeing *inter alia* to implement measures to promote clean technology and integrated waste management strategies; encourage technology transfer on environmentally sound management of e-waste; improve waste management controls through legislation and diligent enforcement; and prevent and combat illegal trade.[110] At COP10 the parties adopted the Cartagena Declaration, which highlights the importance of reducing the generation of waste amidst a changing perception of waste as a potential resource.[111] The Declaration acknowledges *inter alia* that 'prevention, minimization and recovery of wastes advance the three pillars of sustainable development'.[112] An important initiative at COP10 was to provide for the Ban amendment to come into force for those countries who wish to adhere to it and to introduce a regime for countries who wish to trade in waste to ensure minimisation of risks to human health and the environment.[113]

The special problems posed by e-waste

Over the past 20 years, there has been an upsurge in technological innovation and production of electronic devices such as computers, printers, mobile phones, iPads and other electronic equipment. While initially these devices were confined to the workplace, they have rapidly become an indispensable acquisition for households and individuals in industrialised and industrialising countries. A drawback of these products is that they have a short lifespan and are frequently replaced by new and better models.

E-waste is the most rapidly growing waste stream. A recent study by UNEP estimates global e-waste generation at approximately 40 million tons each year.[114] The study also predicts that by 2020 e-waste from old computers will have risen by 500 per cent in India and by 200 to 400 per cent in South Africa and China, while that from old mobile phones will be 7 times higher in China and 18 times higher in India.[115] E-waste contains a mixture of several hundred components, including valuable products such as silver, gold, palladium,

108 As at COP10 in 2011, 17 additional ratifications were required for the amendment to come into effect.

109 Basel Action Network, 'The Basel Ban: A Triumph for Global Environmental Justice', October 2011. Online. Available HTTP: <http://www.ban.org/wp-content/uploads/2011/10/BP1_Oct_2011_Final_Letter.pdf> (accessed 23 November 2011).

110 UNEP/CHW.8/CRP.24.

111 Linkages, 'Summary of the Tenth Meeting of the Conference of the Parties to the Basel Convention', *Earth Negotiations Bulletin* 20(37), 2011. Online. Available HTTP: <http://www.iisd.ca/vol20/enb2037e.html> (accessed 23 November 2011).

112 UNEP/CHW.10/CRP.3/Rev.3.

113 UNEP, 'Historic Agreement Ends 15 year Deadlock over Banning North-South Movements of Hazardous Waste', 25 October 2011. Online. Available HTTP: <http://www.basel.int/>.

114 UNEP: Sustainable Innovation and Technology Transfer Industrial Sector Studies, 'Recycling – from E-Waste to Resources', Final Report July 2009. Online. Available HTTP: <http://ewasteguide.info/files/UNEP_2009_eW2R.PDF> (accessed 25 November 2011).

115 Ibid.

copper and indium. However, e-waste can also be hazardous as it also contains a number of heavy metals and hazardous chemicals. These include beryllium, cadmium, chromium hexavalent, lead, mercury, brominated flame retardants, polyvinyl chloride and orgoteins.[116] Most of these substances are toxic to humans and several are known carcinogens.[117]

E-waste poses serious problems on disposal. Globally, millions of tons of e-waste is being consigned to landfill where it leaches into the ground and water over time, or is released into the atmosphere. The vaporisation of metallic and dimethylene mercury creates a risk of uncontrolled fires with associated health and environmental risks.[118] Consequently, many industrialised countries, such as the European Union, the United States and some Asian nations, have introduced legislation prohibiting the disposal of e-wastes to landfill. Incineration has also been banned in most developed countries because it can result in heavy metals such as lead and cadmium being released into the atmosphere. If the waste contains polyvinyl chloride plastic, POPs such as dioxins and furans are also released.[119]

In most industrialised countries, recycling is now the preferred option for dealing with e-waste. Recycling facilities for e-wastes have been established since the 1990s in most developed countries but are often economically unviable because of high labour costs and environmental restrictions on the disposal of components and residues. In many cases, this has led to the export of large quantities of e-waste to developing countries for disposal or recycling. Less stringent environmental standards and lower labour costs in these countries make exports an economically viable alternative. However, the recycling and disposal of e-waste in developing countries is a serious threat to human health and the environment as these countries often lack the capacity to handle these wastes safely.[120]

Global initiatives to resolve the e-waste problem

International conventions

The Rotterdam, Stockholm and Basel Conventions all regulate a number of constituents of e-waste. The PIC procedures under the Rotterdam Convention apply to chemicals, such as mercury and polychlorinated biphenyls, and exports must not take place without the consent of the importing country. Export of e-waste to developing countries for recycling is also contrary to the obligations imposed by the Stockholm Convention. At COP4 two commercial mixtures of brominated flame retardants, known as pentaBDE and octaBDE, were listed. These chemicals are contained in products such as mobile phones, computers and motor vehicles. Since the Stockholm Convention does not permit wastes that contain POPs to be recovered, recycled,

116 Greenpeace International, 'Toxic Tech: Not in our Backyard.' Online. Available HTTP: <http://www.greenpeace.org/international/Global/international/planet-2/report/2008/2/not-in-our-backyard.pdf> (accessed 15 November 2011).
117 Ibid.
118 UNEP: Sustainable Innovation and Technology Transfer Industrial Sector Studies, 'Recycling – from e-Waste to Resources', op. cit.
119 Greenpeace International, 'Where Does E-waste Go?' Online. Available HTTP: <http://www.greenpeace.org/usa/en/campaigns/toxics/hi-tech-highly-toxic/e-waste-goes>(accessed 15 November 2011).
120 See Z. Lipman, 'Economic Growth and Ecological Integrity – the Impact of the Hazardous Waste Trade on the Economy and Environment of Developing Countries', *Environmental Law and Management* 18(5), 2006, 232.

reclaimed or directly re-used, it is problematic as to how products containing these chemicals can be disposed of when they become waste. To deal with this issue, at COP4 an exemption was provided to permit recycling until 2030, but to prohibit exports of such products if they contained levels exceeding those allowed for sale in the exporting country.[121] This compromise may deter exports to developing countries, but a total ban would be preferable.

Of the three conventions, the Basel Convention has the most potential to reduce the movements of e-waste. Among the wastes that are listed as hazardous in Annex VIII and subject to the Convention are a number of constituents of e-waste. Waste electrical and electronic assemblies or scrap are listed as hazardous wastes, as are a number of constituents of computer e-waste such as circuit boards, cathode ray tubes and other electronic boards or components containing lead-based solders and copper beryllium alloys.[122] Thus, exports of whole computers, printers and monitors that contain circuit boards or cathode ray tubes are prohibited under the Basel ban. However, as the ban has not yet come into force, the effectiveness of the Convention to prevent e-waste exports to developing countries is diminished. Indeed, ratification of the ban would not necessarily put an end to the trade, which could continue between states that are not parties to the Convention and between non-Annex VII country parties. There is also the problem of a burgeoning illegal trade in e-waste.

An important recent initiative is the 'synergies' approach which is taking place under the Basel, Rotterdam and Stockholm Conventions. Joint programmes are planned involving all three conventions, in relation to providing technical assistance and promoting global public awareness campaigns on the life cycle management of chemicals and waste.[123]

Technology transfer

Most international initiatives emphasise the importance of information and technology transfer to enable countries to develop the capacity to manage their chemicals and waste in a manner that is safe for human health and the environment.[124] The Basel and Stockholm Conventions both require parties to establish regional and sub-regional centres for capacity-building and technology transfer.[125] Fourteen Basel Convention Regional Centres and 16 Stockholm Convention Regional and Sub-regional Centres have been established.[126] These Centres provide training, information awareness-raising and technology transfer on a range of matters relevant to the Conventions.

There have also been several international e-waste pilot schemes in developing countries and state-of-the-art e-waste recycling facilities have been established. According to UNEP

121 Centre for International Environmental Law, 'Nine Chemicals added to Global Toxics Treaty, with Gaping Exemptions,' 11 May 2009. Online. Available HTTP: <http://www.ciel.org/Publications/CIEL_COP4_11May09.pdf> (accessed 25 November 2011).

122 Decision IV/9. The computer wastes noted are listed in Annex VIII to the Basel Convention.

123 UNEP, 'Enhancing Synergies among the Basel Rotterdam and Stockholm Conventions.' Online. Available HTTP: <http://excops.unep.ch/documents/consproc/PPTEnhancingSynergies.pdf> (accessed 25 November 2011).

124 Rotterdam Convention, op. cit., Art. 14 (information exchange), Art. 16 (technical assistance).

125 Basel Convention, op. cit., Art. 14; Stockholm Convention, op. cit., Art. 12.

126 UNEP, 'The Basel Convention Regional and Coordinating Centres at a Glance'. Online. Available HTTP: <http://archive.basel.int/centers/description/BCRCataGlance.pdf>(accessed 9 May 2012); UNEP 'Stockholm Convention Centres'. Online. Available HTTP:<http://chm.pops.int/Implementation/RegionalCentres/TheCentres/tabid/583/Default.aspx>(accessed 23 November 2011).

reports these schemes have not been entirely successful in changing attitudes to informal recycling. This is partly attributable to an uncritical implementation of technology from developed countries without taking local conditions into account. According to UNEP:

> Technology transfer is not merely a simple duplication of technology from developed countries to developing countries. Local situations like available investment, economic conditions, local treatment standards, awareness and education of workers and management level of the recycling chain should be considered when introducing new technology.[127]

Domestic and regional initiatives: product stewardship and extended producer liability schemes

Product stewardship or extended producer liability is an important recent development in waste management and could assist in providing a solution to the e-waste problem. Product stewardship requires all parties in the product chain to share responsibility for the products they produce, handle, purchase, use and discard. This responsibility extends to designers, manufacturers, suppliers, consumers, collectors, processors, transporters and disposers.[128]

Extended producer responsibility is one part of product stewardship but focuses primarily on the producer of the product. It involves producers taking responsibility for the full life cycle of their product and implementing initiatives to reduce resource use, waste generation and environmental impact and enhance post-consumer resource recovery.[129] It includes 'upstream' impacts from choice of materials and manufacturing processes and 'downstream' impacts associated with the use and disposal of products.[130] 'Upstream' aspects focus on the promotion of clean production throughout the manufacturing process. This strategy is in accordance with Agenda 21, which requires states to encourage industry to develop schemes to integrate the cleaner production approach into product design and management practices.[131] Insofar as electronic products are concerned, progress has already been made with the development of a new computer that is free of both polyvinyl chloride and brominated flame retardants, both known POPs.[132] Downstream regulation involves extending the producers' responsibility to the post-consumer stage of the product's life cycle by requiring them to accept responsibility for end-of-life products. According to the OECD, the advantages of transferring the costs of post-consumer impacts to the producers is that it will provide 'powerful incentives for producers to prevent waste generation, reduce the use of potentially

127 UNEP: Sustainable Innovation and Technology Transfer Industrial Sector Studies, 'Recycling – From E-waste to Resources' op. cit., para. 3.6.
128 Government of Western Australia, 'Extended Producer Responsibility Policy Statement,' 29 June 2005, p. 3.
129 Ibid., p. 4.
130 OECD, 'Pollution Prevention and Control Extended Producer Responsibility in the OECD Area Phase 1 Report, Legal and Administrative Approaches in Member Countries and Policy Options for EPR Programs', 'Preface', OECD, 1996. Online. Available HTTP: <http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=OCDE/GD(96)48&docLanguage=En> (accessed 28 November 2011).
131 UNCED, *Agenda 21*, op. cit., para. 20(17)(c).
132 Greenpeace International, 'Victory! New Greener Computer Released in India', 4 February 2010. Online. Available HTTP: <http://www.greenpeace.org/international/en/news/features/victory-green-electronic-02032010/> (accessed 26 November 2011).

toxic inputs, design products that are easily recyclable and internalise the costs of waste management into product prices'.[133]

The European Union WEEE directives

A number of extended producer responsibility schemes relating to waste electrical and electronic equipment (WEEE) have been implemented in various countries,[134] particularly in Europe. The scheme adopted by the EU is one of the most comprehensive. In 2002 the EU introduced two directives to specifically address the problem of electrical equipment and e-waste and impose cradle-to-grave responsibility on manufacturers. All EU member states were required to incorporate these directives into national legislation and by 2008 all had done so to a greater or lesser degree.[135]

The Directive on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment[136] requires lead, cadmium, mercury, hexavalent chromium, polybrominated biphenyls and polybrominated diphenyl ethers in electrical and electronic equipment to be substituted by safer alternatives by 1 July 2006. The Directive on Waste Electrical and Electronic Equipment[137] provides for collection schemes where consumers can return their e-waste free of charge. It requires manufacturers of such equipment to take back the appliance at their own expense, recycle it and dispose of the residual waste. Registration is mandatory for all manufacturers.

Despite these measures, it has been reported that only a third of electrical and e-waste is separately collected and appropriately treated. The remainder is either consigned to landfill, inadequately treated or illegally exported.[138] As a result, in 2008, the EU decided to revise Directive 2002/96/EC on electrical and e-waste. The proposed amendments set a new binding target for the collection of electrical and e-waste, which includes non-household waste.

Conclusion

The FAO Code and London Guidelines were important early initiatives in providing information exchange and in developing the PIC system. The Rotterdam, Stockholm and Basel Conventions are the most important internationally binding legal instruments to protect human health and the environment from the dangers associated with hazardous chemicals and pesticides. However, implementation of these Conventions has been difficult. In the case of the Rotterdam and Stockholm Conventions, listing of additional chemicals has proved challenging. The Stockholm Convention has a number of exemptions and the Basel Ban has

133 OECD, 'Pollution Prevention and Control Extended Producer Responsibility in the OECD Area Phase 1 Report', op. cit., p. 16.

134 In Australia, manufacturers and importers are liable for disposal costs and material recovery of certain e-waste (*Product Stewardship (Televisions and Computers) Regulations 2011* (Cth)).

135 'The WEEE Directive and its Implementation in the EU', updated September 2009. Online. Available HTTP: <http://www.ecsn-uk.org/Legislation/WEEE/2WEEE%20directive%20&%20implementation%20in%20EU%20sept09v2.pdf> (accessed 2 December 2011).

136 Directive 2002/95/EC.

137 Directive 2002/96/EC.

138 European Commission Environment, 'Recast of the WEEE Directive'. Online. Available HTTP: <http://ec.europa.eu/environment/waste/weee/index_en.htm> (accessed 26 November 2011).

not yet received sufficient ratifications to come into force. Not only has the Basel ban not been observed, but the PIC procedures have not been followed. These problems have been exacerbated by a growing illegal trade in e-waste which necessitates a more careful monitoring of exports and imports. The result is that the capacity of these Conventions to protect human health and the environment from the dangers of chemical and pesticides has been considerably weakened.

An additional global problem is the rapid growth of chemical and electronic production in developing countries. Developed countries should observe their obligations in the Rotterdam, Stockholm and Basel Conventions, to assist developing countries in acquiring the necessary expertise to manage safely any chemicals or hazardous wastes generated domestically. This requires financial assistance and technology transfer. However, experience in developing countries has shown that if these schemes are to be successful, they cannot be transplanted from developed countries without regard to local culture and circumstances.

Clearly, international measures alone are not sufficient to address the problems associated with chemical use and disposal. These measures must to be reinforced by government regulation in developed and developing countries. Developed countries should assume responsibility for waste they have generated instead of exporting it to developing countries. This obligation is reaffirmed in Principle 14 of the Rio Declaration.[139] It is also a fundamental underlying principle in the Basel and Stockholm Conventions. Product stewardship and extended producer responsibility schemes, such as those in the EU, are an important step in achieving this objective. Similar schemes should be adopted in all developed countries and in those developing countries with their own chemical industries.

139 Rio Declaration, op. cit.